

ZERODHA

Markets and Taxation

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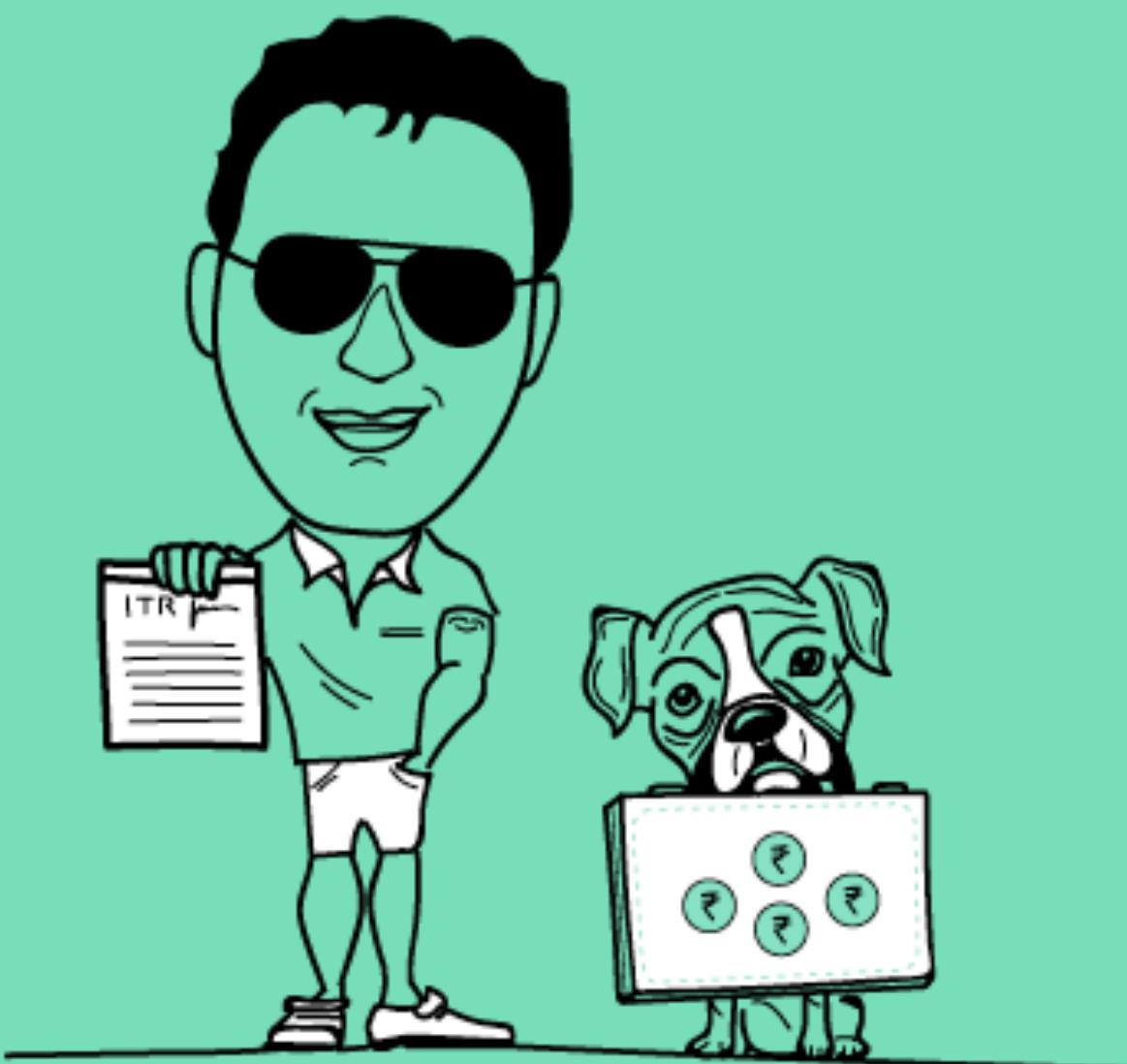


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Introduction(Setting the Context)

I remember a time (maybe about 6 years ago) I had the opportunity to meet one of those hard to find Chartered Accountants who knew both taxation and markets quite well. It was at a friend's party that I got introduced to him. He asked me what I do for a living, to which I promptly replied that I trade for a living. We immediately struck a chord and had a great conversation going. Somewhere during that engaging conversation he asked me a few questions –

- How would I declare my Profits and/or Losses from my market activity?
- Do I bifurcate between speculative business income and non-speculative business income?
- Also, he asked me about the books of accounts that I'm supposed to maintain.

Thanks to my ignorance I had no answers to give him.

I was an eager learner, as I spent all my time learning about the markets and trading strategies but spent very little time learning about taxation and its relevance to market participants.

Probably the reason why I consciously ignored learning about taxation was because I always feared the heavy usage of jargon, random references to sections, subsections, circulars, and whatnot. To my defense – I once did honestly try to learn about taxation. I paid a visit to my broker's office and met my dealer and questioned him on taxation. This is what he had to say – “Arre, why are you so worried? Long-term capital tax is 0% and short-term capital gains tax is 10%, that's it, it is a simple matter.”

I for sure knew it was not just that, I insisted to meet someone more knowledgeable to understand the topic in greater detail. To my luck I got to meet the Regional Head of the stock broking company, enthusiastically I picked his brains about taxation for market participants; unfortunately even he reiterated the same thing that my dealer had told me. It seemed even worse as the regional manager had a sense of pride while he gave me that sloppy answer.

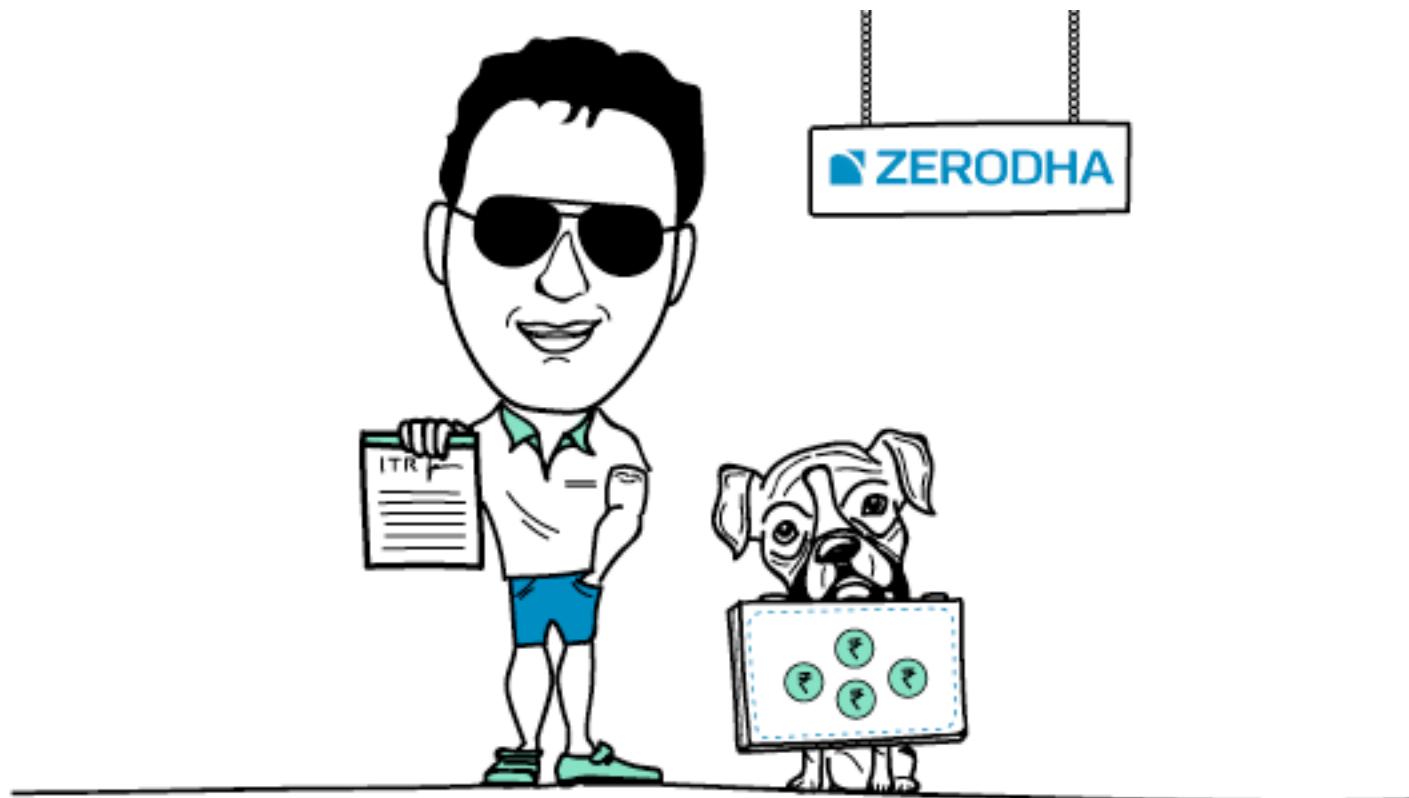
Frustrated, I visited a CA and he essentially said the same thing that my dealer said, but he used fancy jargon and complicated the whole matter to no end. At that point in time nobody had blogged about it online, no good articles were written on the topic and thus my quest to learn taxation related to markets got squashed like a bug.

In retrospect, had I known more about this topic, had I got more information – I would have clearly benefited in multiple ways.

I'm certain there are many traders and investors in a similar situation as I was few years ago. In fact this is true considering that our blog on taxation (which was put up a few years ago) has received over 2000 questions! This number is besides the numerous emails received and queries asked on Trading Q&A.

Keeping this in perspective, we are happy to introduce our new module on Zerodha Varsity aptly titled “Markets & Taxation”. The module deals with literally everything that you need to know about taxation related to markets – be it short term capital gains, or treating your intraday trades as speculative business income, or about Section 44AD – we have it all on Zerodha Varsity – in one place, concise, and simplified.

Now here is the best part – the whole module is authored by Nithin himself, which means that we get to learn about taxation from a trader/investor's perspective and not really from the CA's perspective. This makes a huge difference in terms of topic narrative. With a seasoned trader discussing taxation, we get to learn about the essential topics without digressing into the taxation wilderness.



Lastly, if I look back in time, I could not imagine brokers giving out such valuable information to clients. In fact, stock brokers were always known to hoard information and pass it only to select clients. I'm sure you would agree with me on this, especially if you have been trading the Indian

markets for a while now. Stock Brokers in India have always been snobby, expensive, and full of unwanted attitude.

However the stock broking industry is slowly waking up to the fact that the customer, irrespective of his size deserves the best. This change in attitude is leading to a revolution of sorts in the industry – and I do believe Zerodha is the epicenter of this revolution – changing the way the Indian broking industry functions. Be it providing you high quality tools to trade, better trader education, or ready to use tax friendly reports – Zerodha has it all for you.

So please do go ahead and explore this unique module on Markets & Taxation. I can assure you that the content presented here will make you more confident about matters related to taxation, and with that new-found confidence you will never have to fear the taxman!

Stay connected, stay profitable.

– Karthik Rangappa

Basics

2.1 – Overview

India needs help from all of us countrymen in developing a tax culture. The fear about income tax department can be removed only by gaining knowledge on all the basic rules and regulations. Income tax rates in India have drastically reduced from over 90% in the early seventies to now (2015) where no tax has to be paid on annual income upto Rs 2.5lks. But the apathy of taxpayers towards filing income tax returns and paying taxes continues till today.

With the systems used by the IT department becoming sophisticated every year, the chances of repercussions in terms of notices and penalties due to non-filing, mis-filing, and hiding information while filing your income tax returns (ITR) is going up significantly. Similar to how Income tax (IT) department has access to all your bank account details, they can also check upon all your capital market activity easily through the exchanges as they are all mapped to your PAN (Permanent account number).

Even if the intent is there to be compliant, most people including many Chartered Accountants (CAs) don't understand the subject of taxation when investing & trading very well. We had put up blog post, "**Taxation Simplified**" on Z-Connect a few years back simplifying key aspects of taxation for market participants. Over the last 2 years we have received a few thousand queries on the post. Answering all of them it was obvious that we had to do a lot more to simplify all aspects around taxation while trading or investing in the markets, hence this module.

If you only invest into stocks or mutual funds filing returns is quite simple, but can get tricky if trading intraday stocks or financial derivatives (futures and options).

We will in this module break all the concepts down into small easy to understand chapters without any of those jargons typically used by CA's or tax consultant's. Here is a sneak peak into what you can expect going forward in this module –

- 1. Introduction (Setting the Context)**
- 2. Basics**
- 3. Classify your Market Activity**
- 4. Taxation for Investors**

- 5. Taxation for Traders**
- 6. Turnover, Balance Sheet, and P&L**
- 7. ITR Forms (The Finale)**



2.2 – What is income tax?

It is a tax levied by the Government of India on the income of every person. The provisions governing the Income-tax Law are given in the Income-tax Act, 1961. In simpler words, Income Tax is a portion of money that you earn paid to the government of India.

Why should I pay tax?

Yes India does not offer social security and free medical facilities as being provided in some developed countries, but the government needs funds collected as taxes to discharge number of responsibilities like Government hospitals, Education, National defense, Infrastructure development just to name a few.

Who is supposed to pay income tax?

Income-tax is to be paid by every person who earns more than the minimum income slab set by the government. The term ‘person’ as defined under the Income-tax Act covers in its ambit natural as well as artificial persons (including corporate).

Only 2.9 percent of over 121 crore population are taxpayers in India compared to over 45% in a developed economy like U.S.A. Part of the reason for such an abysmally low number is also because many Indians don't earn enough to qualify to pay income tax, but the larger factor has got to do with lack of tax culture.

Taxes have to be paid based on how much income you earn every financial year. Financial year in India starts from April 1st and ends on 31st March. Do note that year can be specified either as financial year (FY) or assessment Year (AY).

FY is used to denote the actual year the income was earned for which you are filing taxes. So FY 2014/15 is the financial year starting April 1st 2014 and ending 31st March 2015.

AY is used to denote the year in which you are supposed to file your taxes. So AY 2015/16 is the year when you file the returns for income earned in FY 2014/15. So AY 2015/16 and FY 2014/15 are one and the same. So you will use ITR with AY 2015/16 on it to file your taxes for the income earned in financial year starting April 1st 2014 and ending 31st March 2015.

2.3 – Income tax slabs in India for financial year 2014/15

All Indians have to pay taxes on the total income earned every year as per the below tax slabs they belong to. If you are salaried, your employer would already be paying taxes on your behalf to the government and issuing you a 'Form 16' as an acknowledgement for having paid the taxes. Your employer will not have access to all your sources of income, like bank interest, capital gains, rental income, and others. You are supposed to use the form 16, add all your other income, calculate and pay any additional tax, and file your income tax returns before due date every year. The tax slab for individuals (FY 14/15) is as below –

Individual (age upto 60 years)

Income slabs	Tax Rates
0 – Rs 2.5 lks	NIL
Rs 2.5lks – Rs 5lks	10% of amount by which income exceeds Rs 2.5lks.
Rs 5lks – Rs 10lks	Rs. 25,000 + 20% of the amount by which income exceeds Rs 5lks
10lks and above	Rs. 125,000 + 30% of the amount by which income exceeds Rs 10lks

Senior citizen (age 60 to 80 years)

Income slabs	Tax Rates
0 – Rs 3 lks	NIL
Rs 3lks – Rs 5lks	10% of amount by which income exceeds Rs 3lks.
Rs 5lks – Rs 10lks	Rs. 20,000 + 20% of the amount by which income exceeds Rs 5lks
10lks and above	Rs. 120,000 + 30% of the amount by which income exceeds Rs 10lks

Super senior citizen (age 80 years and above)

Income slabs	Tax Rates
0 – Rs 5 lks	NIL
Rs 5lks – Rs 10lks	20% of the amount by which income exceeds Rs 5lks
10lks and above	Rs. 100,000 + 30% of the amount by which income exceeds Rs 10lks

From the next chapter we will start focusing in detail on all aspects of taxation when trading and investing in the markets.

Key takeaways from this chapter

1. Filing correct Income tax returns is the duty of every Indian resident
2. The Income tax department has access to your market activity
3. Only 2.9 % of Indians are tax payers
4. Financial year (FY) is the year income was earned, Assessment year (AY) is the year you file your taxes on the income earned
5. Financial year is between 1st of April of the current year and 31st March of the following year
6. The income tax applicable to you depends on the income tax slab you belong to
7. The income tax slabs vary based on your age group

Disclaimer – Do consult a chartered accountant (CA) before filing your returns. The content above is for your general knowledge only. Content meant for Individual retail investors/traders in India.

Classifying Your Market Activity

3.1 – Are you a trader or investor or both?

Identifying yourself as a trader or an investor is the first step to file your income tax returns. This may seem like an easy task, but here is what this **circular from CBDT** (Central board of direct taxes) says:

“If you buy shares with the intent of earning income through dividends you are an investor, and if you buy and sell shares with the intent to profit, you are a trader”:) .

Yes, that is how vague it is, and this is a circular dated 2007, released after 18 years of the original circular. Numerous judicial pronouncements and government was still unable to clear this highly debatable issue. Thanks to the vagueness of this circular, it has given too much power in the hands of the assessing Income tax officer (AO) especially considering the fact that most of the stock purchases are done intending to profit from the price appreciation.

So before filing income tax returns, you will have to first classify yourself as an investor, trader, or both. We will in this chapter help you figure this out in line with what most AO's would be expecting. By income I mean **both** profits and losses.

When trading or investing you need to classify your income under one of these heads, broadly speaking they are –

- 1.** Long term capital gain (LTCG)
- 2.** Short term capital gain (STCG)
- 3.** Speculative business income
- 4.** Non-speculative business income

Let us understand what each of these mean.

Long term capital (LTCG)

Assume you buy stocks or Mutual Funds today for Rs.50,000/- and sell the same after 365 days at Rs.55,000/-, then the profit or gain of Rs.5,000/- is considered as Long term capital gain. Generally speaking, gain or profit earned by investing into stocks or equity mutual funds, and selling after 1 year from date of purchase can be categorized under LTCG. Currently in India any gains realized and categorized as LTCG (equity & equity MF) is completely exempt from taxes. In other words, tax on LTCG is at 0%. Do note – the purchase and sale of shares has to be conducted via a recognized exchange.

Just to reemphasize – if you had bought Infosys shares worth Rs.1,00,000/- 10 years ago, and sold the same today for Rs 1 crore, you don't have to pay any taxes on your gain or profit of Rs 99,00,000.

So, taxes on long term capital gain of Rs 99,00,000 = 0 (Zero) or exempt

If the investment and the consequent sale were done via an off-market transaction,

- ➡ Non listed stocks – Tax on LTCG is 20% (for example purchase and sale of shares belonging to startup companies by Venture Capitalists)
- ➡ Listed stocks – Tax on LTCG 10%

Short term gain (STCG)

Assume you buy stocks or Mutual Funds today for Rs.50,000/- and sell the same within the completion of 365 days, say at Rs.55,000/-, then the profit or gain of Rs.5,000/- is considered as a Short term capital gain(STCG) .

Generally speaking, gain or profit earned by investing into stocks or equity mutual funds holding for more than 1 day (also called delivery based) and selling them within 1 year from date of purchase can be categorized under STCG.

Currently tax on STCG in India is flat 15% on the gain or profit.

Therefore, if you buy Infosys shares worth Rs 100,000/- today and sell the same 10 days later for Rs.120,000/-, then you are liable to pay 15% on Rs 20,000 (STCG) or Rs 3000/- as taxes.

So, tax on short term capital gain = flat 15% of the gain/profit.

Speculative Business income

As per section 43(5) of the Income Tax Act, 1961, profits earned by trading equity or stocks for intraday or non-delivery is categorized under speculative **business income**.

There is no fixed rate like capital gains tax rate when you have a business income. If you have a business income, it has to be added to the rest of your other income and tax has to be paid as per the tax slab you fall in.

For example, assume for the financial year my profit from trading intraday stocks was Rs. 100,000/-, and my salary for the year was Rs.400,000/-. So my total income for the year is Rs 5,00,000, and I have to pay taxes on this as per my tax slab, Rs 25000 in this case as shown below.

SL No.	Slab	Taxable Amount	Tax Rate	Tax Amount
1	0 to Rs.250,000	2,50,000	0%	Nil
2	250,000 to 5,00,000	2,50,000	10%	25000
Total Tax applicable				Rs. 25,000

So the point here is that, one needs to club the speculative business income with other income source and identify the taxable amount. Once this is done, tax has to be paid based on the tax slab one belongs to.

Non – speculative Business income

Income from trading futures & options on recognized exchanges (equity, commodity, & currency) is categorized under non-speculative business income as per section 43(5) of the Income Tax Act, 1961.

Like discussed earlier, business income has no fixed tax rate, you are required to add the non-speculative business income to all your other income, and pay taxes according to the slab applicable to you.

For example, assume a trader cum hotelier earns Rs, 500,000 by trading F&O. Besides this assume he also earns Rs.20,00,000/- from his hotel business. Therefore his total income for the year is Rs 25,00,000/- (Rs.500,000 + Rs.20,00,000) and therefore his tax obligation is as follows

SL No.	Slab	Taxable Amount	Tax Rate	Tax Amount
1	0 to Rs.250,000	2,50,000	0%	Nil
2	250,000 to 5,00,000	2,50,000	10%	25000
3	500,000 to 1,000,000	5,00,000	20%	1,00,000
4	10,00,000 to 25,00,000	15,00,000	30%	4,50,000
Total Tax applicable				Rs.575,000

Effectively the business man here is paying 30% of his F&O profits as taxes.

You would be wondering why trading equity intraday is considered ‘speculative’ but trading F&O is considered ‘non speculative’?

When trading intraday there is no intention of taking delivery, and hence it is considered speculative business. F&O is defined as non-speculative by the government, maybe as they can be used for hedging and also for taking/giving delivery of the underlying contract (even though currently equity and currency derivatives in India are all cash settled, but by definition they give rise to giving/taking delivery. Certain commodity F&O contracts like gold have delivery option to it).

3.2 – Pros and cons of declaring trading as a business income

Let us look at the bright side first; here is a list of advantages of declaring trading as a business income

- 1. Low tax** – If the total income (trading + any other) is less than Rs.250,000/-, then there is no tax implication and if less than Rs.500,000/- effectively one has to pay less than 10% of income as tax.
- 2. Claim expense** – One can claim benefit of all expenses incurred for the business of trading (while for capital gains only charges on your contract note other than STT can be claimed). For example, brokerage charges, STT, other statutory taxes while trading, internet, phone, newspapers, depreciation of computers and electronics, research reports, books, advisory, etc.
- 3. Offset the loss with gains** – If one incurs any non-speculative F&O trading loss, this can be set-off against any income other than salary. For example, if I incur Rs 5,00,000 loss in trading F&O and my other income (like rent & interest, excluding salary) is Rs 10,00,000 , I will have to now pay tax only on Rs 5,00,000.

4. Carry forward the F&O loss – If there is net loss any year (non-speculative F&O + any income other than salary), and if income tax returns are filed before due date, loss can be carried forward for the next 8 years. During the next 8 years, this loss can be set-off against any other business gain (non-speculative business income). For example, if you had net loss of Rs 5,00,000 this year trading F&O which was declared on time, you can carry forward this loss next year and assuming you made a profit of Rs 20,00,000 next year, you can set-off the previous year's Rs 5,00,000 loss and pay taxes only on Rs 15,00,000.

5. Carry forward your intraday equity loss – Any speculative or intraday equity trading loss can be set-off only against any other speculative gain (note: you cannot set-off intraday equity trading loss which is considered speculative with F&O trading which is considered non-speculative). Speculative losses can be carried forward for 4 years if the returns are filed on time. So assume an equity intraday trader makes a loss of Rs.100,000/- this year, he cannot offset this against any other business income. However, he can carry it forward to the next year (upto 4 years). Assume the next year he makes a profit of Rs.50,000/- by trading equity intraday, then in that case he can use the previous year's Rs.100,000/- loss to offset the complete gains of this year (Rs.50,000). The balance loss of Rs.50,000/- can still be carried forward to the next 3 years. So do note, partial offset of losses is possible.

The following table summarizes the above points –

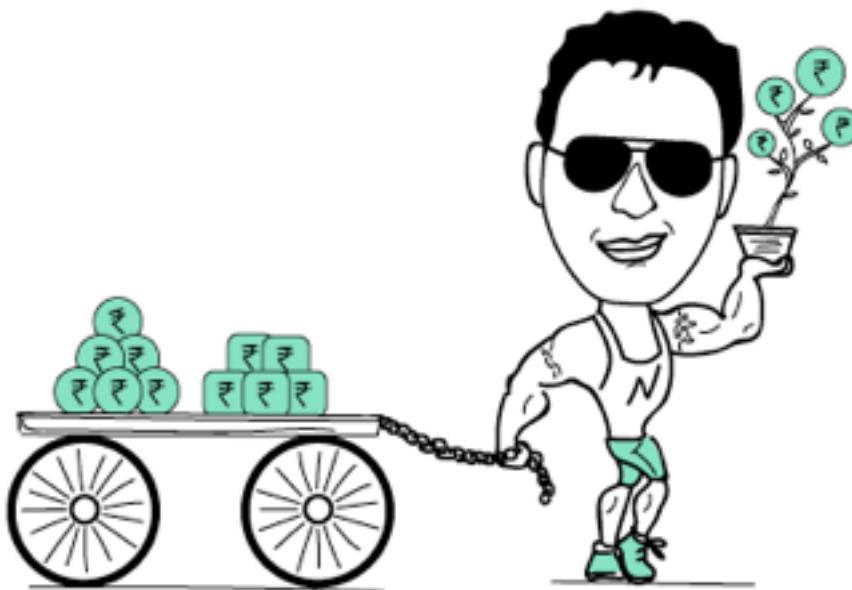
Head of income under which Loss is incurred	Whether loss can be set-off within the same year		Whether Losses can be carried forward and set-off in subsequent years		Time limit for carry forward and set-off of losses
	Under the same head	Under any other Head	Under the same head	Under any other Head	
Losses of F&O as a Trader	Yes	Yes	Yes	No	8 years
Speculation Business	Yes	No	Yes	No	4 years
Capital Gain (Short-Term)	Yes	No	Yes	No	8 years

Now, here is a set of drawbacks for declaring your business income –

1. Potentially high taxes – If you fall under the 30% tax slab, you will effectively pay 30% of all your trading profits as taxes

2. ITR Forms – Declaring business income would mean having to use an ITR4 or 4S, which would mean needing help of a CA to file your IT returns. This can be an added effort and cost especially for those salaried people who might have been using the very easy ITR 1 or ITR 2 (we will discuss more on this topic in the chapter on ITR forms)

3. Audit – Having to maintain the book of accounts which will need to be audited if your turnover goes above Rs 1 crore for a year or if your profit is less than 8% of your turnover (we will discuss more on this topic in the chapter on Turnover)



3.3 – What are you? Trader, Investor, or Both?

Coming back to our original discussion, according to CBDT

Investor: anyone who invests with the intention of earning through dividends

Trader: anyone who buys and sells with the intention of profiting from the price rise.

As an investor, you can claim all your delivery based equity gains/profit to be capital gains. But as a trader, it becomes your business income which has its own pros and cons as discussed above.

The rule is very clear with **respect to F&O trading, and intraday equity trading**. F&O trading has to be considered as a non-speculative business, and intraday equity as a speculative business. So if you trade these instruments, you have to use ITR 4 for filing IT returns. So even if you are salaried, you have to compulsorily use ITR4 and declare this income (profit or loss) from trading as a business.

Unlike what most people think, losses also have to be **declared compulsorily**. Hiding trading activity on the exchange from the IT department could mean trouble, especially in case of any IT scrutiny (IT scrutiny is when the assessing income tax officer (AO) demands you to meet him and give an explanation on your IT returns). The chances of getting a call for scrutiny is higher when the IT department systems/algorithms pick up trading activity on your PAN, but the same not declared on your ITR.

For **equity delivery based investments**, if you are holding stocks for more than a year, you would have received some kind of dividend and even if you didn't, you can show them all as investments and claim exemption under the long term capital gain. If you are **buying and selling stocks frequently** (yes it is an open statement, but there is no rule which quantifies 'frequent') for shorter terms, it is best to declare that as non-speculative business income instead of STCG.

Another thing to keep in mind is that if investing/trading on the markets is your only source of income, and even if your trading activity is moderate, it is best to classify income from all your equity trades as a business income instead of capital gains. On the other hand, if you are salaried or have some other business as your primary source of business, it becomes easier to show your equity trades as capital gains even if the frequency is slightly higher.

Thankfully one thing **that the circular** clarified was that you can be a trader and investor both at the same time. So you can have stocks meant as investment for long term, and stocks meant for shorter term trades. Just because you indulge in a lot of shorter term trades, wouldn't necessarily convert all your longer term holdings or investments into trades and therefore bring those long term gains under business income. But it is important to clearly demarcate your trading and investment portfolio while filing returns.

Similarly, if you are trading F&O or intraday equity trading, you compulsorily have to classify yourself as a trader, but you can still show your long term investments under the capital gains head to get the benefit of LTCG being exempt from taxes.

So, you can be an investor, trader, or both, but make sure to keep the above points in mind, and **do consult a chartered accountant before filing returns.**

Even though this might seem confusing, rules are made for 1% of the population that is trying to break them. As long as your intent is right, you know the basic concerns of the IT department and keep those in mind while filing IT returns, it is quite simple. But stay consistent with the way you classify yourself, don't keep switching between being an investor or trader to declare your equity short term trades.

If you follow these simple rules, let me assure you – there is no need to fear the taxman.

Before we wrap this chapter, here are some interesting links that you should read through.

[CBDT circular on distinction between trades and investments.](#)

[Business Standard – Is your return from stocks capital gains or business income?](#)

[Economic Times – Are you a stock trader or an investor?](#)

[Taxguru – Income from share trading – Business or capital gain?](#)

[Moneycontrol- Investor or trader: The argument continues](#)

[Economic Times – Budget 2014 clarifies that commodity trading on recognized exchanges is non-speculative](#)

[Economic times – New data mining tool may access PAN-based information of taxpayers, help check evasion](#)

Key takeaways from this chapter

1. Trading F&O (Equity, currency, commodity) is considered non-speculative business
2. Trading intraday equity is considered speculative business
3. Equity holdings for more than 1 year is considered Long term capital gain (LTCG)
4. Equity holdings between 1 day to 1 year with low frequency of trades is considered Short term capital gain (STCG), else in case of high frequency of trades it should be considered as non-speculative business income

Disclaimer – Do consult a chartered accountant (CA) before filing your returns. The content above is in the context of taxation for retail individual investors/traders only.

Taxation for Investors

4.1 – Quick recap

In continuation of previous chapter: **Classifying your market activity**

You can consider yourself an **investor** when –

- Buying and selling stocks after taking delivery to your DEMAT account not frequently or
- Equity holdings were purchased with an idea to earn dividends or with a plan of holding it for long term.

If the frequency of transactions (buy/sells) is high, it is best to consider them as trades and not investments. If considered as trades, any income is **non-speculative business income**, whereas if these are investments, then it falls under **capital gains**.

Keeping this in perspective, you may have few questions –

- What is long term?
- What is considered high frequency of transactions (buy/sells)?

We discussed this in the previous chapter, but just to refresh your memory – there is no set rule from the IT department to quantify ‘frequency’ or determine ‘long term’.

As long as your intent is right, and you are consistent across financial years in the way you identify long term or high frequency, there is nothing to worry.

Do note, if you are indulging in equity delivery based trades as frequent as a **few times every week**, it would be best to consider all of them as ‘trades’ and classifying income from them as business income instead of capital gains.

Reiterating again that if investing/trading on the markets is the only source of income, and even if you are trading with moderate frequency, it is best to classify income from all your equity trades as a business income instead of capital gains.

On the other hand, if you are salaried or have some other business as your primary source of business, it becomes easier to show your equity trades as capital gains even if the frequency of trades is slightly higher.

So essentially,

1. Stocks that you hold for more than 1 year can be considered as investments as you would have most likely received some dividends and also held for longish time
2. Shorter term equity delivery buy/sells can be considered as investments as long as frequency of such buy/sells is low
3. Shorter term equity delivery buy/sells ideally has to be considered as trades (trading/business income) if your frequency of such trades is as high as few times every week

The focus of this chapter is on investing; hence we will keep the discussion limited to just points 1 and 2. We will talk about taxation when trading/business income in the next chapter.

4.2 – Long term capital gain (LTCG)

When you buy & sell (long trades) or sell & buy (short trades) stocks within a single trading day then such transactions are called intraday equity/stock trades.

Alternatively if you are buying stocks/equity and wait till it gets delivered to your DEMAT account before selling it, then it is called ‘equity delivery based’ transactions.

Any gain or profit earned through equity delivery based trades or mutual funds can be categorized under capital gains, which can be subdivided into:

- **Long term capital gain (LTCG):** equity delivery based investments where the holding period is more than 1 year
- **Short term capital gain (STCG):** equity delivery based investments where the holding period is lesser than 1 year

Taxes on long term capital gains for equity and mutual funds are discussed below –

For stocks/equity – 0% or NIL tax

It is NIL only if the transactions (buy/sells) are executed on recognized stock exchanges where STT (Security transaction tax) is paid. As discussed above, LTCG is for holding period more than 1 year.

If the transactions (buy/sells) are executed through off-market transfer where shares are transferred from one person to another via delivery instruction booklet and not via a recognized exchange then LTCG is 20% in case of non-listed stocks, and 10% on listed stocks. (Listed are those which trade on recognized exchanges). Do note that when you carry an off-market transaction Security Transaction Tax (STT) is not paid, but you end up paying higher capital gains tax. A typical

example of an off-market transaction could be a father transferring equity holdings to his son via a ‘delivery instruction booklet’.

For equity mutual funds (MF) – 0% or NIL tax

Similar to equity delivery based trades, any gain in investment in equity oriented mutual funds for more than 1 year is considered as LTCG and exempt from taxes. A mutual fund is considered as equity oriented if at least 65% of the investible funds are deployed into equity or shares of domestic companies.

For non-equity oriented/Debt MF – flat 20% on the gain with indexation benefit

Union budget 2014 brought in a major change to non-equity mutual funds. As opposed to 1 year in equity based funds, you have to stay invested for 3 years in non-equity/debt funds for the investment to be considered as long term capital gain. If you sell the funds within 3 years to realize a gain, then that gain is considered as STCG.

4.3 – Indexation

When calculating capital gains in case of non-equity oriented mutual funds, property, gold, and others where you are taxed on LTCG, you get the indexation benefit to determine your **net capital gain**.

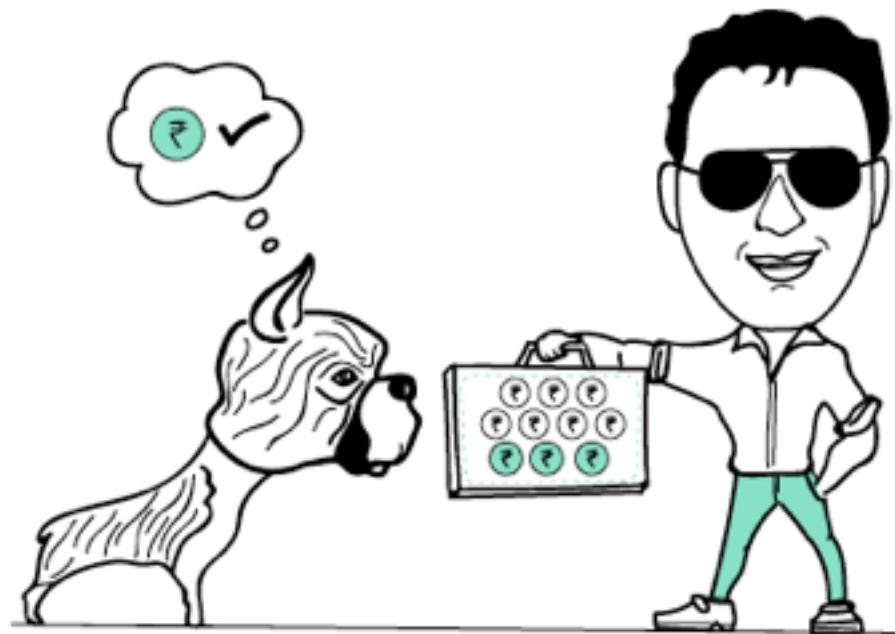
I guess we would all agree that inflation eats into most of what is earned as profits by investing into capital assets such as the ones mentioned above.

For someone wondering what that inflation is, here is a simple example to help you understand the same –

All else equal, if a box of sweets priced at Rs.100 last year, chances are the same could cost Rs.110 this year. The price differential is attributable to Inflation, which in this example is 10%. Inflation is the % by which purchasing value of your money diminishes.

Assuming the average inflation rate in India of around 6.5%, if you had invested into a debt fund, wouldn’t a big portion of your long term capital gain at the end of 3 years get eaten away by inflation?

For example assume you had invested Rs.100,000/- into a debt fund, and you got back Rs 130,000/- at the end of 3 years. You have a long term capital gain of Rs.30,000/-. But in the same period assume purchasing value of money is dropped by 18k because of inflation. Should you still pay long term capital gain on the entire 30k? Clearly this does not make sense right?



Indexation is a simple method to determine the true value from sale of an **asset after considering the effect of inflation**. This can be done with help of **Cost inflation index (CII)** which can be found on the [income tax website](#).

Let me explain this with an example of a purchase/sale of a debt mutual fund.

Purchase value: Rs.100,000/-

Year of purchase: 2005

Sale value: Rs 300,000

Year of sale: 2015

Long term capital gain: Rs 200,000/-

Without indexation I would have to pay tax of 20% on the capital gains of Rs 200,000/-, which works out to Rs 40,000/-.

But we can reduce the LTCG by considering indexation.

To calculate indexed purchase value, we need to use the cost inflation index (CII). Find below the cost inflation index from the income tax website until 2014/15.

Financial Year	CII
Before 1/4/1981	100
1981-82	100
1982-83	109
1983-84	116
1984-85	125
1985-86	133
1986-87	140
1987-88	150
1988-89	161
1989-90	172
1990-91	182
1991-92	199
1992-93	223
1993-94	244
1994-95	259
1995-96	281
1996-97	305
1997-98	331
1998-99	351
1999-00	389
2000-01	406
2001-02	426

Financial Year	CII
2002-03	447
2003-04	463
2004-05	480
2005-06	497
2006-07	519
2007-08	551
2008-09	582
2009-10	632
2010-11	711
2011-12	785
2012-13	852
2013-14	939
2014-15	1024

Going back to the above example,

CII in the year of purchase (2005): 497

CII in the year of sale (2015): 1024

Indexed purchase value = Purchase value * (CII for year of sale/ CII for year of purchase)

So –

Indexed purchase value = Rs 100000 * (1024/497)

= Rs 206036

Long term capital gain = Sale value - Indexed purchase value

Therefore, in our example

$$\text{LTCG} = \text{Rs } 300,000 - \text{Rs } 206,036$$

$$= \text{Rs } 93,964/-$$

So the tax now would be 20% of Rs 93,964 = Rs 18,792, much lesser than Rs 40,000/- you would have had to pay without the indexation benefit.

Like I had said earlier, the indexed purchase value can be calculated using the above method for all long term capital gains which are taxable like debt funds, real estate, gold, FD, among others. You could use the IT department's **Cost inflation index utility** to check on indexed purchase value of your capital assets instead of having to calculate manually.

Interesting thing to note in regards to 20% after indexation for non-equity oriented or debt funds: Most of these funds return between 8 to 10% and typically inflation in India has been around that for the last many years. So with the indexation benefit, you typically won't have to pay any tax on LTCG of non-equity oriented funds.

4.4 – Short term capital gain (STCG)

Tax on short term capital gains for equity and mutual funds are discussed below –

For stocks/equity: 15% of the gain

It is 15% of the gain if the transactions (buy/sells) are executed on recognized stock exchanges where STT (Security transaction tax) is paid. STCG is applicable for holding period less than 1 year (365 days) and more than 1 day.

If the transactions (buy/sells) are executed via off-market transfer (where shares are transferred from one person to another via delivery instruction booklet and not on the exchange) where STT is not paid, STCG will be taxable as per your applicable tax slab rate. For example, if you are earning over Rs.10,00,000/- per year in salary, you will fall in the 30% slab, and hence STCG will also be taxed at 30%.

For equity mutual funds (MF): 15% of the gain

Similar to STCG for equity delivery based trades, any gain in investment in equity oriented mutual funds held for lesser than 1 year is considered as STCG and taxed at 15% of the gain. Do note a fund is considered Equity based if 65% of the funds are invested in domestic companies.

For non-equity oriented/Debt MF: As per your individual tax slab

Union budget 2014 brought in a major change to non-equity mutual funds. You have to now stay invested for 3 years for the investment to be considered as long term capital gain. All gains made on investments in such funds held for less than 3 years are now considered as STCG. STCG in this case has to be added to your other business income and tax paid according to your income tax slab.

For example, if you are earning around Rs 800,000/- per year in your normal business/salary and you had STCG of Rs 100,000/- from debt funds, you will fall in the 20% slab as your total income is Rs 9,00,000/-. So effectively in this example you will pay 20% of STCG as taxes.

4.5 – Days of holding

For an investor, the taxation difference between LTCG and STCG is quite huge. If you sold stocks 360 days from when you had bought, you would have to pay 15% of all gains as taxes on STCG. The same stock if held for 5 days more (1 year or 365 days), the entire gain would be exempt from taxation as it would be LTCG now.

It becomes imperative that you as an investor keep a tab on the number of days since you purchased your stock holdings. If you have purchased the same stock multiple times during the holding period, then the period will be determined using FIFO (First in First out) method.

Let me explain –

Assume on 10th April 2014, you bought 100 shares of Reliance at Rs.800 per share, and on June 1st 2014 another 100 shares were bought at Rs.820 per share.

A year later, on May 1st 2015, you sold 150 shares at 920.

Following FIFO guidelines, 100 shares bought on 10th April 2014 and 50 shares from the 100 bought on June 1st 2014 should be considered as being sold.

Hence, for shares bought on 10th April 2014 gains = Rs 120 (920-800) x 100 = Rs 12,000/- (LTCG and hence 0 tax).

For shares bought on June 1st, Gain = Rs 100 (920-820) x 50 = Rs 5,000/- (STCG and hence 15% tax).

Small little sales pitch here – if you are trading at Zerodha the holdings page in our back office assistant Q will keep a tab for you on number of days since your holdings were purchased, and even a breakdown if bought in multiple trades.

Here is a snapshot of the same –

12	BHEL	INE257A01026	35	₹276.90	₹9,691.50	₹230.95	₹8,083.25	₹-1,608.25 (-16.59%)
	Symbol		Date		Qty		Days	
	BHEL		24-02-2015		35		63	1 
								signifies long term holding.
13	HINDUNILVR	INE030A01027	25	₹470.50	₹11,762.50	₹645.15	₹11,120.75	₹9,366.25 (79.63%)
	Symbol		Date		Qty		Days	
	HINDUNILVR		26-03-2013		25		783	2 
								signifies long term holding.
14	ACROPETAL	INE055L01013	1	₹5.45	₹5.45	₹3.00	₹3.00	₹-2.45 (-44.95%)
15	WONDERLA	INE066O01014	84	₹283.60	₹23,822.40	₹270.55	₹22,726.20	₹-1,096.20 (-4.6%)
	Symbol		Date		Qty		Days	
	WONDERLA		06-05-2015		4		12	3 
			12-03-2015		80		67	
								signifies long term holding.

The highlights shows –

1. Day counter
2. A green arrow signifying holdings more than 365 days, selling which won't attract any taxes.
3. If you have bought the same holdings in multiple trades, the split up showing the same.

Besides Zerodha Q, equity tax P&L is probably the only report offered by an Indian brokerage which gives you a complete breakdown of speculative income, STCG and LTCG.

4.6 – Quick note on STT, Advance Tax, and more

STT (Securities Transaction Tax) is a tax payable to the government of India on trades executed on recognized stock exchanges. The tax is not applicable on off-market transactions which is when shares are transferred from one DEMAT to another through delivery instruction slips instead of routing the trades via exchange. But off market transactions attracts higher capital gains

tax as explained previously. Current rate of STT for equity delivery based trades is 0.1% of the trade value.

When calculating taxes on capital gains, STT can't be added to the cost of acquisition or sale of shares/stocks/equity. Whereas brokerage and all other charges (which includes exchange charges, SEBI charges, stamp duty, service tax) that you pay when buying/selling shares on the exchange can be added to the cost of share, hence indirectly taking benefit of these expenses that you incur.

Advance tax when you have realized capital gains (STCG)

Every tax payer with business income or with realized (profit booked) short term capital gains is required to pay advance tax on 15th Sept, 15th December, and 15th March. Advance tax is paid keeping in mind an approximate income and taxes that you would have to pay on your business and capital gain income by the end of the year. You as an individual are required to pay 30% of the expected annual tax that you are likely to pay for that financial year by 15th Sept, 60% by 15th Dec, and 100% by 15th March. Not paying would entail a penalty of annualized interest of around 12% for the period by which it was delayed.

When you are investing in the stock markets, it is very tough to extrapolate the capital gain (STCG) or profit that will be earned by selling shares for an entire year just based on STCG earned for a small period of time. So if you have sold shares and are sitting on profits (STCG), it is best to pay advance tax only on that profit which is booked until now. Even if you eventually end up making a profit for the entire year which is lesser than for what you had paid advance tax, you can claim for a tax refund. Tax refunds are processed in quick time by the IT department now.

You can make your advance tax payments online by clicking on **Challan No./ITNS 280** on <https://incometaxindiaefiling.gov.in/>.

Which ITR form to use

You can declare capital gains either on ITR 2 or ITR4

ITR 4: When you have business income and capital gains

ITR 2: When you have salary and capital gains or just capital gains

4.7 – Short and long term capital losses

We pay 15% tax on short term capital gains and 0% on long term capital gains, what if these were not gains but net losses for the year.

Short term capital losses if filed within time can be carried forward for 8 consecutive years, and set off against any gains made in those years. For example if the net short term capital loss for this year is Rs.100,000/-, this can be carried forward to next year, and if net short term capital gain next year is say Rs.50,000/- then 15% of this gain need not be paid as taxes because this gain can be set off against the loss which was carried forward. We will still be left with Rs.50,000 ($\text{Rs.}100,000 - \text{Rs.}50,000$) loss which be carried forward for another 7 years.

Long term capital losses can't be used to set off against long term gains as in the first place long term capital gains is exempt from any tax. So long term capital loss is a dead loss, and can't be set off or carried forward.

Key takeaways:

1. LTCG : Equity: 0%, Equity MF: 0%, Debt MF: 20% after indexation benefit
2. STCG: Equity: 15%, Equity MF: 15%, Debt MF: as per individual tax slab
3. You can use cost inflation index to determine and get the benefit from the indexed purchase value
4. Index purchase price = Indexed purchase value = Purchase value * (CII for year of sale/ CII for year of purchase)
5. If you have bought and sold the same shares multiple times then use FIFO methodology to calculate holding period and Capital gains
6. STT is payable to the Govt and cannot be claimed as expense when investing

Interesting reads:

Livemint: If you pay STT STCG is 15% otherwise as per tax slab

Income tax India website – Cost inflation index utility

Taxguru – Taxation of income & capital gains for mutual funds

HDFC- Debt mutual funds scenario post finance bill (no2), 2014

Disclaimer – Do consult a chartered accountant (CA) before filing your returns. The content above is in the context of taxation for retail individual investors/traders only.

Taxation for Traders

5.1 – Quick Recap

Reiterating from the previous chapter –

You can classify yourself as an Investor if you hold equity investments for more than 1 year and show income as long term capital gain (LTCG). You can also consider yourself an investor and gains as short term capital gains (STCG) if your holding period is more than 1 day and less than 1 year. We also discussed on how it is best to show your capital gains as a business income if frequency of trades is higher or if investing/trading is your primary source of income.

In this chapter we will discuss on all aspects of taxation when trading is declared as a business income, which can be categorized either as:

1. **Speculative business income** – Income from intraday equity trading is considered as speculative. It is considered as speculative as you would be trading without the intention of taking delivery of the contract.
2. **Non-speculative business income** – Income from trading F&O (both intraday and overnight) on all the exchanges is considered as non-speculative business income as it has been specifically defined this way. F&O is also considered as non-speculative as these instruments are used for hedging and also for taking/giving delivery of underlying contract. Even though currently almost all equity, currency, & commodity contracts in India are cash settled, but by definition they give rise to giving/taking delivery (there are a few commodity future contracts like gold and almost all agri-commodity contracts with delivery option to it). Income from shorter term equity delivery based trades (held for between 1 day to 1 year) are also best to be considered as non-speculative business income if frequency of such trades executed by you is high or if investing/trading in the markets is your main source of income.

5.2 – Taxation of trading/business income

Unlike capital gains there is no fixed taxation rate when you have a business income. Speculative and non-speculative business income has to be added to all your other income (salary, other business income, bank interest, rental income, and others), and taxes paid according to the tax slab you fall in. You can refer to chapter 1 for tax slabs as applicable for FY 2015-16.

Let me explain this with an example:

- My salary – Rs.1,000,000/-
- Short term capital gains from deliver based equity – Rs.100,000/-
- Profits from F&O trading – Rs.100,000/-
- Intraday equity trading – Rs.100,000/-

Gives these incomes for the year, what is my tax liability?

In order to find out my tax liability, I need to calculate my total income by summing up salary, and all business income (speculative and non-speculative). The reason capital gains is not added is because capital gains have fixed taxation rates unlike salary, or business income.

Total income (salary + business) = Rs.1,000,000 (salary income) + Rs.100,000 (Profits from F&O trading) + Rs.100,000 (Intraday equity trading) = Rs 12,000,000/-

I now have to pay tax on Rs 12,000,000/- based on the tax slab –

- 0 – Rs.250,000 : 0% – Nil
- 250,000 – Rs.500,000 : 10% – Rs.25,000/-
- 500,000 – Rs.1,000,000 : 20% – Rs.100,000/-,
- 1,000,000 – 1,200,000: 30% – Rs.60,000/-
- Hence total tax : 25,000 + Rs.100,000 + Rs.60,000 = **Rs.185,000/-**

Now, I also have an additional income of Rs.100,000/- classified under short term capital gains from deliver based equity. The tax rate on this is flat 15%.

STCG: Rs 100,000/-, so at 15%, tax liability is **Rs.15,000/-**

Total tax = Rs.185,000 + Rs.15,000 = **Rs.200,000/-**

I hope this example gives you a basic orientation of how to treat your income and evaluate your tax liability.

We will now proceed to find a list of important factors that have to be kept in mind when declaring trading as a business income for taxation.

5.3 – Carry forward business loss

If you file your income tax returns on time (July 31st for non-audit case – extended to Aug 31st this year (2015), and Sept 30th for audit case) you can carry forward any business loss that is incurred.

Speculative losses can be carried forward for 4 years, and can be set-off only against any speculative gains you make in that period.

Non-speculative losses can be set-off against any other business income except salary income **the same year**. So they can be set-off against bank interest income, rental income, capital gains, but only in **the same year**.

You carry forward non-speculative losses to the next 8 years; however do remember carried forward non-speculative losses can be set-off only against any non-speculative gains made in that period.

For example consider this – my hotel business income is Rs 1,500,000/-, my interest income for the year is Rs.200,000/-, and I make a non-speculative loss of Rs 700,000. In such case my tax liability for the year would be –

My gain is Rs 1,500,000/ from business and Rs.200,000/- from interest, so total of Rs.1,700,000/-.

I have a non speculative business loss of Rs.700,000/-, which I can use to offset my business gains, and therefore lower my tax liability. Hence

$$\text{Tax liability} = \text{Rs.1,700,000} - 700,000 = \text{Rs.1,000,000/-}$$

So I pay tax on Rs.1,000,000/- as per the tax slab I belong to, which would be –

- 0 – Rs.250,000 : 0% – Nil
- 250,000 – Rs.500,000 : 10% – Rs.25,000/-
- 500,000 – Rs.1,000,000 : 20% – Rs.100,000/-,

Hence, Rs.125,000/- goes out as tax.

5.4 – Offsetting Speculative and non-speculative business income

Speculative (Intraday equity) loss can't be offset with non-speculative (F&O) gains, but speculative gains can be offset with non-speculative losses.

If you incur speculative (intraday equity) loss of Rs. 100,000/- for a year, and non-speculative profit of Rs. 100,000/-, then you cannot net-off each other and say zero profits. You would still have to pay taxes on Rs. 100,000/- from non-speculative profit, and carry forward the speculative loss.

For example consider this –

- Income from Salary = Rs. 500,000/-
- Non Speculative profit = Rs. 100,000/-
- Speculative loss = Rs. 100,000/-,

I calculate my tax liability as –

Total income = Income from Salary + Gains from Non Speculative Business income
= Rs.500,000 + Rs.100,000 = **Rs. 600,000/-**

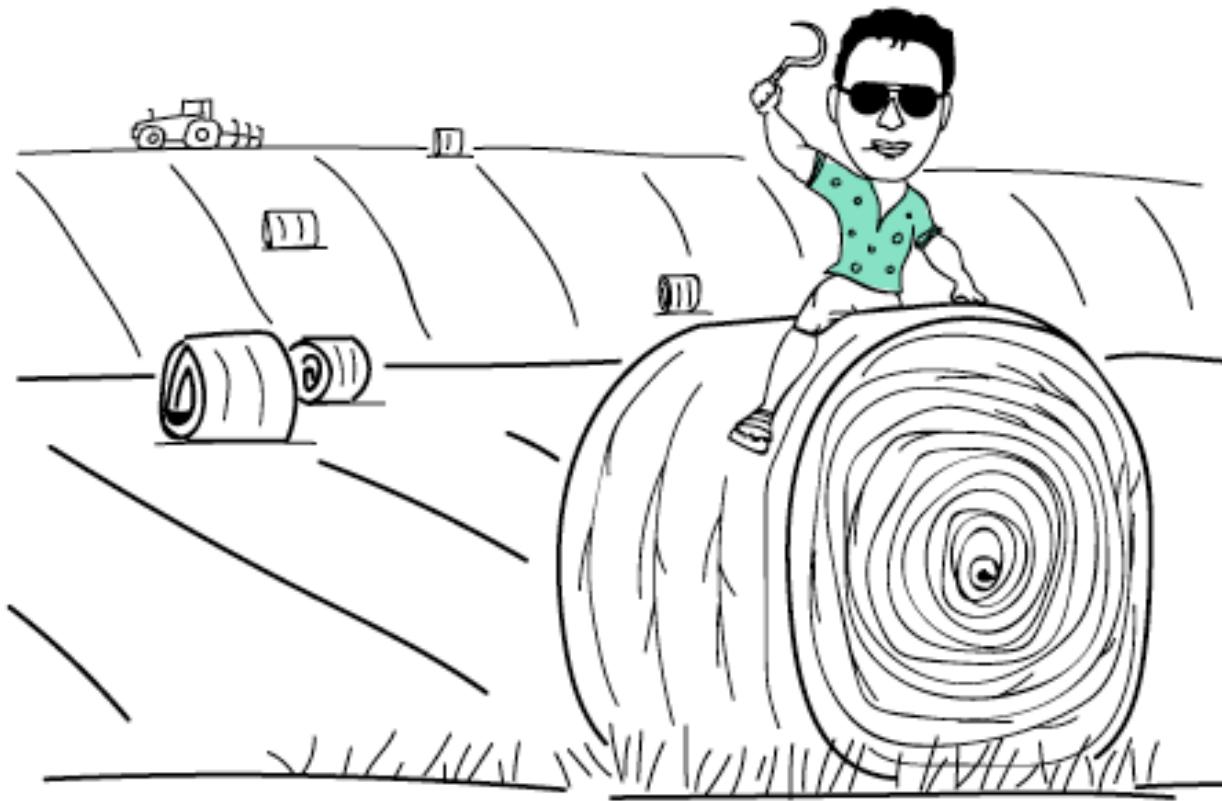
I'm required to pay the tax on Rs.600,000 as per the slab rates –

- 0 – Rs.250,000 : 0% – Nil
- 250,000 – Rs.500,000 : 10% – Rs. 25,000/-
- 500,000 – Rs.600,000 : 20% – Rs. 20,000/-,

Hence total tax = Rs.25,000 + Rs.20,000 = **Rs .45,000/-**

I can carry forward speculative loss of Rs.100,000/-, which I can set-off against any future (upto 4 years) speculative gains. Also to reiterate, speculative business losses can be set-off only against other speculative gains either the same year or when carried forward. Speculative losses can't be set-off against other business gains.

But if I had speculative gain of Rs. 100,000/- and non-speculative loss of Rs. 100,000/- they can offset each other, and hence tax in the above example would be only on the salary of Rs. 500,000/-.



5.5 What is tax loss harvesting?

Towards the end of a financial year you might have realized profits and unrealized losses. If you let it be, you will end up paying taxes on realized profits, and carrying forward your unrealized losses to next year. This would mean a higher tax outgo immediately, and hence any interest that you could have earned on that capital which goes away as taxes.

You can very easily postpone this tax outgo by booking the unrealized loss, and immediately getting back on the same trade. By booking the loss, the tax liability for the financial year would reduce. We at Zerodha are the only brokerage in India presently giving out a tax loss harvesting report, which will spot all opportunities for you to harvest losses. Click here to [learn more](#).

5.6 – BTST (ATST) – Is it speculative, non-speculative, or STCG?

BTST (Buy today Sell tomorrow) or ATST (Acquire today sell tomorrow) is quite popular among equity traders. It is called BTST when you buy today and sell tomorrow without taking delivery of the stock.

Since you are not taking delivery, should it be considered as speculative similar to intraday equity trading?

There are both schools of thought, one which considers it to be speculative because no delivery was taken. However I come from the second school, which is to consider it as non-speculative/ STCG as the exchange itself charges the security transaction tax (STT) for BTST trades similar to regular delivery based trades. A factor to consider is if such BTST trades are done just a few times

in the year show it as STCG, but if done frequently it is best to show it as speculative business income.

5.7 – Advance tax – business income

Paying advance tax is important when you have a business income. Like we discussed in the previous chapter, advance tax has to be paid every year – 30% by 15th Sep, 60% by 15th Dec, and 100% by 15th March. I guess the question that will arise is % of what?

The % of the annual tax that you are likely to pay, yes! When you have a business income you have to pay most of your taxes before the year ends on March 31st. The issue with trading as a business is that you might have a great year until September, but you can't extrapolate this to say that you will continue to earn at the same rate until the end of the financial year. It could be more or less.

But everything said and done, you are required to pay that advance tax, otherwise the penalty is 12% annualized for the time period it was not paid for. The best way to pay advance tax is by paying tax for that particular time period, so Sept 15th pay for what was earned until then, and by March 15th close to the year end, you can make all balance payments as you would have a fair idea on how you will close the year. You can claim a tax refund if you end up paying more advance tax than what was required to pay for the financial year. Tax refunds are processed in quick time by IT department.

You can make your advance tax payments online by clicking on **Challan No./ITNS 280** on <https://incometaxindiaefiling.gov.in/>

Also, here is an interesting link that helps you calculate your advance tax – <http://www.incometaxindia.gov.in/Pages/tools/advance-tax-calculator.aspx>. You can also **check this link** to see how exactly interest or penalty is calculated for non-payment of advance tax.

5.8 – Balance sheet and P&L statements –

When you have trading as a business income, you are required to like any other business create a balance sheet and P&L or income statement for the financial year. Both these financial statements might need an audit based on your turnover and profitability. We will discuss more on this in the next chapter.

5.9 – Turnover and Tax audit

When is audit required?

An audit is required if you have a business income and if your business turnover is more than Rs.1 Crore for the given financial year. Audit is also required as per section 44AD in cases where turnover is less than Rs.1 Crore but profits are lesser than 8% of the turnover.

We will discuss this in detail in the next chapter.

However let us understand what audit really means.

The dictionary meaning of the term “audit” is check, review, inspection, etc. There are various types of audits prescribed under different laws like company law requires a company audit; cost accounting law requires a cost audit, etc. Likewise the Income-tax Law requires the taxpayer to get the audit of the accounts of his business/profession from the view point of Income-tax Law if he meets the above mentioned turnover criteria.

Check this [link for FAQ's on tax audit](#) on the income tax website for more.

Audit can also be defined as having an accountant verify if you have filed everything right. In this case it is getting an accountant check if you have created a correct balance sheet and P&L statement for the year. Ideally this audit should be done by the IT department itself, but considering the number of balance sheets out there it is surely impossible for IT department to audit each one of them. Hence we need a Chartered accountant (CA), who is a qualified professional and authorized by Income tax department to perform audits on balance sheet and P&L statements. You the tax payer can use any CA of your choice.

What role should a CA play?

Ideally a CA is required to only audit and sign on the balance sheets and P&L statements. But a CA also typically ends up creating your balance sheets and P&L statements and will audit them only if required. We will in the next chapter briefly explain how a CA typically creates these two statements.

The importance of the audit process by a CA cannot be understated, apart from all the reporting requirements an audit also helps traders/investors know their financial health, ensure it faithfully reflects the income and claims for deduction are correctly made. It also helps lenders evaluate credibility, and act as a check for any fraudulent practices.

Which ITR form to use? – ITR 4, we will discuss more on this in the last chapter. I have come across incidents where people have declared both speculative and non-speculative as capital gains to avoid having to declare business income, and not having to use ITR4. Taking a shortcut like this could mean a lot of trouble if called for an IT scrutiny.

Business expenses when trading – Advantage of showing trading as a business is that you can show all expenses incurred as a cost which can then be used to reduce your tax outgo, and if a net loss for the year after all these costs, it can be carried forward as explained above.

Following are some of the expenses that can be shown as a cost when trading

- All charges when trading (STT, Brokerage, Exchange charges, and all other taxes). I hope you remember that STT can't be shown as a cost when declaring income as capital gains, but it can be in case of business income.
- Internet/phone bills if used for trading (portion proportionate to your usage on the bill)
- Depreciation of computer/other electronics (used for trading)
- Rental income (if the place used for trading, if a room used – portion of your rent)
- Salary paid to anyone helping you trade
- Advisory fees, cost of books, newspapers, subscriptions and more...

Key takeaways from this chapter

1. Speculative business income if trading intraday equity.
2. Non-speculative if trading F&O, or short term equity delivery actively.
3. Speculative losses can't be set-off against non-speculative gains.
4. Advance tax has to be paid when trading as a business – 30% by Sep 15th, 60% by Dec 15th and 100% by Mar 15th.
5. Can claim all expenses if income from trading shown as a business income.

Disclaimer – Do consult a chartered accountant (CA) before filing your returns. The content above is in the context of taxation for retail individual investors/traders only.

Turnover, Balance Sheet, and P&L



6.1 – Turnover & Tax Audit

In the previous chapter, we discussed briefly on tax audit, and when it is required if you are declaring trading as a business income. To determine if an audit is required or not, we need to first determine the turnover of your trading business.

Reiterating – the requirement of calculating turnover arises only when treating trading P&L as a business income (An audit is not required if you only have capital gains income irrespective of the turnover). Turnover is only to determine if a tax audit is required or not. **Your tax liability does not get affected by your turnover.**

An audit is required if –

- **1 Crore mark** – Turnover for the year crosses the Rs 1 crore mark
- **Section 44AD** – If the turnover is less than 1 crore, and if **profit less than 8% of turnover**

I am sure the first thing that came to your mind after reading turnover is contract turnover, i.e

- Nifty is at 8000, you buy 100 Nifty
- Buy side value = $8000 * 100 = \text{Rs.}800,000/-$
- Nifty goes to 8100, you square off the 100 Nifty
- Sell side value = $8100 * 100 = \text{Rs.}810,000/-$
- Turnover = Buy side value + Sell side value = $800,000 + 810,000 = \textbf{1,610,000/-}$

But it is **not** the contract turnover the IT department is interested in; they are interested in your **business turnover**.

Read below on how business turnover can be calculated –

The method of calculating turnover is a debatable issue and what makes it a grey area is that there is no guideline as such from the IT department. One article of great help though is the guidance note on tax audit under Section 44AB by ICAI (Institute of Chartered accountants of India, the governing body for CA's). The article on [Page 23, Section 5.12 of this guidance note](#) has a guideline on how turnover can be calculated. It says:

→ **Delivery based transactions**

For all delivery based transactions, where you buy stocks and hold it more than 1 day and sell them, total value of the sales is to be considered as turnover. So if you bought 100 Reliance shares at Rs 800 and sold them at Rs 820, the selling value of Rs 82000 (820×100) can be considered as turnover.

But remember that the above calculation of turnover for delivery trades is only applicable if you are declaring equity delivery based trades also as a business income. If you are declaring them as capital gains or investments, there is no need to calculate turnover on such transactions. Also, there is no need of an audit if you have only capital gains irrespective of turnover or profitability.

→ **Speculative transactions (intraday equity trading)**

For all speculative transactions, aggregate or absolute sum of both positive and negative differences from trades is to be considered as a turnover. So if you buy 100 share of Reliance at 800 in the morning and sell at 820 by afternoon, you make a profit or positive difference of Rs 2000, this Rs.2000 can be considered as turnover for this trade.

→ **Non-speculative transactions (Futures and options)**

For all non-speculative transactions, the article says that turnover to be determined as follows –

- The total of favorable and unfavorable differences shall be taken as turnover
- Premium received on sale of options **is also** to be included in turnover
- In respect of any reverse trades entered, the difference thereon should also form part of the turnover.

So if you buy 25 units or 1 lot of Nifty futures at 8000 and sell at 7900, Rs.2500 (25×100) the negative difference or loss on the trade is turnover.

In options, if you buy 100 or 4 lots of Nifty 8200 calls at Rs.20 and sell at Rs.30. Firstly, the favorable difference or profit of Rs 1000 (10×100) is the turnover. But premium received on sale also has to be considered turnover, which is $Rs\ 30 \times 100 = Rs\ 3000$. So total turnover on this option trade = $1000 + 3000 = Rs\ 4000$.

The above calculations (points 1 to 3) are fairly straight forward; the next important thing to decide though is if you want to calculate turnover scrip wise or trade wise.

Scrip wise is when you calculate the turnover by collating all trades on the particular contract/ scrip for the financial year, find average buy/sell value, and then determine the turnover using the above 3 rules with the total profit/loss or favorable/unfavorable difference on this average price.

Trade wise is when you calculate the turnover by summing up the absolute value of profit and loss of every trade done during the year, and following the above rules.

Let me explain both with some examples –

1. 100 Nifty Jan future bought at 8000 and sold at 8100 on 1st Another 100 Nifty Jan future bought at 8100 and sold at 8050 on 10th Jan. Determine turnover

Using scrip wise:

Average Nifty Jan Fut buy: 200 Nifty Buy at 8050

Average Nifty Jan Fut sell: 200 Nifty Sell at 8075

Total profit/loss = $200 \times Rs\ 25 = Profit\ of\ Rs\ 5000 = Turnover\ of\ Nifty\ Jan\ Futures$

Using trade wise:

100 Nifty Buy at 8000, Sell at 8100, Profit = Rs 10,000

100 Nifty Buy at 8100, Sell at 8050, Loss = Rs 5000

Turnover of Nifty Jan futures = Rs 10,000 + Rs 5000 (absolute sum of the loss) = Rs 15000

- 2.** 100 Nifty Dec 8000 puts bought at 100 and sold at 50 on Dec 3rd. Another 100 Nifty Dec 8000 puts bought at 50 and sold at 30. Determine turnover

Using scripwise:

Average of Nifty Dec 8000 puts buy: 200 puts at 75

Average of Nifty Dec 8000 puts sell: 200 puts at 40

Total profit/loss = 200 x Rs 35 = Loss of Rs 7000

Total Selling value of options = 200 x Rs 40 = Rs 8000

Total Turnover for Dec 8000 puts = Rs 7000 + Rs 8000 = Rs 15000

Using tradewise:

Trade 1

100 Nifty Dec puts bought at 100 and sold at 50, Loss = Rs 5000

Selling value of options = 100 x Rs 50 = Rs 5000

Turnover = Rs 10000

Trade 2

100 Nifty Dec puts bought at 50 and sold at 30, Loss = Rs 2000

Selling value of options = 100 x Rs 30 = Rs 3000

Turnover = Rs 5000

Total turnover = turnover of (trade 1+trade2) = Rs 15000

Which of the methods scrip wise or trade wise should I follow?

Calculating turnover trade wise is the most compliant way of determining turnover. The tricky bit calculating trade wise turnover though is that **no broker (other than us at Zerodha)** currently offers trade wise turnover report. All brokers provide a P&L with an average buy/sell price, which can be used to calculate scrip wise turnover. If you are not trading at Zerodha and are looking at

calculating turnover tradewise, you will have to download all trades done during the year on an excel sheet and calculate turnover manually.

Here is the scrip wise and trade wise turnover reports on **Q** (Zerodha's reporting tool)

Currency

FUTURES GROSS PROFIT	₹-357.50
OPTIONS GROSS PROFIT	N/A
TOTAL GROSS PROFIT	₹-357.50
FUTURES TURNOVER	₹357.50
OPTIONS TURNOVER	N/A
TOTAL TURNOVER	₹357.50
TOTAL CHARGES	₹177.39

≡ Details

TURNOVER

The turnover is being calculated here just to determine if you need a tax audit or not. We are following [guidance note](#) on Tax audit under section 44AB (Section 5.12, Page 23).

- For Intraday equity — absolute sum of settlement profits and losses per scrip
- For Delivery equity — sell side value of the stock
- For F&O (Equity, Currency, Commodity) — absolute sum of settlement profits & losses for F&O per scrip and the sell side value of option contract.

If you want the turnover scripwise, you will see on the Tax P&L statement.

If you want the turnover tradewise, (more conservative/compliant way of turnover calculation))  [Click here to download your turnover statement.](#)

F&O

FUTURES GROSS PROFIT	₹-192.50
OPTIONS GROSS PROFIT	₹-23,232.50
TOTAL GROSS PROFIT	₹-23,425.00
FUTURES TURNOVER	₹192.50
OPTIONS TURNOVER	₹36,677.50
TOTAL TURNOVER	₹36,870.00
TOTAL CHARGES	₹417.76

TRADEWISE

SCRIPWISE

ITR FORM TO BE USED

- Only Capital Gains (Equity) — ITR 2
- Futures and options — ITR 4, Trading as a business
- Presumptive income — ITR 4S

≡ Details

A	B	C	D	E	F	G	H	I	J	K
1	ZERODHA									
2	The Discount Brokerage									
3										
4	Tradewise Turnover Statement for All-FO from 01/04/2014 to 31/03/2015									
5	Total turnover									
6	Total tradewise futures turnover 192.50									
7	Total tradewise options turnover with sell val: 49277.50									
8	Tradewise Futures Turnover									
9	Trade details Date Buy qty Buy avg Buy value Sell qty Sell avg Sell value Turnover Total turnover									
10	NIFTY14MAYFUT 21/05/2014 50.00 7297.90 364895.00 50.00 7294.05 364702.50 192.50									
11	Total turnover 192.50									
12	Tradewise Options Turnover									
13	Trade details Date Buy qty Buy avg Buy value Sell qty Sell avg Sell value Turnover Turnover with sell value									
14	ITC15MAR370CE 04/03/2015 2000.00 0.00 0.00 2000.00 3.15 6300.00 6300.00 12600.00									
15	ITC15MAR370CE 05/03/2015 1000.00 3.55 3550.00 1000.00 0.00 0.00 3550.00 3550.00									
16	ITC15MAR370CE 28/02/2015 1000.00 12.50 12500.00 1000.00 0.00 0.00 12500.00 12500.00									
17	ITC15MAR370CE 28/02/2015 1000.00 12.50 12500.00 1000.00 0.00 0.00 12500.00 12500.00									
18	SUNPHARMA15JAN960CE 28/01/2015 250.00 1.00 250.00 250.00 1.05 262.50 262.50 275.00									
19	NIFTY15JAN880OPE 28/01/2015 25.00 9.45 236.25 25.00 0.00 0.00 236.25 236.25									
20	NIFTY14JUL760CE 10/07/2014 50.00 105.80 5290.00 50.00 96.10 485.00 485.00 5290.00									
21	NIFTY15MAR860OPE 27/02/2015 25.00 93.05 2326.25 25.00 82.10 2052.50 273.75 2326.25									
22	Total turnover 35857.50									
23	Turnover with sell value 49277.50									
24	EQ TURNOVER NO TURNOVER CDS TURNOVER COM TURNOVER									

Once you determine the turnover, you will know if you need an audit or not, that is if a visit to a CA and have him verify your balance sheet and P&L statements is compulsory or not.

6.2 – Section 44AD

An audit is also required as discussed above if your profit is less than 8% of the turnover. By turnover I am referring to all business turnover (speculative, non-speculative, and any other business you have), and by profit I am referring to only your net business profits(not including, salary, capital gains, and others). This means that if you are trading as a business and incur a loss, you will most likely have to get the books audited.

But an important thing to remember is that if your turnover is less than 1 crore and if your profit is less than 8% of turnover an audit is not required if your total tax liability for the year is zero. That means if your total income (Salary + Business income + capital gain) is less than Rs 2.5lks (minimum tax slab), you have no tax liability and hence audit not required.

Applying section 44AD for trading as a business income is causing huge inconvenience for the retail trading community. Turnover in an ordinary business to turnover while trading on the markets is hugely different. Unlike an ordinary business where there is a fixed margin every time there is a transaction, in the business of trading there is no such guarantee. This section is an unnecessary burden that indirectly gets most small retail traders to have their books audited. We at Zerodha have petitioned to the government through this [campaign on Change.org](#), make sure to support it and also get your trading friends to do the same.

When you show trading as a business income, you will have to file using ITR4, which would mean that like any other business you are required to create and maintain –

- Balance Sheet
- P&L statement
- Books of Accounts

Like discussed above, these will need to be audited based on your turnover (either turnover crosses the 1 Crore mark or in case the turnover is less than 1 Crore and your profits is less than 8% of the total turnover). Creating balance sheet, P&L, and maintaining books of account is quite simple for individuals with just trading as a business income, it is explained below in brief.

6.3 – Balance sheet, P&L, Book of accounts

Balance sheet

A personal balance sheet provides an overall snapshot of your wealth at a specific period in time. It is a summary of your assets (what you own), your liabilities (what you owe) and your net worth (assets minus liabilities).

Creating a personal balance sheet is fairly simple first pull together all of these information:

- Your latest bank statements
- Loan statement
- House loan statement
- Personal loan statements
- Principal balance of any outstanding loans
- Demat holding statement

Once you have all of that information available, start developing your balance sheet by listing all of your assets (financial and tangible assets) with its respective values. Typical examples of the assets could be –

- Cash (in the bank, in hand , deposits with Bank)
- All investments (mutual funds, Shares , Debt investment)
- Property value (Cost of Purchase + Duty any paid + Interiors etc)
- Automobile value (Motor Car + Two wheeler)
- Personal Property Value (jewelry, household items, etc)

- Other assets (Computers, Loans to friends , plot of land etc)

The sum of all of those values is the total value of your **assets**.

Next, you can look at your liabilities, which should be everything you owe. Here are some common liability categories:

- Remaining mortgage balance (Loan Statement)
- Car loans
- Student loans
- Any other personal loans
- Credit card balances

The sum of all of the money you owe is your **liabilities**.

The difference between your assets and your liabilities is your **net worth**.

That's it; this is your balance sheet. Instead of creating one at the end of every financial year, it probably makes sense to update once every few months.

Profit & Loss statement

Profit and loss will summarize your revenue streams and your expenses for the financial year.

To create your P&L for the given Financial Year, you will have to list down all revenues and expenses.

Revenue –

- Realized sale value from your stock holdings (Capital gains)
- The Income from F&O, Intraday, or Commodity Trades. (Speculative and non-speculative business income)

Remember that you can't add your salary income (if you are working elsewhere) into your revenue stream on the P&L.

Expenses –

- Salaries, if you have people helping you trade.
- Rent, if you are using an office or any space for trading activity for which you are paying a rental income
- Brokerage charges, taxes, and all other trade related expenses.

- ➡ Advisory fees, consultancy, depreciation of computer, and etc (read the expenses section in the chapter on taxation-traders)

Revenue minus the Expense equals profit.

A **Balance sheet** helps you understand your networth between two dates and the **P&L** will give you the reasons why your networth went up or down in that period. Maintaining financial discipline is the key to long term personal wealth creation. A personal balance sheet and P&L will ensure that you are constantly in touch with reality – your assets and liabilities.

Book of accounts/Book-keeping

Maintaining book of accounts and Book-keeping seem like very complex tasks, and typical reactions I have seen from traders is to get scared of the word and try postponing the decision to learn more on the topic. Again for an individual with only trading as a business income and/or salary, it is super simple- you just need to maintain two books.

Bank book: Take an excel download of all your bank statements, and make a note next to every entry to identify the nature of the transaction. It is also best to keep a copy of all the bills in case of expenses.

Trading book: This should be automatically getting maintained for you by the broker where you trade. The broker should be able to give you a P&L statement including all expenses for the year, ledger statement, and an online repository of contract notes if required. Unlike what many people think, contract notes aren't really required unless a scrutiny by the IT department, and even then if only asked for the same.

As a person who has traded with over 10 online brokers in India, the ledger and P&L statements with all expenses on it will show up any hidden charges by the broker.

At Zerodha, **we take great pride in the transparency we bring in as a business.** Every charge other than brokerage is captured on the other credits/debits section on the tax P&L on Q. We also give you a summary with value of all your open option positions starting April 1st and closing March 31st. This is extremely useful when you are trying to tally your ledger with your P&L statement.

A	B	C	D	E	F	G
9						
10	Open option positions on 01/04/2014					
11	Contract	Exchange	Type	Quantity	Closing price	Value
12	NIFTY14APR7100CE	NSE-FO	B	500.00	11.45	5725.00
13	NIFTY14APR6500PE	NSE-FO	B	100.00	38.85	3885.00
14	AXISBANK14APR1600CE	NSE-FO	B	250.00	14.65	3662.50
15					Total buy premium	13272.50
16						
17	Contract	Exchange	Type	Quantity	Closing price	Value
18	NIFTY14APR6400PE	NSE-FO	B	100.00	24.30	2430.00
19					Total sell premium	2430.00
20						
21					Total premium present on 01/04/2014	10842.50
22					Ledger balance on 01/04/2014	694692.03
23					Opening ledger balance on 01/04/2014	705534.53
24						
25	Open option positions on 31/03/2015					
26	Contract	Exchange	Type	Quantity	Closing price	Value
27	HINDALCO15APR135CE	NSE-FO	B	2000.00	3.50	7000.00
28	ASHOKLEY15APR70CE	NSE-FO	B	8000.00	5.35	42800.00
29	ASHOKLEY15APR67.5PE	NSE-FO	B	8000.00	0.90	7200.00
30	HDIL15APR100PE	NSE-FO	B	4000.00	4.75	19000.00
31	ASHOKLEY15APR70PE	NSE-FO	B	8000.00	1.60	12800.00
32					Total buy premium	88800.00
33						
34	Contract	Exchange	Type	Quantity	Closing price	Value
35					Total sell premium	0.00
36						
37					Total premium present on 31/03/2015	88800.00
38					Ledger balance on 31/03/2015	182449.82
39					Opening ledger balance on 31/03/2015	271249.82
40						
41						
42						
43						
44						
	EQ-TAX-PNL	FO-TAX-PNL	CDS-TAX-PNL	COM-TAX-PNL	OTHER CREDITS AND DEBITS	OPEN OPTION POSITIONS
	Ready					

We are almost done with the taxation module. The last chapter will have an explanation on what kind of ITR forms to use, and also an excel download of a sample ITR 4 form with all details as an easy reference.

Key takeaways from this chapter –

1. Audit of the books is required if turnover is more than INR 1 Crore mark
2. Audit of the books is required if turnover is less than INR 1 Crore but if the profits is less than 8%
3. Audit of the books is NOT required if turnover is less than INR 1 Crore and profits higher than 8% of the turnover
4. Turnover does not take into consideration the regular contract turnover
5. Turnover refers to the business turnover
6. Business turnover (for trading as a business) can be calculated scripwise or tradewise
7. Trade wise turnover is the most compliant way of declaring turnover.
8. If you are declaring trading as a business then one needs to use the ITR4 form to file tax returns
9. ITR4 requires you to have Balance Sheet and Profit and Loss statement along with books of account
10. Balance sheet equation states that Net worth = Assets – Liabilities
11. P&L statement details the revenues and expenses
12. If trading as a business maintaining 2 books of account becomes mandatory – Bank Book and Trade book
13. It is advisable to maintain and update Balance Sheet, P&L, and books of account once in every quarter.

Disclaimer – Do consult a chartered accountant (CA) before filing your returns. The content above is in the context of taxation for retail individual investors/traders only.

ITR Forms (The Finale)

7.1 – Income Tax Return (ITR) Forms

The last step of taxation is filing your Income tax returns (ITR), and this can be done using ITR forms. Find below brief explanation on everything important on ITR that you need to know as an investor/trader.

I have noticed from my interactions with many that they are confused between the two actions i.e ‘paying income tax’ and ‘filing income tax’. Many are of the opinion that if they pay income tax the act of filing income tax is not really necessary. This is not true, let me explain why.

Paying Income tax – If you are employed and draw a salary you very clearly know that your employer on your behalf deducts tax (based on your tax slab) and pays the income tax on your behalf. This is usually called ‘**Tax Deducted at source (TDS)**’. Now what if you have an income sources besides your salary?

For example for the given year assume besides drawing a salary, you also made a profit by actively trading delivery based equity trading. As we now know this activity falls under “Non-speculative Business Income”. Since the employer is not privy to this activity it becomes your responsibility to declare this source of income to the Income tax department and paying the appropriate amount as tax.

Filing Income tax returns – Filing income tax returns is a mandatory way of communicating to the IT department all the sources of income you have including your salary. An **Income Tax Return Form (ITR)** form is simply a form that you need to fill up declaring your sources of income. There are different ITR forms for different sources of income. You may wonder why I should file my returns when I don’t have any other source of income besides salary. Well, in such a case by virtue of filing your income tax returns (via appropriate ITR form) you are officially communicating to the income tax department that you do not have any other source of income.

So in essence, the act of filing your returns is your official communication to IT department about all the source of income that you have along with the tax you have paid against that income. You do this via the prescribed **ITR forms**.

More formally, an ITR is a prescribed form through which the particulars of income earned by a person in a financial year and taxes paid on such income are communicated to the Income-tax Department. There are different types of ITR forms, one needs to select the appropriate ITR form, based on the different sources of income. These forms can be downloaded from here <https://incometaxindiaefiling.gov.in/>

7.2 – ITR forms and its uses

In the context of this module, which is focused towards individuals having investments as capital gains or trading as a business income, the important ITR forms to know about are:

ITR 1 – when you have only salary, interest income, or rental income from only one house property, you can use ITR 1 forms to file your income tax returns. This is the most common type, but if you have capital gains or trading as a business income, you can't use this ITR form.

ITR 2 – when you have salary, interest income, income from house property or **income from capital gains**, you can use ITR 2. So if you are an individual who only invests in the market (remember investor, hence capital gains), you need to use ITR2

ITR 4 – when you have salary, interest income, income from house property, income from capital gains, and income from business/profession, you can use ITR 4.

So if you are an individual who is declaring trading as a business income, you have to use ITR 4. If you are an investor and trader, you can show trading under business income and investments as capital gains on the same ITR 4 form.

ITR 4S (Sugam) – this is similar to ITR4 but with presumptive scheme if section 44AD and 44AE used for computation of business income. ITR 4S can't be used if you have speculative business income (intraday equity); losses to be carried forward, or short term capital gains tax (STCG). So you can use ITR 4S only if you have non-speculative trading income, but it is best avoided.

7.3 – Exploring ITR 4S

The advantage of ITR 4S is that it can be used by tax payers who do not maintain regular book of accounts or want it to be audited (refer chapter 2) provided your turnover is lesser than Rs 1 Crore for the year.

You can get away without maintaining books or getting audited if you firstly calculate turnover based on section 44AD (check the previous chapter) and then declare 8% of this turnover as your

presumptive income. You have to then pay taxes adding this 8% of the turnover to your other income and pay tax as per the slabs.

So if you are a trader with turnover less than Rs 1 Crore for the year and profit less than 8% of the turnover with only non-speculative business income (not possible if you have speculative business income or short term capital gain), you can declare presumptive income of 8% of the turnover, and get away from the need to get your books audited. There is no need to pay advance taxes if you are using ITR4S, but you are not allowed to deduct any business expenses against your income.

For example, assume my salary was Rs.500,000/- for the last FY, and I had incurred F&O loss of Rs.25,000/- on a turnover of Rs.400,000/-. Since my profit is less than 8% ($25,000/400,000$) of my turnover I will need to use ITR4, maintain books, and have them audited. Instead of this, I could use ITR4S and declare 8% of Rs.400,000/- (business turnover) or Rs.32,000/- as my presumptive trading business income even though I have incurred a loss.

My total income for the year is Rs 500,000 (salary) + R 32,000 (business income) = Rs.532,000/-. Therefore my tax liability would be as follows –

Upto Rs.250,000 – No Tax

Between Rs.250,000 to Rs.500,000 – 10% – Rs.25,000/-

Between Rs.500,000 to Rs.532,000 – 20% – Rs.6,400

Total tax = Rs.25,000 + Rs.6,400 = Rs.31,400/-

Here, by virtue of declaring a presumptive business income of Rs.32,000/- I'm paying additional tax of Rs.6,400/-. This works out to be a much cheaper alternative than getting an audit done for which the CA fees could have been Rs.15,000/- and above. So using ITR4S would make sense only if your turnover is low, hence declaring 8% of turnover as income would work out cheaper than paying an audit fees to the CA.



7.4 – Quick FAQ and notes

How to file the return of income electronically?

Income-tax department has established an independent portal for e-filing of return of income. You can log on to www.incometaxindiaefiling.gov.in for e-filing the return of income. Check [this very nice video](#) on e-filing put by the IT department.

Is it necessary to attach documents along with return of income?

ITR return forms are attachment less forms. Hence along with the ITR form (whether filed manually or filed electronically), you are not required to attach any document (like proof of investment, TDS certificates, etc) unless if you fall under the audit case.

However, these documents should be retained by you and should be produced before the tax authorities when demanded in situations like assessment, inquiry, scrutiny etc. But in audit cases, soft copy of balance sheets, P&L, and any notes along with the audit report needs to be attached.

What is the difference between e-payment and e-filing?

E-payment is the process of electronic payment of tax (i.e., by net banking or SBI's debit/credit card)

E-filing is the process of electronically furnishing (filing) of return of income.

Using the e-payment and e-filing facility, payment of tax and furnishing of return is quick, easy, and hassle free.

Is it necessary to file return of income when I do not have any positive income?

If you have sustained a loss in the financial year, which you propose to carry forward to the subsequent year for adjustment against subsequent year(s) positive income, you must make a claim of loss by filing your return before the due date.

What are the due dates for filing returns of income/loss?

If no audit: July 31st (Extended to Aug 31 this year of 2015)

If audit: September 30th

If I fail to furnish my return within the due date, will I be fined or penalized?

Yes, if you have not furnished the return within the due date, you will have to pay interest on tax due. If the return is not filed up to the end of the assessment year, in addition to interest, a penalty of Rs. 5,000 shall be levied under section 271F.

Can return be filed after the due date?

Yes you can. Return filed after the prescribed due date is called as a belated return. If one could not file the return of income on or before the prescribed due date, then he can file a belated return. A belated return can be filed within a period of one year from the end of the assessment year or before completion of the assessment, whichever is earlier. A belated return attracts interest and penalty as discussed in previous FAQ.

For Example – In case of income earned during FY 2013-14, the belated return can be filed up to 31st March, 2016. However, if return is filed after 31st March, 2015, penalty under section 271F can be levied.

If I have committed any mistake in my original return, am I permitted to file a revised return to correct the mistake?

Yes, provided the original return has been filed before the due date and the IT Department has not completed the assessment. It is expected that the mistake in the original return is of a genuine and bona fide nature and not rectification of any deliberate mistake. However, a belated return (being a return filed after the due date) cannot be revised.

Return can be revised within a period of one year from the end of the relevant assessment year or before completion of the assessment whichever is earlier.

Example, in case of income earned during FY 2013-14, the due date of filing the return of income (considering no audit) is 31st July, 2014. If the return of income is filed on or before 31st July, 2014 then the return can be revised upto 31st March, 2016 (assuming assessment is not completed by that date). However, if return is filed after 31st July, 2014, then it will be a belated return and a belated return cannot be revised.

ITR forms are typically Microsoft Excel sheets where you can fill all the relevant details, and the calculations happen automatically.

Find attached an ITR 4 form with all types of income, salary, capital gains, trading as a business, and rental income. This should act as an easy reference if you are trying to fill this on your own. This is the ITR4 form from AY 14/15(FY 13/14).

[XLS Sample ITR4 Form.](#)

Key takeaways from this chapter

1. The act of paying your taxes is called “Tax Payment”, which can be done via e-payment
2. The act of communicating different sources of income and tax paid against that is called “Income Tax Return filing”
3. Filing income tax returns is mandatory, even though you have paid taxes
4. An ITR form should be used to file taxes
5. Use different ITRs for different sources of income
6. ITR 4S for presumptive business income. Use this to lower your cash outflow (paying taxes versus audit fees)

Phew! That brings us to the end of the taxation module. Keeping it simple is most challenging, especially a topic like this where almost every other word is a jargon. Hopefully I have done a decent job with it, and this module acts as your ready reckoner for everything on taxation when trading and investing.

Financial discipline is the key to long term wealth creation, and it starts with compliant filing of your income tax returns. It is best not to avoid or postpone especially with advancement of technology and reach of our income tax department.

Do help spread the word,

Happy Trading,

Nithin Kamath

Zerodha

Special thanks to **Tax IQ for providing valuable inputs throughout this module.**

Disclaimer – Do consult a chartered accountant (CA) before filing your returns. The content above is in the context of taxation for retail individual investors/traders only.

ZERODHA

Currency & Commodity Futures

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CHAPTER 1

Currency Basics

1.1 – Module Orientation

At the onset, let me give you a quick orientation, so you can set your expectations for this module. The focus of this module will be on three main topics –

1. Currencies and currency trading
2. Understanding Commodities
3. Interest Rate Futures

I agree that each of these topics is vast, and commands an entire module on its own. However, these assets are not as liquid as equities. We are still at a very nascent stage when it comes to trading these alternate assets in India. Given this, the idea here would be introducing these assets, familiarize you with what drives these assets, and what you need to watch out for before placing your trades. So, in a sense, you could consider this module as a ‘thought starter’ of sorts for trading these alternative assets. Needless to say, we will try and discuss these topics to a reasonable depth, ensuring you have more than just the bare basics on these topics.

We’ll begin the module by discussing Currencies. We’ll discuss some of the popular currency pairs traded in India such as USD-INR, GBP-INR, and INR-JPY. We also discuss other (non INR) currency pairs such as EUR-USD, GBP-USD, and USD-JPY. The discussion on currencies would be spread across a few chapters. The objective here would be to introduce these currency pairs, and familiarize with not just the contract specification but also with a few fundamental factors that affect these currencies.

Once this is done, we’ll move on to the next part of the module. This’d deal with Commodities. We’ll follow a similar template here – i.e. introduce the commodities (both agri and non-agri) and get familiarize you with not just the contract specifications but also a few fundamental factors which would influence the movement of these commodities. Some of the commodities we’ll be discussing would be – Gold, Silver, Zinc, Aluminium, Crude oil, Natural Gas, Turmeric, Cardamom, Pepper, Cotton, etc. Of

course, the formula to calculate the price of commodities such as Gold, based on the price of Gold in International markets will also be discussed.

Lastly, this module will discuss ‘Interest Rate Futures (IFR)’, which I think is a very exciting space. The discussion would deal with topics related to RBI’s borrowing pattern, issuance of sovereign bonds, listing on NSE, and eventually trading them. Based on how we progress, we can even touch topics related to bond trading and bond trading strategies.

As you see, we have some really interesting stuff lined up. I believe this’ll be a great learning experience for you, and me!

Please note, the prerequisites for this course –

1. [Futures Trading](#)
2. [Options Theory](#)
3. [Technical Analysis](#)

The above mentioned topics are absolutely essential before learning about currencies. I’d suggest you brush up these topics before proceeding.

Let’s now begin this module by discussing few basics about currencies.

1.2 – Currency (in)equality

Before we get started on currencies, let me share with you an interesting conversation I had with my 6-year-old daughter. Perhaps this could set a good starting point for our discussion on currencies.

I had recently been to Austria with my family on vacation. As you can imagine, the country is extremely beautiful. It was my daughter’s first visit to Europe and she was in complete awe. Needless to say, she was attracted to all the small little stores selling pretty little things. On one of the days while we were there, she forcibly took me to this toy store she spotted off the street, and I knew I was in for trouble. After spending about 5-10 minutes scanning through the shop, she finally picked up a colourful wooden caterpillar, and she wanted me to buy her that. It looked really nice, and I was willing to buy her that, until I saw the price! The wooden caterpillar had a 25 Euro price tag. I thought I’d negotiate with her and buy her something else.

I tried telling her that it was 25 Euros, and 25 Euros was quite steep especially for a tiny wooden caterpillar! She obviously didn't understand my point, and refused to budge from her stance. In fact, she said 'it's just 25 Euros', and I realised that she equated 25 Euros to 25 Rupees, completely oblivious to the fact that she needs to multiply each Euro with 78 to get the exact Rupee equivalent.

However, this got me thinking – why isn't one Euro or for that matter one Dollar equal to one Rupee? More generally why isn't one unit of currency belonging to country A equivalent to another unit of currency belonging to country B? I understand this may sound very basic and some of you may already know the answer, but I think it is very important to discuss this and understand why the inequality between currencies exists. After all, it is this inequality which allows us to trade the currency pairs.

To understand this, we need to brush up a bit on the history of currencies and how currency trading evolved. Don't worry, I won't get into history lessons here; will restrict this to a quick recap. For the sake of simplicity, let me break this down into different stages for you based on my own understanding of the evolution of currency.



Stage 1 – The Barter era

Before the advent of currencies, transactions occurred through something called the 'barter system'. Barter system is a 'method of exchange' which has existed for many centuries. In a typical barter, people exchange goods for other goods (or services). A classic example would be – say a farmer has harvested cotton, he could exchange (or barter) cotton with another farmer giving him wheat. Similarly, a farmer who has

oranges could exchange the oranges he has harvested with someone who agrees to wash his cows and sheep.

The problem with the barter system was the scale and divisibility of the system. For example, assume a farmer had 5 bales of cotton and he wants to barter cotton with someone selling cattle, assuming 2 bales for 1 cow, after the barter he'd be left with 2 cows and a bale of cotton. He would certainly not get half a cow for 1 bale of cotton. This caused a divisibility issue within the system.

The scalability was also an issue with the barter system – it required our farmer to travel from one part of the country (with all his produce) to another part of the country to barter for goods of his choice.

Both these issues were eventually overcome with an improved system – Goods for metal.



Stage 2 – Goods for Metal era

The problems that plagued the barter system eventually paved way to the next transaction methodology. People tried to invent a common denominator for the ‘exchange’. The common denominator ranged from food grains to metals. But eventually metals thrived for obvious reasons. Metal was divisible, easily movable, and metal had no issue with shelf life. Further, of all the metals, Gold and Silver were the most popular; therefore, eventually these metals became the standard for transactions. The direct exchange between gold/silver and goods lasted for many centuries; however, things started to change when people deposited gold and silver

coins in safe havens and issued a ‘paper’ against the value of gold. This paper derived its value based on the gold/silver coins deposited in safe haven.

With time, safe havens evolved to banks and the paper transformed to different currencies. Perhaps this was the start of the book entry of the currency system.



Stage 3 – The Gold Standard era

Over time, as domestic trade flourished, trading across borders also flourished. Economic sense prevailed and merchants realized producing everything locally did not make sense. Merchants started exploring cross border trade – simple import and export of goods thrived. This also meant merchants transacting across border also required to pay for it in a currency that was acceptable across borders. Banking systems also evolved, and somewhere around the late 19th Century exchanging goods for Gold (not silver) became the norm. Valuing the local currency against the value of gold was called the **‘Gold Standard’**.

As things progressed, geo political situation changed (world wars, civil wars, cold wars etc.) and so did the economic situation across the world. When it came to cross border transactions, there was an urgent need for merchants to trust one currency and value their own currency against that currency. This is when ‘Bretton Woods System’ came to the picture. You can read more on the **Bretton Woods System**.

However, here is a simplified version of the Bretton Woods System (BWS). The BWS was a way of defining the monetary relationship between countries, where the currencies were pegged to USD at a fixed rate while the value of the USD itself was marked against the value of Gold. Countries accepted this system with a room for 1% variation either

side (against the pegged value). Needless to say, with BWS in place the USD became the currency the world transacted in, as USD was backed by Gold!

Developed countries slowly withdrew from the BWS system and eventually BWS became history. Countries adopted a more market driven approach, where the market decided the value of one currency against the other. The market drives the value of currencies based on the political and economic landscape of a country versus the other.

This brings us to where we are now.

1.3 – International Currency market (Forex)

Internationally, the notional currency trading volume is massive and needs a moment to digest the figure. As per the April 2013 survey conducted by ‘Bank of International Settlement’ (BIS) the size of International Markets stands at \$5.4 Trillion! Here is the [link](#) for the detailed report. My guess is we could be close to \$5.8 – 6 Trillion as of April 2016. If you can imagine, this is roughly 20% higher than the entire Indian annual GDP that gets traded on a daily basis!

Probably what really contributes to such massive trading is the fact that currency markets chase the Sun. Currencies are traded across all the major markets, and information flows seamlessly.

To understand what I mean, keep the Indian markets as reference and think about it – before Indian markets are open, the Australian, Japanese, Hong Kong, and Singapore markets are open. In fact, we get some overlap with these markets. While the Southeast market closes, Indian markets would have just warmed up with Middle Eastern markets opening up. This leads to the European markets opening up – London, Frankfurt, and Paris being the financial nerve center of the Europe. In fact, Indian markets are situated in a sweet spot as our time zone overlaps with major Southeast Asian markets and the European markets. Finally, the US markets open, followed by the Japanese markets and the cycle continues 24 hours a day, 6 days a week!

Having said that, the most active time for currencies is when the US, UK, Japanese, and Australian markets are open. This is when the order flow gets brim-full.

This leads us to an interesting question – who are these people trading currencies and why are the notional values so crazy? More importantly how are currencies traded?

Unlike Equity markets, the participation in Forex is not just restricted to investors and traders. The participants in the Foreign Exchange (Forex) markets are many – Central Banks, Corporate, Banks, Travelers, and of course traders. Each of these participants have their own agenda while participating in the Forex markets. For example, the corporate maybe buying/selling USD to hedge their order book, and a traveller maybe buying USD for his travel expense. While the trader maybe just speculating on the movement of the currency. Obviously since participation comes in from many quarters, the volumes are driven up. More so, Forex trading is highly leveraged, hence the notional value appears large.

There is no centralized International exchange where the Forex transactions take place. Transactions occur at different financial institutions (like NSE in India) and information flows from one platform to another making it borderless.

1.4 – Currency Pairs and quotes

The standard practice while trading currencies is to trade the currency as a ‘pair’. The value of the pair keeps fluctuating as the trades flow through. An example of the pair could be USD INR or GBP INR. The currency pair has a standard format, as shown below

Base Currency / Quotation Currency = value

There are three parts here, lets figure out each one of them –

Base Currency – Base Currency is always fixed to 1 unit of a currency (like 1 US Dollar, 1 Indian Rupee, 1 Euro etc.)

Quotation Currency – Refers to another currency which equates to the base currency (obviously it can be any currency apart from the base currency)

Value – Indicates the value of the Quotation Currency against the Base Currency.

Confusing? Let take an example to make it clearer. Assume **USD/INR = 67**.

The Base Currency here is USD, and as I mentioned earlier the Base Currency is always fixed to 1 unit, hence this is fixed to 1 US Dollar.

Quotation Currency is in Indian Rupees (INR)

Value is 67, which means for 1 unit of Base Currency i.e. 1 USD the equivalent quotation currency is 67. In simpler terms \$1 = Rs.67.

The most active currency pairs that get traded across the world and its current value as on 3rd June 3, 2016 are as follows –

SL No	Base Currency	Quotation Currency	Pair	Pair Value
1	Euro	US Dollar	EUR/USD	1.11
2	US Dollar	Japanese Yen	USD/JPY	108.94
3	Great Britain Pound	US Dollar	GBP/USD	1.44
4	Australian Dollar	US Dollar	AUD/USD	0.72
5	UD Dollar	Canadian Dollar	USD/CAD	1.31
6	US Dollar	Swiss Franc	USD/CHF	0.99

Now here is the big question – what makes the pairs move? Why do they move? Are there events that influence the pairs?

We will explore this in the next chapter.

Key takeaways from this chapter

1. The Gold Standard system of evaluating currencies existed for a long time, but eventually got phased out
2. The currency inequality between currencies exist because of political and economic differences between two countries
3. By volumes, the currency markets are easily one of the largest
4. The currency markets are open 24 hours, 6 days a week
5. Currency is traded as pairs
6. Currency Pairs have a standard format to include Base Currency and Quotation Currency
7. The Base Currency is always fixed to 1 unit

CHAPTER 2

Reference Rates & Impact of events

2.1 – Dual View

Think about a stock, Infosys for example, when you buy or sell Infosys – your view on the stock is straightforward – you are either bullish or bearish on Infosys therefore you buy or sell Infosys. Now think about a currency pair – say USD INR, when you buy or sell USD INR, whether you know or not, you have a dual view on the pair. For instance, when you buy USD INR; it implies you are bullish on the US Dollar and bearish on the Indian currency.

Why is it this way you may ask?

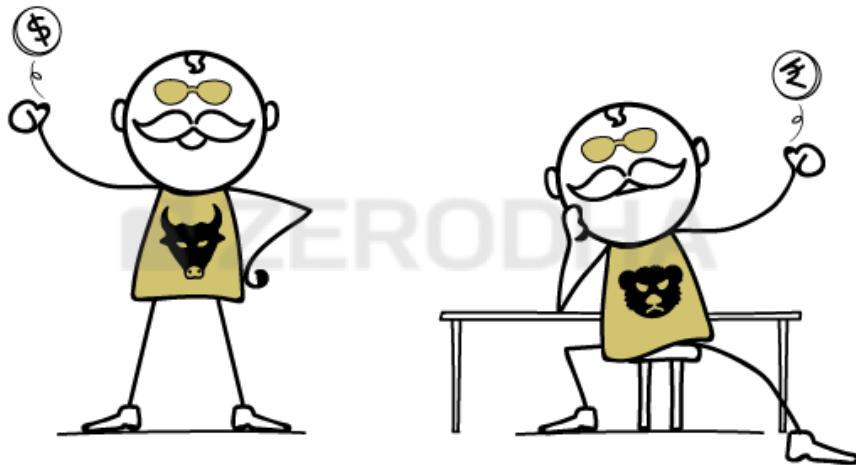
Well, the value of a currency is always quoted against another. Recall from the previous chapter – the currency pair is quoted as –

Base Currency / Quotation Currency = Value

In other words, this format tells us, how many units of quotation currency one can buy for 1 unit of base currency.

If you buy a currency pair, clearly it implies that you expect the value of the pair to go up. Consider this example – USD INR = 65, one would buy the pair, hoping for the price of the pair to hit 68.

Now if the price of the pair is expected to increase, then it implies that going forward 1 unit of base currency can buy more units of quotation currency i.e. 1 USD to buy more INR.



In other words, if the value of the pair goes up then the power of the Base currency goes up while at the same time the quotation currency weakens. This translates to you being bullish on the Base currency and bearish on the quotation currency at the same time.

Similarly, if you sell the USD INR pair, it implies that you anticipate the Base Currency to buy lesser amount of quotation currency. This translates to you being bearish on base currency and bullish on the quotation currency.

Given this, “strengthening/weakening of a currency” refers to the following situations–

1. Base currency strengthens when it can **buy more units of quotation currency**. For example, USD INR moves from 67 to 68 it means the base currency (USD) strengthens and the quotation currency (INR) weakens.
2. Quotation currency strengthens when the base currency **buys lesser units of quotation currency**. For example, USD INR moves from 66 to 65 it means the base currency (USD) weakens and the quotation currency (INR) strengthens.

Note that strengthening and weakening of a currency is equivalent to a currency appreciating and depreciating. These terminologies are often used interchangeably.

Before we proceed, here is something you need to know. Just like a stock, the currency (and the currency pair) has a ‘two-way quote’. The two-way quote enables one to identify the rate at which one can buy and sell the currency (and currency pair).

Don’t get thinking on the ‘two-way quote’, it simply refers to ‘Bid and Ask’ rates J, but we do need to touch upon this as its vital to know how the two-way quote works.

Have a look at the image below –



Spot Rates						Near real time rates - Not to be used for trading purposes
World Time: Sydney 9:22 PM Hong Kong 7:22 PM London 12:22 PM New York 7:22 AM San Francisco 4:22 AM						
Major Rates	Bid	Ask	Cross Rates*	Bid	Ask	
AUD/USD	0.7402	0.7405	USD/AUD	1.3504	1.3510	
USD/CAD	1.2771	1.2775	USD/CAD	1.2771	1.2775	
USD/CHF	0.9659	0.9660	USD/CHF	0.9659	0.9660	
USD/DKK	6.5967	6.5990	USD/DKK	6.5967	6.5990	
EUR/USD	1.1269	1.1270	USD/EUR	0.8873	0.8874	
GBP/USD	1.4176	1.4180	USD/GBP	0.7052	0.7054	
USD/HKD	7.7626	7.7631	USD/HKD	7.7626	7.7631	
USD/JPY	106.0400	106.0700	USD/JPY	106.0400	106.0700	
USD/NOK	8.2720	8.2746	USD/NOK	8.2720	8.2746	
NZD/USD	0.7072	0.7075	USD/NZD	1.4134	1.4140	
USD/SEK	8.2777	8.2798	USD/SEK	8.2777	8.2798	
USD/SGD	1.3560	1.3562	USD/SGD	1.3560	1.3562	
USD/ZAR	15.1929	15.2011	USD/ZAR	15.1929	15.2011	

This is a snap shot of the currency spot rates, as quoted on a Forex trading site. For the sake of this discussion, I've highlighted the two-way quote for EUR USD and GBP USD. The quote gives you the rate at which you can buy and sell the currency pair.

For example, if you want to buy the EUR/USD – you will have to buy the pair at the 'Ask' price i.e. 1.1270. When you buy the pair, technically you are long EUR and short USD. Likewise, if you want to sell the EUR/USD, then you would do so at 1.1269 (Bid price), and here you would be short EUR and long USD (remember the dual view concept).

The pairs are sometimes quoted in a short form, which is actually quite a popular way to quote currencies internationally. The shortened two-way quote would be something like this for the EUR/USD pair –

EUR/USD – 1.1269/70.

If you notice in the shortened version, the 'bid' price is stated in full, but only the last two digits of 'ask' is stated.

Further, in the Forex lingo, digits are referred to as '**pips**'. Therefore, if the EURUSD moves from 1.1270 to 1.1272, then it means that the pair has moved 2 pips.

2.2 – Rate fixing and conversion path

As of today, the USD/INR rate stands at 67.0737. This rate is fixed by the RBI on a daily basis, and is called RBI's '**Reference Rate**'; in fact, RBI publishes these rates on a daily basis on their website. The Reference rate acts as crucial input for the currency futures trading as all settlements are based on this Reference rate.

Have a look at this –

The screenshot shows the official website of the Reserve Bank of India (RBI). At the top, there is the bank's logo and the text "भारतीय रिजर्व बैंक" (Reserve Bank of India) and "India's Central Bank". Below the logo is a navigation bar with tabs for "Home", "About Us", "Notifications", and "Pre". The main content area features a large image of the RBI building in Mumbai. Below the image, the heading "CURRENT RATES" is displayed in blue. Under this heading, there are three dropdown menus: "Policy Rates", "Reserve Ratios", and "Exchange Rates". The "Exchange Rates" menu is currently selected, indicated by an orange background. Underneath, the "RBI Reference Rate" section is shown with the following data:

INR / 1 USD	:	67.0737
INR / 1 Euro	:	75.5116
INR / 100 Jap. YEN	:	63.3200

The above is a snapshot from the RBI's site showing the reference rate for 14th June 2016. Do note, these are **spot rates**, and not future rates. Future rates are as seen on NSE's website.

Anyway, the obvious question is – how does the RBI arrive at this rate?

Well, nothing hi tech here, RBI follows the age-old method of polling to arrive at the spot rate! [Click here](#) to see the RBI circular that explains the rate fixing procedure, but

if you are in no mood to read the circular, you could read the following points that summarize the procedure.

1. RBI has identified a list of banks based on their market share in the foreign exchange market. RBI calls them the ‘contributing banks’
2. Every day between 11:30AM and 12:30PM RBI calls a set of banks (randomly selected) listed under the contributing banks and ask them to give a two-way quote on USD INR
3. RBI collates these rates and averages out the rate based on the bid and ask
4. The average rate is set as the USD INR rate for the day
5. The same process is repeated every day except for weekends and bank holidays

It's as simple as that!

The procedure is quite simple; however, RBI polls only for the USD INR rates. For the other major rates i.e. EUR INR, GBP INR, JPY INR RBI adopts a technique called ‘Crossing’ also referred to as the cross rate mechanism.

While crossing, the direct rate of one currency is not available with respect to another. For example, the direct rate of Euro with respect to INR is not readily available; one needs to cross these rates with a common denominator to arrive at the rates.

Let me take the example of deriving the EUR INR rate by crossing, keeping USD as the common denominator, hopefully this will give you a better clarity on the crossing technique.

Let us begin with getting the spot rate for USD INR, as we can see from snap shot above, the USD INR spot is –

USD INR – 67.0737

This is the spot rate; the two-way quote for this would be something like this –

USD INR – 67.0730 / 67.0740

This means if I have to buy 1 USD, I need to pay INR 67.0740 and if I have to sell 1 USD, I'd receive INR 67.0730.

Let's keep this information aside. We now focus on EUR USD spot rates from the international markets.

The two-way quote from Bloomberg suggests –

EUR USD – 1.1134/40

This means I need USD 1.1140 (Ask price) to buy 1 Euro. In other words, the cost of 1 Euro in terms of the US Dollar is 1.1140. Hence if I convert the price of 1.1140 USD to INR, then I will have enough INR to buy 1 Euro and by doing so, I will also get the EUR/INR rate.

Now going back to the USD INR rate –

1 USD = Rs.67.0740

1.1140 USD = How many Rupees?

$$= 67.0740 * 1.1140$$

$$= 74.72044$$

Hence to buy 1 Euro I need 74.72400 INR, or **EUR INR = 74.72400**

Notice how the USD acts as a pivot in the crossing technique.

Now here is a simple task for you – using the crossing technique, we have calculated the ASK price of the EUR INR pair, can you extend this logic to calculate the Bid price for the EUR INR pair? Feel free to post your answers in the comments section below.

If you think about this, it's now clear that the reference rates and the cross rates change every day based the sentiments of the contributing banks. This leads us to a bigger question – what influences the sentiment of the contributing banks?

The answer is quite simple – domestic and international events.

2.3 – Events that matter

Think about an event that can potentially change the sentiment on a stock. Quarterly result of company is one such event. Estimating the change in sentiment based on this

event is quite straightforward. If the quarterly result is good, the sentiment is positive; therefore, the stock price is expected to go up. Alternatively, if the quarterly result is not great, sentiment is hurt and therefore the stock price is expected to go down. The point here is, there is some sort of linearity between the event and the expected outcome.

However, when it comes to currency pairs, there is no such linearity, which makes it a herculean task to assess the impact of events, a.k.a. fundamentals on currencies. The complexity mainly stems from the fact that currencies are quoted as pairs. While some factors lead to strengthening of a pair, an event could occur at the exact same time that weakens the pair.

Let me give you an example to illustrate this – imagine two economic events running in parallel.

Event 1 – India receives a continuous inflows of Foreign Direct Investments (FDI) geared towards long term investments, clearly this is a big positive for the economy and therefore it tends to strengthen the INR.

Event 2 – There is an uptick in the US economy (or a fear of a crash in commodities) leading to an appreciation in the US Dollar.

Given these two events occur in parallel – which direction will the USD INR currency pair move? Well, the answer to this is not straightforward. Eventually the currency pair will take cues from the more dominant of the two factors and head in that direction, but until this happens the pair invariably exhibits volatile behaviour. Hence, to successfully trade currencies, it becomes extremely important to track world events and assess their impact on the currency pair in question.

Here are few such events and data that you should track –

Import/Export Data – These numbers are highly significant, especially for a country like India, whose economy is highly sensitive to trade deficits. India exports goods and services such as rice and software and imports commodities such as crude oil and bullion. In general, increase in exports tends to strength domestic currency and increase in imports tends to weaken the domestic currency. Why so you may ask?

When imports are made (crude oil for example), the purchase has to be made in the International market which requires one to pay in USD. Therefore, one has to sell INR and buy USD to facilitate this purchase, which in turn causes a demand for USD and hence USD strengths.

We can extend the same logic to exports. When we export goods, we receive USD; we sell the USD received and convert to INR. This causes the INR to strength.

The Trade Deficit – the excess of imports over exports is a key factor to track as it influences the direction in which the currency trades. In general, narrowing the trade deficit is a positive for the domestic currency. The trade deficit is also referred to as the ‘Current account deficit’. I’d suggest you read this [news piece](#), just to reinforce your understanding on this topic.

Interest Rates – Typically investors borrow money from countries where the interest rate is low and invest in countries where the interest rates are high and profit from the interest rate difference. This is called the ‘**carry trade**’. Clearly the country offering higher interest attracts a lot more foreign investment into the country, naturally this leads to the strengthening of the domestic currency. This clearly implies that the ‘Interest rate’ is one big number currency traders watch out for.

The monetary policy review conducted by the central banks (RBI in India, Federal Reserves in US, and ECB in Euro region) reviews the interest rates of the country. This is the reason why there is so much attention paid for the policy review. Besides tracking the actual change in numbers in the on-going review, the market participants look for cues regarding the policy stance. The monetary stance helps the participants understand the future course of action concerning the interest rate.

Dovish – Dovish is a term used to describe the central bank’s stance wherein they are likely to lower the interest rate in the future. Remember, lower interest rate weakens the domestic currency. Here is a new headline talking about the relationship between a dovish stance and the currency.

Dollar retreats as dovish Fed holds rates

Late sell-off leaves S&P 500 nursing loss

[**Click here**](#) to see the article.

Hawkish – Hawkish is a term used to describe the central bank's stance wherein they are likely to increase the interest rate in the future. Remember, higher interest rates attract foreign investments to the country and therefore strengthens the domestic currency.

And here is another new headline which talks about hawkish stance.

Get Ready for a Hawkish Federal Reserve Statement

■ The Federal Reserve is set to issue a hawkish statement, says David Nelson, chief strategist at Belpointe Asset Management.

Inflation – Inflation, as you may know, is the rate at which the prices of basic goods and services increase over time. If inflation increases, then it means the cost of basic necessities is increasing, therefore this affects the day to day living of the common man. Given this, the central bank strives hard to keep inflation in control. The link between inflation and currency movement is a bit tricky.

One of the direct mechanisms to curb inflation is by tweaking the interest rates. If the inflation is perceived as high, then the central bank is likely to take a hawkish stance and increase the interest rates.

What do you think is the logic here?

Well, easy money in the hands on consumers and corporates increases spending; when spending increase merchants smell an opportunity to make higher margins and therefore this leads to rapid increase in prices, and thus the inflation increases. When inflation increases, the central banks tend to curb the spending by cutting the access to easy money. And how do they do that? Well, they increase the interest rates!

Therefore, when inflation is on the rise, expect the central banks to take a hawkish stance and increase the interest rates. When interest rates increase, the domestic currency strengthens!

Therefore, as I mentioned earlier, the relationship between interest rates and currencies is a little tricky. So traders eagerly track inflation data to figure out what the central banks are likely to do, and accordingly take positions on the currency pair.

Remember this – if the inflation is high, expect a hawkish stance by the central government and therefore expect the domestic currency to strengthen. Likewise, if inflation is low, expect a dovish stance (as the central bankers wants to encourage spending), therefore the interest rates are likely to come down. This leads to the domestic currency weakening.

Consumer Price Index (CPI) – The CPI is a time series data, averaged out to capture the prices of basic goods and services. Hence the CPI is a measure for inflation. A rising CPI means inflation is increasing, and vice versa. For the most accurate Indian CPI data and information check this [website](#)

Gross Domestic Product (GDP) – The GDP of a country represents the total Rupee value (for Indian GDP of course) of all the goods and services produced in the country for a given year. As you can imagine the GDP would be a massive number and it does not make sense to repeat the GDP number while making estimates or during conversations. Therefore, one always refers to the GDP as a growth rate. For example, if the GDP of a country is 7.1%, it means that the GPD number is growing at a rate of 7.1%.

Higher the GDP growth rate, higher is the investor confidence in that country, and therefore the stronger the countries domestic currency.

The list of events that matter while trading currencies is virtually endless, and at some point you will realize that every piece of data you can possibly look at is interconnected with one another. Honestly, you need not know the details of each event the way an economist would. Understanding the cause and effect relationship is good enough. I've listed some of the key events/data points that matter while trading currencies. I guess this would serve as a good start, If nothing more.

Key takeaways form this chapter

1. The base currency is said to strengthen/appreciate against the quotation currency when it can buy more units of quotation currency.

2. The base currency is said to weaken/depreciate against the quotation currency when it buys lesser units of the quotation currency.
3. When you go long on a currency pair, you are essentially going long on the base currency and short on the quotation currency.
4. When you go short on a currency pair, you are essentially going short on the base currency and long on the quotation currency.
5. The RBI sets the reference rate of USD INR on a daily basis by conducting a poll, the ‘contributing banks’ participate in this poll.
6. The reference rates for other currency pairs are derived by crossing technique.
7. Understanding events and its impact on currencies is complicated, simply because of the currency is quoted in pairs and impact on the pair could be similar.
8. Eventually the more dominating event will set the direction for the pair.
9. Countries with higher interest rates tend to have stronger currencies and vice versa.
10. Lower the trade deficit of the country, stronger is the country’s currency.
11. Higher inflation leads to strengthening of currency and vice versa.
12. Knowing the cause and effect of events on currencies helps while trading currencies.

CHAPTER 3

Impact of events (Brexit) & Interest Rate Parity



3.1 – Brexit, the event extraordinaire!

I originally planned to dedicate this entire chapter to the USD INR pair, which as you may know is the largest traded currency contract in India. But then, the BREXIT issue happened today and I can't help writing about it as it has a huge relevance to what we just discussed in the previous chapter – events and their impact on currency pairs.

To give you a sense of what happened, have a look at how the Great Britain Pound (GBP) reacted to the event. It was down a massive 8.64%, which you will eventually realize is a big deal in currencies.

Quote As on Jun 24, 2016 10:34:50 IST 

GB Pound-Indian Rupee - GBPINR [| Currency Watch](#)

Index Derivatives Stock Derivatives Currency Derivatives

Instrument Type: **Currency Futu** Symbol : **GBPINR** Expiry Date : **28JUN2016** Option Type : **Select** Strike Price : **Select...** **Get Data**

91.4600 ▼ -8.65 -8.64%	Prev. Close 100.1100	Open 91.1000	High 93.7000	Low 90.5000	
--	-------------------------	-----------------	-----------------	----------------	--

Fundamentals	Historical Data			
RBI Reference Rates 99.4721	Print			
No. of Trades 28,142	Order Book			
Traded Volume (contracts) 2,64,235	Intra-day			
Traded Value * (lacs) 2,41,301.55	Buy Qty.	Buy Price	Sell Price	
VWAP 91.8621	5	91.4425	91.4600	9
Open Interest 27,717	45	91.4400	91.4900	40
Change in Open Interest -6,237	4	91.4275	91.4925	21
% Change in Open Interest -18.37	10	91.4250	91.4950	10
	13	91.4225	91.4975	2
	5,077	Total Quantity		6,435

The Guardian UK, had this to say about the event –

Brexit vote wipes \$2 trillion off global stocks and knocks pound to 31-year low

Here is the [article](#).

My objective here is to simplify Brexit to the best of my knowledge and help you understand why the pound reacted the way it did. Obviously, the bigger agenda here is to help you understand the potential impact of such events on currencies. By doing so, you'll get a grip on how to summarize global events such as Brexit and understand what kind of impact they could have on currencies.

For the sake of simplicity and brevity, let me bullet point Brexit for you. We start with a bit of history –

1. After the World War 2, Germany and France debated the idea of forming a union of sorts. The thought process was that if countries traded and did business together, then they are less likely to wage war against each other.
2. This laid the foundation for forming a bigger union called the ‘European Union’ (EU) with more European countries agreeing to join the EU.

3. The EU formed a single market of sorts where goods, service, and people moved easily across countries. So much so that the EU decided to have its own currency called the ‘Euro’.
4. UK, although was a part of the EU, never accepted Euro as their currency. Note there are many other countries in the EU which still have their own currency, example – Switzerland, Chez Republic, Denmark etc.
5. There was a growing debate in UK in the recent times on whether the UK should remain in the EU. Many of UK’s citizens believed that UK was better off outside the union as the rules laid out by the EU commission was more taxing on UK’s citizen than actually benefiting them. In simpler words – they believe they would progress faster and better economically and as a society being outside the EU.
6. **Britain** option to **exit** from the EU was called ‘Brexit’.
7. The UK decided to formally seek its citizens’ vote on 23rd June 2016, where in the citizen would vote for being in or leaving the EU. This is called a ‘referendum’
8. The outcome of the referendum was a bit of shocker with the UK actually deciding to opt out of the EU. In fact, many in the UK and the world believed that UK would vote to stay in the EU.

The referendum’s outcome sent a shiver down the spine for traders and investors round the globe. The GBP crashed to a 31-year low, the major European indices dove close to 8-10%.

Now why did this happen? Why did the markets fall? What is the connection between Brexit and the currency markets and the work markets?

Now here is where I’m hoping the previous chapter comes to help us J

Recall in the previous chapter we discussed how a strong economy (defied by inflation, interest rates, trade deficit etc.) leads to a strong currency.

Given this, think about the UK – clearly UK is one of the strongest economies in the world and contributes significantly the EU. Now with UK opting out of the EU, things are set to change both economically and politically.

While UK has a trade deficit with the rest of the world, it maintains a trade surplus with EU. This should give you a sense of how strongly the UK's economy is coupled with EU. With UK opting out of the EU, its finances are certainly going to take a hit.

Further the problem is with clarity. Everyone knows that the economic situation is bound to change, but to what extent is something no one really knows. How will the Bank of England react? Will they cut the rates to near zero?

Uncertainty is one thing that the market despises, and given its nature, Brexit has many. Therefore, as a result, the markets cracked.

You as a currency trader should be in a position to study the event and understand some basics. From my experience, sometimes the best trades are set up backed by simple common sense and basic knowledge.

Remember if you had studied the event and arrived at a conclusion to not take on a trade, then that in itself would have been a good trade, as the rule of thumb says “when in confusion, do nothing”.

The point is – when you have events of this magnitude around the corner, it is mandatory for you to know what is happening. Taking on a trade without the perquisite knowledge is equivalent to a blind speculative bet!

So, that's about Brexit and how events like this can impact the currencies.

Let us move ahead to figure out few other currency concepts.

3.2 – Fairy Trade

Imagine a perfect world, where in you can borrow money at a certain interest rate, invest the borrowed money at a higher rate, and earn the differential in the rates. Confusing? Let me give you an example to simplify this.

The interest rate in the United States is about 0.5%, arguably one of the lowest in the world. Assume you borrow \$10,000 from a bank in United States at 0.5%; invest this borrowed money in a country like India where the interest rate is about 6-7%.

To do this, you will have to convert the borrowed money (which is in USD), to INR. At today's conversion rate, a US dollar gets you 67 INR. Therefore \$10,000 fetches Rest. 670,000/- . We invest the converted money in India at say 7%.

At the end of the invested year, we get back 7% interest plus the initial capital. This would be –

$$670000 + 670000 * (7\%)$$

$$= 670000 + 46900$$

$$= \text{Rest. } 716,900/-$$

We convert this money to USD, assume the conversion rate is 67, we get back \$10,700. We now have to repay the principle amount plus 0.5% in interest. This would be \$10000 plus \$50.

So after repaying back \$10,050 we get to retain \$650, which if you realize is a risk free gain!

If you realize, \$650 is the interest rate differential times the borrowed money –

$$10000 * (7\% - 0.5\%)$$

$$10000 * (6.5\%)$$

$$650$$

This is a simple case of arbitrage, quite easy to implement, don't you think so?

Given this, imagine a situation where you could borrow large amounts of money from US and invest this large amount in India and make pot loads of money year on year right?

Well, sorry to burst the bubble, such trades happen only in fairy tales J. In the world we live in, such easy risk free profits do not exist. Even if it did, it would vanish before even you realize.

However, the bigger question we need to answer is – why is this ‘fairy trade’ not possible?

3.3 – Forward Premia & Interest Rate parity

The problem with the above trade is that there are one too many assumptions, we assumed–

1. We could borrow unlimited amounts of money in US
2. We could deposit unlimited amounts of money in India
3. There is no cost of transaction, no taxes
4. Easy movement of currency between countries
5. Most importantly we assumed the conversion rate stayed flat at 67 after 1 year

Given that such arbitrage cannot exist for long, the currency rate a year later should be such that it would prohibit the arbitrage to exist. In other words,

The money we receive from India a year later = Money we repay to banks in US a year later

From the example we discussed above, we borrowed \$10,000 from US, invested the same in India and a year later we received Rest. 716,900/-.

For the arbitrage to NOT exist, at the end of 1 year, Rest. 716,900/- should be equal to \$10,050.

This means the conversion rate should be –

716900/10050

= **71.33**

This is called the '**Forward Premia**' in the currency world. The approximate formula to calculate the Forward Premia is –

$$F = S * (1 + R_{oc} * N) / (1 + R_{bc} * N)$$

Where,

F = Future Rate

S = Today's spot rate

N = Period in years

R_{oc} = Interest rate in quotation currency

R_{bc} = Interest rate in base currency

Let's apply this formula to check if we get the forward rate right for the above situation.

Remember the spot rate is 67,

$$F = 67 * (1 + 7\% * 1) / (1 + 0.5\% * 1)$$

$$= \mathbf{71.33}$$

Further, note that the forward premia rate is approximately equal to the spot rate plus spot times the difference in interest rate i.e. –

$$F = S * (1 + \text{difference in interest rates})$$

$$= 67 * (1 + 7\% - 0.5\%)$$

$$= 67 * (1 + 6.5\%)$$

$$= 71.35$$

This is called the '**Interest rate parity**'.

Think about this – Indian Rupees is trading at 67 today compared to 71.35 in the future, therefore the Rupee is considered to be at a discount **now**. Generally speaking, the future value of any currency which has a higher interest rate is at a discount to a currency which has a lower interest rate.

So why are we discussing all this and what is the relevance to currency trading? Well, the forward premia plays an important role in determining the futures price!

We will discuss more on this going forward.

Key takeaways from this chapter

1. Events like Brexit tend to have extra ordinary influence on currencies
2. A country whose economy is expected to suffer tends to have a weaker currency
3. Forward premia is the expected spot rate over a given period
4. $\text{Forward premia} = S * (1 + R_{oc} * N) / (1 + R_{bc} * N)$

5. Interest Rate parity indicated that the forward premia is approximately equal to the spot rate plus spot times the difference in interest rate
6. Future value of any currency which has a higher interest rate is at a discount to a currency which has a lower interest rate

CHAPTER 4

The USD INR Pair (Part 1)

4.1 – The contract

We make an extremely critical assumption at this stage – we will assume you are familiar with how **Future** and **Option contracts** work.

Technical Analysis plays an important role in setting up short term currency trades, so we'll assume you know **Technical Analysis** as well.

If you are not familiar with these topics, then I'd strongly suggest you to read through these modules before proceeding further. The currency and commodities market is largely a Futures market; hence a working knowledge of these derivative instruments is the key.

Now, assuming you understand these concepts fairly well, let us begin by slicing and dicing the USD INR futures contract. The contract specification of the USD INR futures gives us insights on the trade logistics.

Here are the salient features of the USD INR pair –

Particular	Details	Remark
Lot Size	\$1,000	In equity derivatives, lot is number of shares, but here it's a dollar amount
Underlying	The rate of Indian Rupee against 1 USD	
Tick Size	0.25 Paise or in Rupee terms INR 0.0025	
Trading Hours	Monday to Friday between 9:00 AM to 5:00 PM	
Expiry Cycle	Upto 12 month contracts	Note, equity derivatives have an expiry upto 3 months
Last trading day	Contracts trades till 12:30 PM, 2 days prior to the last working day	Equity derivatives continue to trade till 3:30 PM of the expiry day
Final Settlement day	Last working day of the month	
Margin	SPAN + Exposure	Usually SAPN is about 1.5%, and exposure is around 1%, hence roughly about 2.5% is the overall margin requirement
Settlement Price	RBI Reference rate on the day of Final settlement	Closing price of spot

To give you a sense of how this works, let's take an example –



This is the 15-minute chart of the USD INR pair, as you can see the encircled candle has formed a bearish Marubuzo. One can initiate a short trade based on this, keeping the high of the Marubuzo as the stop loss.

Note that I'm not trying to justify a trade here, my objective is to showcase how the USD INR contract works.

The trade details are as below –

Date: 1st July 2016

Position – Short

Entry – 67.6900

SL – 67.7500

Number of lots to short – 10

1 lot of USD INR = \$ 1000

Contract value of 1 lot of USD INR = Lot size * price

=1000 * 67.7000

=67,700

The margin required for this can be fetched from Zerodha's margin calculator; here is the snapshot of the same.

Currency margin (PDF)						
#	Contract	Expiry	Lot size	Price	NRML Margin	MIS Margin
16	USDINR	Jul 2016	1000	67.77	1524	762
17	USDINR	Aug 2016	1000	68.15	1533	766

As you can see, the margin required to initiate a fresh position in USD INR is about Rs. 1,524/- Therefore, on a contract size of 67700, this works out to –

1525/67700

= 2.251%

Out of this, I'm guessing about 1.5% would be SAPN margin requirement (read as minimum margin required as per exchange) and the rest as exposure margin.

Further, the idea is to short 10 lots, hence total margin required is –

$$10 * 1525$$

$$= 15,250/-$$

A point to note here – when trading equity futures, one has to earmark anywhere between 15% and 65% of the contract value as margins, this obviously varies from stock to stock. In contrast to equities, the margin charged in currencies is way lower. This should give you a sense of how leveraged currency trading really is.

On the other hand, currency sticks to a tight trading range compared to equities. Hence higher leverage.

4.2 – The contract logistics

Notice how the currency futures are quoted – they go up to the 4th decimal digit. There is a reason for this – when it comes to currency futures, a number as small as this – 0.0025 is considered big.

When RBI states the reference rate, they quote up to the 4th decimal. Even a minor difference at the 4th decimal can alter the foreign reserves by a large degree. In fact, it is a norm world over to quote the currency to 4th decimal – in case of USD INR this is 0.0025. This is called the tick size or in currency parlance, a ‘pip’. A pip/tick is the minimum number of points by which a currency can move.

So when the USD INR moved from 67.9000 to 67.9025, it is said that the currency has moved up by a pip.

How much money would you make per pip in the USD INR pair? Well, this should be easy to figure out –

$$\text{Lot Size} * \text{pip (tick size)}$$

$$= 1000 * 0.0025$$

= 2.5

This means to say, for every pip or every tick movement you make Rs.2.5/-.

Going back to the short trade, here is how the Marubuzo panned out –



After initiating the short, the currency pair declined 67.6000. If I choose to close this position, he is how much I would make –

Entry = 67.6900

CMP = 67.6000

Total number of points = $67.6900 - 67.6000 = 0.0900$

Position – Short

This could be a bit tricky, do pay attention. A pip as you know is the minimum number of points the currency can move. To know how many pips a currency has moved when it moved by 0.09 paise, we divide the total number of points moved by the pip size.

Number of pips = $0.0900 / 0.0025$

= 36

As you can see the trade managed to capture 36 pips, let us now calculate how much money one would make –

Lot size * number of lots * number of pips * tick size

We know, **Number of pips * tick size** is as good as the **total number of points** caught with this trade, therefore we can restate the above formula –

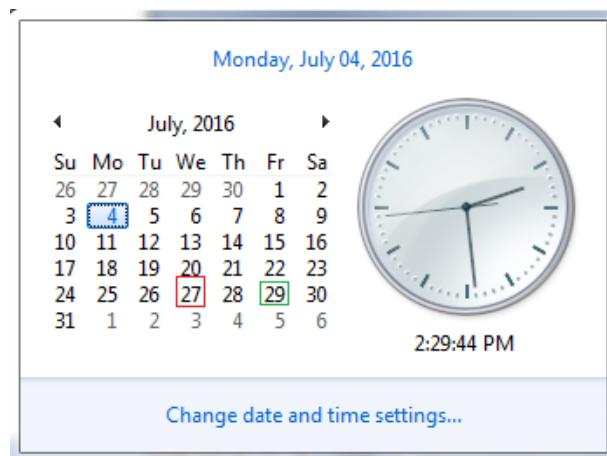
Lot Size * Number of lots * total number of points

$$= 1000 * 10 * 0.0900$$

$$= \mathbf{900}$$

Remember this is an intraday trade. What if you were to carry this forward to expiry? Well, we can carry this forward as long as we maintain the adequate margin requirements. The July contract will stay in series 2 days prior to the last working day of the month.

Here is the calendar –



So 29th July happens to be the last working day of the month, hence 27th July will be the expiry of this series. In fact, you can hold the contract only till 12:30 PM on 27th July.

Of course you can always look at the contract to see the exact date of the expiry.

Another question at this stage – at what price will the settlement happen?

The settlement will happen at the RBI reference rate set for 27th July, and it is important to note that the P&L will be settled in INR.

So for example if I hold this position till 12:30 PM on 27th July and let it expiry, assume the price is 67.4000, then I'd stand to make –

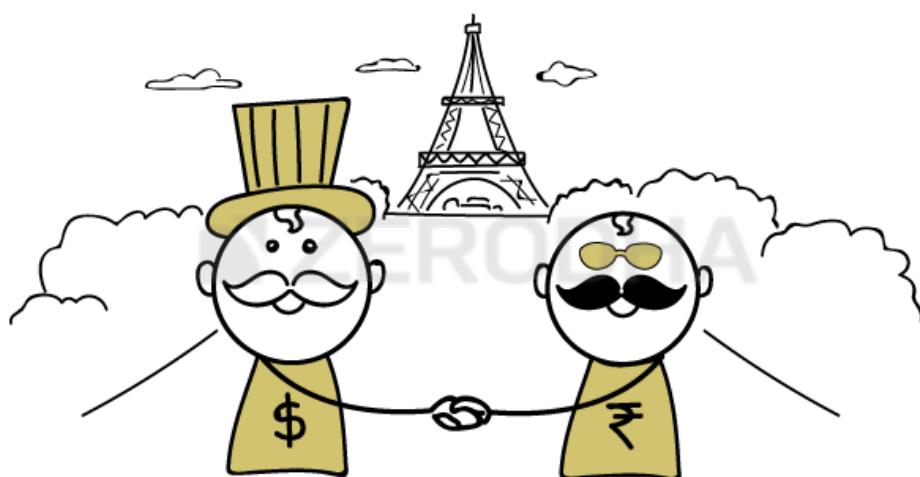
$$= 1000 * 0.29 * 10$$

$$= 2900/-$$

And this money will be credited to my trading account on 28th July 2016. Needless to say as long as you hold the contract, your position will be marked to market (M2M). This is similar to the way it works for equity futures.

Hopefully this example should give you a sense of how the logistics for the currency futures work.

Let us quickly run through the USDINR options contract.



4.3 – USD INR options contract

Let us have a look at how the USDINR option contract is structured. You may be interested to know that the option contract is made available only for the USD INR pair. Hopefully going forward, we could see option contracts on other currency pairs as well. While most of the parameters are similar to the future contract, there are few features specific to option contracts.

Option expiry style – European

Premium – Quoted in INR

Contract cycle – While the future contracts are available for 12 months forward, the option contracts are available just 3 months forward. This is similar to equity derivatives. So, since we are in July, contracts are available for July, August, and September.

Strikes available – 12 In the Money, 12 Out of the Money, and 1 Near the money option. So this is roughly 25 strikes available for you to pick and choose from. Of course, more options are added based on how the market behaves. Strikes are available at every 0.25 paisa intervals.

Settlement – Settled in INR based on the settlement price (RBI reference rate on expiry date).

Let's have a look at the USD INR option contract and figure out the logistics. Have a look at the following image –

Quote As on Jul 05, 2016 12:59:50 IST

U S Dollar-Indian Rupee - USDINR | [Option Chain](#) | [Currency Watch](#)

Index Derivatives Stock Derivatives Currency Derivatives

Instrument Type: **Currency Opti** ▾ Symbol : **USDINR** ▾ Expiry Date : **27JUL2016** ▾ Option Type : **Call** ▾ Strike Price : **67.00** ▾ **Get Data**

0.7400 ▲ 0.10 15.63%	Prev. Close 0.6400	Open 0.6850	High 0.7575	Low 0.6475	
--	-----------------------	----------------	----------------	---------------	--

Fundamentals		Historical Data	
		Print	
RBI Reference Rates		67.1848	
No. of Trades		247	
Traded Volume (contracts)		5,562	
Traded Value - Premium (lacs)		38.71	
Traded Value * (lacs)		3,765.25	
VWAP		0.6960	
Open Interest		31,697	
Change in Open Interest		1,384	
% Change in Open Interest		4.57	

Order Book		Intra-day	
Buy Qty.	Buy Price	Sell Price	Sell Qty.
82	0.7200	0.7325	104
20	0.7150	0.7350	71
10	0.7125	0.7375	47
100	0.7075	0.7400	99
100	0.7050	0.7425	50
626	Total Quantity		483

Note:

* In case of Option Contracts "Traded Value" represents "Notional Turnover"

From the option quote, we know the following –

Option type – Call option

Strike – 67.0000

Spot price (see RBI reference rate) – 67.1848

Expiry Date – 27th July 2016

Position – Long

Premium – 0.7400 (quoted in INR)

We know the lot size is \$1000, although the lot size has not been mentioned in the quote above. Usually this information is made available in the quote for equity derivatives. So if you are seeing this for the first time, just be aware that the lot size is \$1000.

Now, if you were to buy this option, what would be the premium outlay? Well, this is fairly easy to calculate –

Premium to be paid = lot size * premium

$$= 1000 * 0.7400$$

$$= \mathbf{740}$$

The option contract works similar to the equity derivative contracts. Here is an another snapshot I captured –

Quote As on Jul 05, 2016 14:06:52 IST 

U S Dollar-Indian Rupee - USDINR

| Option Chain | Currency Watch

Index Derivatives

Stock Derivatives

Currency Derivatives

Instrument Type:

Currency Opti

Symbol :

USDINR

Expiry Date :

27JUL2016

Option Type :

Call

Strike Price :

67.00

Get Data

0.7750

 0.14 21.09%

Prev. Close

0.6400

Open

0.6850

High

0.7750

Low

0.6475

Fundamentals

Historical Data

Print

RBI Reference Rates	67.4028
No. of Trades	501
Traded Volume (contracts)	10,927
Traded Value - Premium (lacs)	78.66
Traded Value * (lacs)	7,383.00
VWAP	0.7216
Open Interest	31,814
Change in Open Interest	1,501
% Change in Open Interest	4.95

Order Book

Intra-day

Buy Qty.	Buy Price	Sell Price	Sell Qty.
75	0.7725	0.7800	53
48	0.7700	0.7825	5
94	0.7675	0.7850	30
25	0.7650	0.7875	25
59	0.7625	0.7900	2
813	Total Quantity		179

Note:

* In case of Option Contracts "Traded Value" represents "Notional Turnover"

As you can see, the premium has shot up, and I can choose to close my trade right away.

If I did, here is how much I would make –

$$= 1000 * 0.7750$$

$$= 775$$

This translated to a profit of $775 - 740 = 35$ per lot.

What if you were to sell/write this option instead? Well, you know that option selling requires you to deposit margins. You can use Zerodha's **F&O Margin calculator** to get an estimate on the margin required.

Have a look at the snapshot below, I've used the calculator to identify the margin required to write (short) this option –

Exchange

Symbol

Option type

Net quantity

Buy Sell

Product

Strike price

Add **Reset**

Combined margin requirements

Initial margin	Rs: 1,378
Exposure margin	Rs: 1,012
Premium receivable ?	Rs: 640
Total margin ?	Rs: 2,390

Exchange	Contract	Product	Strike	Qty	Initial margin	Exposure	Total
CDS	USDINR16JUL	Options	67 CE	1 S	1,378	1,012	2,390
					Total		

As you can see, the margin required is Rs. 2,390/-.

I hope this chapter has given you a basic sense of how the USD INR contracts are designed. In the next chapter, we will try and discuss some quantitative aspects of the USD INR pair, and perhaps look at the contract specification of other currency pairs.

Key takeaways from this chapter

1. The contract specification specs out the logistics of the USD INR derivative.
2. Lot size is fixed to \$1,000 but this can be changed by the exchange anytime.
3. Expiry of the USD INR contract is 2 days prior to the last working day of the month.
The contract can be held/traded till 12:30 PM.
4. Margins applicable = SPAN + Exposure, usually the margins add up to 2.25 – 2.5%.
5. Currency pairs are quoted up to the 4th decimal place.
6. A pip is the minimum price moment allowed in a currency.
7. Currency options are European in nature.
8. The premium quoted in currency options is in INR.
9. Strikes are available at every 25 paisa price difference.
10. Margins are blocked when you intend to write currency options.

CHAPTER 5

The USD INR Pair (Part 2)

5.1 – Futures Calendar spread

All else equal, the futures contract is always supposed to trade at a premium to the spot. This, as we know, can be attributed to the interest rate factor (cost of carry) in the Futures pricing formula. We have discussed this earlier in the **Futures module**. Any variation in this equation leads to an arbitrage opportunity.

For a quick low level recap on that, consider this scenario where there is arbitrage opportunity between Spot and Futures –

Futures trade at a lower price – Assume the spot price is at 100, and the fair value of its future is at 105. Fair value of the future can be calculated using the futures pricing formula. The ‘no arbitrage spread’ is the difference between spot and Future’s fair value i.e. $105 - 100 = 5$

Given this, for whatever reasons (read as market mispricing) assume the future is trading at 98, this leads to a spread of 7 (105-98) between the spot and future, which can be captured.



All one has to do is buy the future at 98, and simultaneously sell the spot at 100. We know upon expiry, the futures and the spot will converge and therefore the spread gets captured.

If you are unable to understand the above clearly, I'd encourage you to read the chapter from the Futures module (link posted above).

Likewise, if the futures trade at a higher price (over and above its fair value) then one can capture the spread by selling the futures and buying the spot.

We have learnt this before and this is quite straight forward. However, when it comes to the USDINR contract, for practical reasons such arbitrage trades involving spot and futures cannot be executed. This is because the USDINR spot market is not really accessible to the retail.

So how does one trade the spreads in the currency segment? Well, this is fairly easy – as opposed to spot-future spread, one has to identify the spread between two different future contracts expiring over two different dates. This is also known as the ‘Calendar Spread’.

In a calendar spread, you decide whether the spread between two futures contract is considered normal or otherwise. All else equal, the long dated futures contract will always trade at a premium over the ‘short term’ dated futures contract. For example, August month futures contract is expected to trade at a premium when compared to July month. Therefore, a certain amount of spread between these two contracts is deemed ‘normal’. However, there could be situations where the spread goes beyond normal (either higher or lower) and this is when opportunities arises.

As of today the USD INR July Futures is trading at 67.3075 and the August contract is trading at 67.6900.

The spread is calculated as the difference between the two futures contract –

$$67.6900 - 67.3075$$

$$= 0.3825$$

Now assume, for whatever reason you think this spread of 0.3825 high, and it should ideally be 0.2000 as opposed to 0.3825. This means you have an arbitrage opportunity here, and you stand to make –

$$0.3825 - 0.2000$$

$$= 0.1825$$

To capture the spread, you are required to buy the July Futures and simultaneously sell the Aug futures –

Long July Futures at 67.3075

Short August Futures at 67.6900

When you set up a trade wherein you are long current expiry and short a further term expiry, it is also called a “**Future Bull Spread**”. Likewise, a ‘**Futures Bear spread**’ is when you are required to short the current month expiry and go long on the further month expiry.

Anyway, once you set up the ‘Future Bull Spread’, you will have to monitor the trade and close the position when the spread converges to 0.2000 or lower. You will profit when one of the following things happen –

1. When the July (long) leg rises and Aug (short) leg falls
2. When the long leg rises and the short leg remains unchanged
3. When the long leg rises and short leg rises, albeit at a lower rate
4. When the short leg falls faster than the long leg
5. When the long leg remains unchanged and short leg falls

Will the spread converge? If yes, then when will it converge? Why should it converge? Will one of the above situations really pan out? Well, the answer to this really depends on how well you know the spread, and for you to know the spread really well, you need to back test it. Techniques of back testing are perhaps a topic for another day; however, I'd like to show you how easy it is to buy sell the spread from your trading terminal.

5.2 – Executing the spread

How would it be if you could directly buy or sell the spread? For example, in the above case we concluded 0.3825 is an overpriced spread, to capture this spread you execute two orders i.e. buy July Futures and sell August futures.

Executing these trades has some inefficiency mainly in terms of execution risk – by the time you buy/sell both the contracts the prices could move and thereby the spread may no longer look attractive.

Given this, it would be really convenient to buy the spreads directly and not really deal with two different contracts. If you are a Zerodha customer, you have access to NEST trader, from which you can trade the spread directly. Of course, going forward this will also be available in both Pi and Kite.

Here are a series of snapshots which will help you trade the spreads directly.

The screenshot shows a software interface for market monitoring. At the top, there is a toolbar with several dropdown menus and input fields. The 'SPREAD' dropdown is open, showing options like 'CDS', 'FUTCUR', and 'USDINR'. Below the toolbar is a table with columns for 'Trading S...', '% Change', 'LTP', 'Bid Rate', 'Ask Rate', 'Total Bid...', and 'Total As...'. To the right of the table is a vertical column of dates. The date '27JUL29AUG' is highlighted in red, indicating it is the selected spread contract. The rest of the dates listed are: 27JUL28SEP, 27JUL26OCT, 27JUL28NOV, 27JUL28DEC, 27JUL27JAN, 29AUG28SEP, 29AUG26OCT, 29AUG28NOV, 29AUG28DEC, 29AUG24FEB, 28SEP26OCT, 28SEP28NOV, 28SEP28DEC, 28SEP29MAR, 26OCT28NOV, 26OCT28DEC, 26OCT26APR, 28NOV28DEC, 28NOV29MAY, and 28DEC28JUN.

Look at the part highlighted in red, as you may have realized, this snapshot is from the market watch. Starting from the left –

1. We select ‘Spread’ from the dropdown which specifies that we are looking at spread contracts.
2. After selecting spreads, we choose CDS from the dropdown to indicate currency derivatives as the segment.
3. FUTCUR indicates that within CDS spreads, we are interested in Future contracts.
4. USDINR indicates that we are interested in the USDINR contracts.

5. The full view of the dropdown menu is visible here, as you can see there are many different spreads available. However, we are only interested in the July-August spread, which is what we have selected.

Once we configure the above market watch, we submit this to load the spread, here is how it looks like –

SPREAD	CDS	FUTCUR	USDINR	XX	-0.0100	27JUL29AUG	USDINR 16JUL 1				
Trading Symbol	% Change	Se...	LTP	Bid Rate	Ask Rate	Total Bid...	Total Ask...	Open	High	Low	Prev Close
USDINR16JUL16AUGFUT	0.00		0.3700	0.3675	0.3700	9400	14913	0.3700	0.3700	0.3700	0.0000

I've highlighted the spread's last traded price. As you can see, this particular spread instrument just denotes the spread between July and August contract.

Note – the spread should be trading at 0.3825 and not really 0.3700 right? Why do you think there is a difference in price?

I'll try and explain this from as per my own understanding, I could be wrong; therefore, comments are more than welcome! Also, we are digressing a bit here, so try not to lose focus on the main topic i.e. how to trade the spreads.

Have a look at the snapshot below –

Normal	CDS	FUTCUR	USDINR	XX	-0.0100	29Aug2016	USDINR 16AUGI				
Trading Symbol	% Change	Se...	LTP	Bid Rate	Ask Rate	Total Bid...	Total Ask...	Open	High	Low	Prev Close
USDINR16AUGFUT	0.00		67.6900	67.6775	67.6850	16574	16758	67.6000	67.7000	67.5900	67.6900
USDINR16JULFUT	-0.02		67.3075	67.3075	67.3100	59765	45379	67.2500	67.3275	67.2100	67.3225
USDINR16JUL16AUGFUT	0.00		0.3700	0.3675	0.3700	9400	14913	0.3700	0.3700	0.3700	0.0000

The market watch has July, August and the July-August spread contract loaded.

Forget about the spread contract for now, assume you want to set up a Future Bull Spread (buy July, sell Aug) contract, then you essentially –

Buy July contract at the Ask Rate – 67.3100

Sell Aug contract at the Bid Rate – 67.6775

$$\text{Spread} = 67.6775 - 67.3100 = 0.3675$$

Now, if you were to set up a Future Bear Spread, then you essentially –

Buy August contract at Ask Rate – 67.6850

Sell July contract at Bid Rate – 67.3075

Spread = $67.6850 - 67.3075 = 0.3775$

As you can see, there are two spreads possible based on what you intend to do i.e. future bull/bear spread.

Now the question is – which price should the spread reflect? Would it be that of the Future Bull Spread or the Future Bear spread?

My guess is that the spread trades close to the average of the two spreads. In this case average is 0.3725, and the actual market spread is 0.3700. Why 0.3700 and not really 0.3725? I'd attribute this to one of the two things – the latest quote has not been captured by the terminal, or lack of liquidity.

A different explanation here could be that the spread itself is mispriced!

Anyway, back to the main topic i.e. buying/selling the spread. Once the spread instrument is loaded, all you need to do is select the instrument from your market watch and press F1 or F2 for buying and selling respectively.

This is what you see upon invoking the buy order window –

The screenshot shows a financial trading interface. At the top, there is a menu bar with 'Normal', 'CDS', 'FUTCUR', 'USDINR', 'XX', '-0.0100', '29Aug2016', and 'USDINR16AUGI'. Below the menu is a table titled 'Trading Symbol' showing market data for three contracts:

Trading Symbol	% Change	Se...	LTP	Bid Rate	Ask Rate	Total Bid...	Total Ask...	Open	High	Low	Prev Close
USDINR16AUGFUT	-0.00		67.6875	67.6825	67.6875	17090	16433	67.6000	67.7000	67.5900	67.6900
USDINR16JULFUT	-0.02		67.3100	67.3050	67.3100	59910	45289	67.2500	67.3275	67.2100	67.3225
USDINR16JUL16AUGFUT	0.00		0.3700	0.3675	0.3700	9400	14913	0.3700	0.3700	0.3700	0.0000

Below the table is a 'Spread Contract Order Entry- ADMIN2' dialog box. It contains fields for B/S (SELL), Inst Name (FUTCUR), Symbol (USDINR), Op Type (XX), Strike Price (-0.0100), Expiry date (27Jul29AUG), Total Qty (1), Price (0.3700), Market Lot (1), and buttons for Reset and Submit. There are also dropdown menus for Exhg-Seg (CDS), OrderType (SP), Prod Type (NRML), Pro/Cli (CLI), ClientID, ClientName, Validity (DAY), Participant code, and BWL Id.

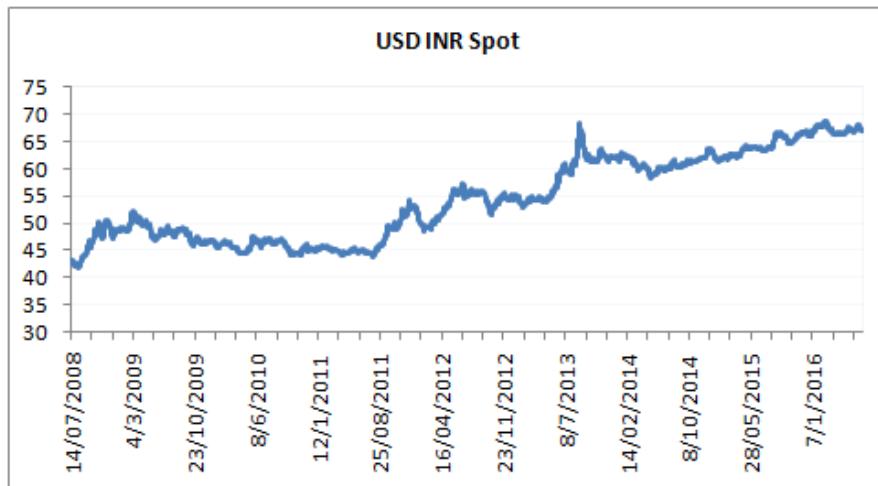
The window is pre-populated with the spread details; you may just want to edit the quantity bit to suit your lot size requirement. Press submit to place the order.

As simple as that!

5.3 – USD INR Stats

I thought it would be interesting to study some statistics on the USD INR pair; I downloaded the **USD INR spot data** from the RBI site.

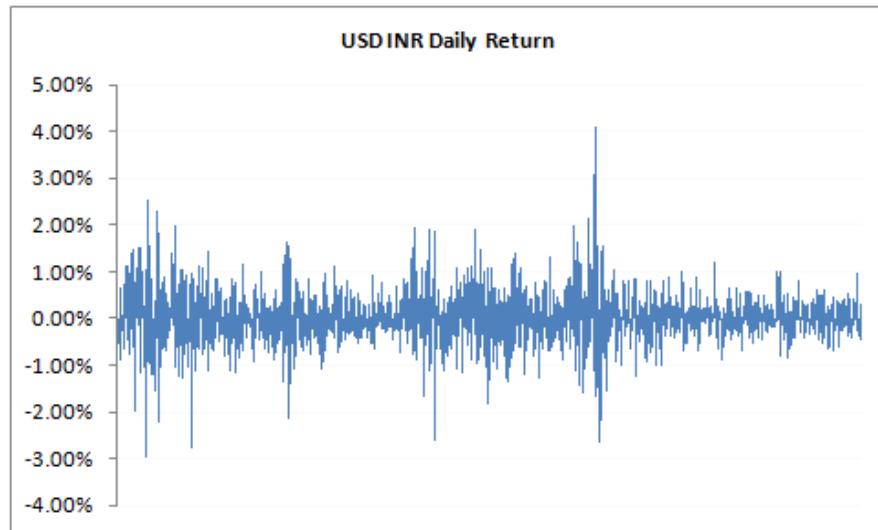
Let us start by looking at the long term chart of the USD INR over the last 8 years (July 2008 to July 2016) –



Clearly the US Dollar has strengthened against the Indian Rupee over the last 8 years.

Quite intuitive as our economy has literally stagnated over these years.

Have a look at the daily return plot of the USD INR –



We can observe few interesting parameters from this –

The average daily return of USD INR is about 0.025%. The maximum and minimum daily return stands at +4.01% and -2.962%, contrast this with Nifty 50's maximum and

minimum daily return of +3.81% and -5.92%, you will realize that the USD INR pair is a lot less volatility compared to Nifty 50 or in fact any other indices. This fact is further manifested in the volatility numbers –

- Daily Standard deviation (last 8 years) – 0.567%
- Daily standard deviation (2015) – 0.311%
- Annualized standard deviation (2015) – 4.94%

These numbers are clearly much lower compared to the Nifty 50's daily volatility and annualized volatility number of 0.82% and 15.71% respectively.

Further, I also ran a correlation function on Nifty 50 and USD INR, before I tell you the answer I want you to take a guess on what this correlation would be like.

For those of you who don't know what correlation is, here is a quick explanation –

Correlation between two variables gives us a sense of how two variables move with respect to each other. Correlation is measured as a number which varies between -1 to +1. For example, if the correlation between two variables is +0.75, then it tells us two things –

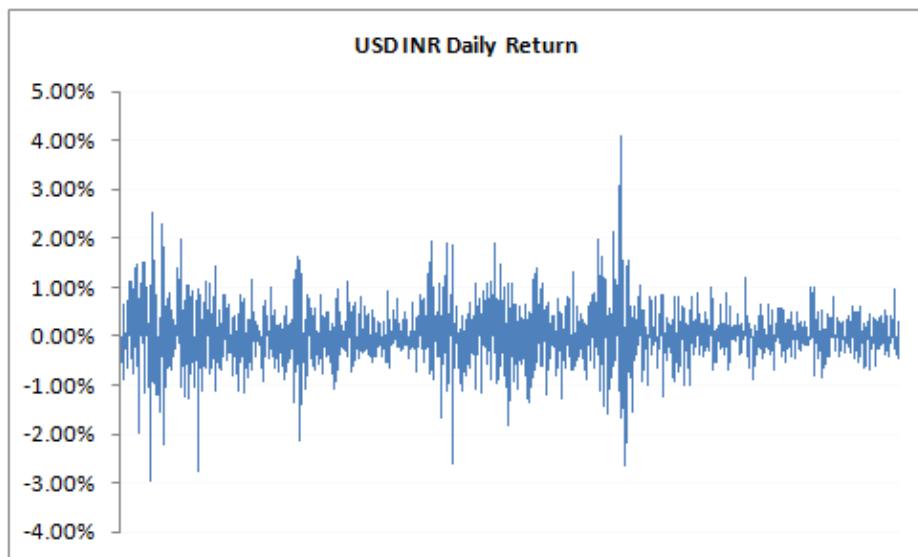
1. The plus preceding the number tell us that they both are positively correlated i.e. they move in the same direction
2. The actual number gives us a sense of the strength of this movement. In a loose sense, the closer it is to +1 (or -1) the higher is the tendency for the two variables to move in tandem.
3. A correlation of 0 suggests that the two variables are not related to each other.

From the above, we know a correlation of +0.75 suggests that the two variables move not only in the same direction but also tend to move together closely. Note, the correlation does not suggest the extent of the move, all it is suggesting is that the move in the same direction is likely to happen. For example, if Stock A moves 3%, and the correlation between stock A and stock B is +0.75, then it does not mean that Stock B will also move by 3%, all it is suggesting is that Stock B will move up positively, just like Stock A.

But, there is another twist here – suppose stock A and Stock B are correlated at 0.75, and the daily average return of Stock A and Stock B is 0.9% a 1.2%, then it can be said that on any given day, if Stock A moves above its daily average return of 0.9%, then stock B is also likely to move higher than its daily average return of 1.2%.

Likewise, a correlation of -0.75 indicates that the two variables move in opposite directions (indicated by the -ve sign). Suppose stock A moves up by +2.5%, then by virtue of correlation we know that Stock B is likely to come down, but by what degree will it come down isn't known.

While we are at it, one more point on correlation. This bit is only for those interested in the maths of correlation. The correlation data makes sense only if the data series is ‘stationary around the mean’. What does this mean? – Well, it simply means that the data set should be sticking close the average values. Take another look at the graph of the daily returns of the USD INR, reposting the same for your convenience –



The daily average return here is 0.025%, and if you notice the daily returns, it is mean reverting in nature, meaning even if the returns shoots up, or comes down, it eventually sticks back to the average value. A data series which exhibits such a property is said to be “stationary around the mean”. Stock/commodity/currency returns are invariably stationary, but the Stock/commodity/currency prices are not stationary as they tend to trend.

Confusing? Well, the key point that you need to remember here is that when you run a correlation test, make sure you run it on the daily returns (as they are stationary) and not really on the daily prices (as they tend to trend).

Calculating correlation between two variables is quite easy, in fact has just 2 steps –

1. Calculate the daily returns
2. Use the ‘=Correl’ function in excel

Press enter and you get the correlation between the two variables.

Date	Nifty Closing	Daily Rt	USD INR	Daily Rt
1-Jan-15	8284		63.3213	
2-Jan-15	8395.45	1.35%	63.2878	-0.053%
5-Jan-15	8378.4	-0.20%	63.3888	0.160%
6-Jan-15	8127.35	-3.00%	63.385	-0.006%
7-Jan-15	8102.1	-0.31%	63.4495	0.102%
8-Jan-15	8234.6	1.64%	62.967	-0.760%
9-Jan-15	8284.5	0.61%	62.3953	-0.908%
12-Jan-15	8323	0.46%	62.1605	-0.376%
13-Jan-15	8299.4	-0.28%	62.1021	-0.094%
14-Jan-15	8277.55	-0.26%	62.153	0.082%

Correlation =CORREL(C3:C242,E3:E242)

Remember correlation between stock A and Stock B is the same as correlation between Stock B and Stock A.

I hope you've had a decent understanding on correlation, its time I repost the question asked earlier.

If you were to guess the correlation between USDINR and Nifty 50, what would it be? Forget about the number, can you at least guess whether they are positively correlated or negatively correlated?

Let us try and deduce this – If the markets (as a representation of the whole economy) are doing good, then the markets tend to attract investments from overseas. This means dollars are coming into the country. The dollars get sold to get converted to Rupee. Essentially this translates to dollars being sold for Rupees, naturally the Rupee strengthens. This means the USDINR goes down while the Nifty 50 increases. The same logic can be applied when you look at it from the other way i.e. market going down while USDINR increases.

This means Nifty 50 and the USDINR should be inversely correlated. In fact, this is true, and the correlation value is -0.12267 (2015 data).

You can **download** the excel sheet.

In the next chapter we will briefly look into other currency contracts and the role of Technical Analysis while trading currencies, and with this discussion we will wrap up currencies and start exploring the world of commodities!

Key takeaways from this chapter

1. The classic future – spot arbitrage is not really accessible to the retail market, hence traders tend to look at calendar spreads
2. In a calendar spread you simultaneously buy and sell contracts belonging to two different expiries
3. Future Bull spread is when you buy near month futures and sell the further month expiry
4. Futures bear spread is when you sell near month futures and buy the further month expiry
5. You can directly trade the spread from your trading terminal, these are called the ‘Spread contracts’
6. The USD INR pair tends to have lower volatility when compared to Nifty 50
7. The USD INR and Nifty 50 are inversely correlated

CHAPTER 6

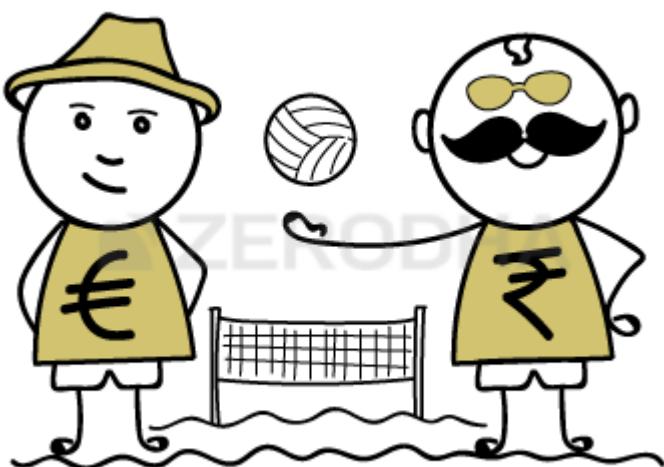
EUR, GBP, and JPY

6.1 – The other currency pairs

We focused on the USD INR pair extensively over the last few chapters, and we now look into the other currency pairs that are traded in the Indian markets, namely the EUR INR, GBP INR, and JPY INR. The functioning of the other currency pairs is very similar to the USD INR. Think about it this way – you know how the Nifty 50 contracts work, then you pretty much know or are capable of knowing how Bank Nifty works.

Given this, the agenda for this chapter is to quickly run through the contract specifications of the other three crosses available for us to trade. In the 2nd part of this chapter we'll dwell on some of the common trading techniques, mainly employing technical analysis, and with this we will conclude our discussion on currencies and start looking into commodities.

So let's get started.



EUR INR

Globally the EUR USD is one of the most actively traded currencies, however we do not have that contract yet in India, but RBI has given the exchanges a nod to list these crosses as well. So I guess it is a matter of time before we have the EUR USD pair along with GBP USD, JPY USD etc. But for now, we do have EUR INR to trade.

The EUR as we know is the currency of the European Union. Unlike other currencies, the EURO is backed by the economy of many European countries and not just one economy.

The EUR INR contract structure is quite similar to the USD INR contract. Here are the key details that you need to know –

Particular	EUR INR	Remarks
Lot Size	€ 1,000	In equity derivatives, lot is number of shares, but here it's an Euro amount
Underlying	The rate of Indian Rupee against 1 EUR	
Tick Size	0.25 Paise or in Rupee terms INR 0.0025	
Trading Hours	Monday to Friday between 9:00 AM to 5:00 PM	
Expiry Cycle	Upto 12 month contracts	Note, equity derivatives have an expiry upto 3 months
Last trading day	Contracts trades till 12:30 PM, 2 days prior to the last working day	Equity derivatives continue to trade till 3:30 PM of the expiry day
Final Settlement day	Last working day of the month	
Margin	SPAN + Exposure	Usually SAPN is about 1.5%, and exposure is around 1%, hence roughly about 2.5% is the overall margin requirement
Settlement Price	RBI Reference rate on the day of Final settlement	Closing price of spot

So as you see, the contract specifications are similar to that of the USD INR pair. The only difference is that the lot size in EUR INR is € 1,000 as opposed to \$1,000 in USD INR.

Let's see how this would impact the margins; here is the snapshot of the EUR INR futures –

Quote As on Aug 04, 2016 13:52:57 IST 

Euro-Indian Rupee - EURINR | Currency Watch

Index Derivatives Stock Derivatives Currency Derivatives

Instrument Type: **Currency Futu** Symbol : **EURINR** Expiry Date : **29AUG2016** Option Type : Strike Price : **Select** **Select...** **Get Data**

74.8950 ▼ -0.49 -0.65%	Prev. Close 75.3875	Open 75.5650	High 75.5725	Low 74.7975	
----------------------------------	------------------------	-----------------	-----------------	----------------	--

Fundamentals		Historical Data		
		Print		
RBI Reference Rates		74.9893		
No. of Trades		5,857		
Traded Volume (contracts)		33,558		
Traded Value * (lacs)		25,123.28		
VWAP		74.8987		
Open Interest		69,519		
Change in Open Interest		-1,047		
% Change in Open Interest		-1.48		

Order Book		Intra-day	
Buy Qty.	Buy Price	Sell Price	Sell Qty.
5	74.8900	74.8975	50
42	74.8875	74.9000	39
29	74.8850	74.9025	155
12	74.8825	74.9050	7
20	74.8800	74.9075	12
9,028	Total Quantity		4,822

As you can see, the last traded price of the contract is 74.8950, with this we can estimate the contract value –

Contract Value = Lot size * Contract price

$$= 1000 * 74.8950$$

$$= 74,895.0$$

Assuming the margin is approximately 2.5%, the margin should be in the vicinity if Rs. 1,870/-, in fact one can use the margin calculator on Zerodha to get the exact value of the margin required.

Securities under ban: **JINDALSTEL**

Exchange	Product	Combined margin requirements
CDS	Futures	Span Rs: 1,523
Symbol		Exposure margin Rs: 225
EURINR Aug 2016		Total margin ? Rs: 1,748
Net quantity	1	
<input type="button" value="Add"/> <input type="button" value="Reset"/>		
Buy Sell		

So the margins are slightly higher than the USD INR pair, but still way lower compared to what is required for any equity derivative contract.



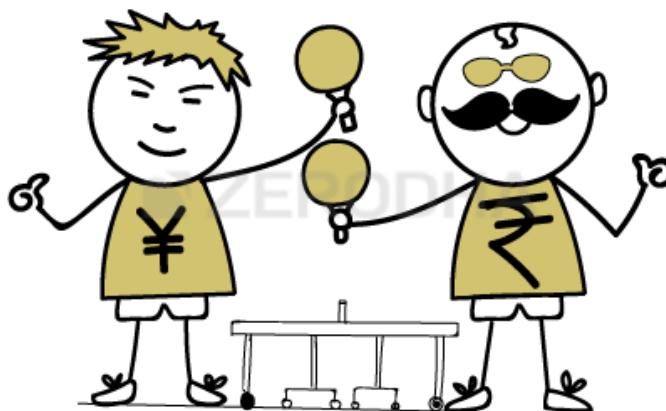
GBP INR

The GBP INR contract is probably the 2nd most popular currency contract after the USD INR pair. On the contract specification side of things, everything remains the same except for the lot size and the underlying. The underlying is the exchange rate of 1 GBP in Indian Rupees. The lot size is £1,000, which makes the contract value approximately Rs. 89,345/- considering the futures is trading at 89.3450 as of 5thAugust 2016.

As you see below, the margin required for this slightly higher compared to the other two contracts we've already discussed-

Exchange	Product	Combined margin requirements
CDS	Futures	Span Rs: 3,472
Symbol		Exposure margin Rs: 447
Net quantity	<input type="text" value="1"/> Add Reset	Total margin ? Rs: 3,919
@Buy @Sell		

By the way, did you know in the international markets that the GBP USD pair is also called the ‘Cable’? So, when you hear a currency trader say he is short cable, he means he is short GBP USD cross.



JPY INR

The JPY INR contracts are a bit tricky compared to the other currency contracts. The lot size is not the usual 1000 units, but 100000 and the underlying here is the exchange rate for 100 Japanese Yen in Indian Rupees.

So when we look at this –

Quote As on Aug 04, 2016 16:14:31 IST

Japan YEN-Indian Rupee - JPYINR

| Currency Watch

Index Derivatives Stock Derivatives Currency Derivatives

Instrument Type: Symbol : Expiry Date : Option Type : Strike Price : **Get Data**

66.2750 ▼ -0.15 -0.22%	Prev. Close 66.4225	Open 66.3800	High 66.3800	Low 66.0600	
----------------------------------	------------------------	-----------------	-----------------	----------------	--

Fundamentals		Historical Data		
		Print		
RBI Reference Rates		65.9500		
No. of Trades		7,451		
Traded Volume (contracts)		40,634		
Traded Value * (lacs)		26,898.99		
VWAP		66.1982		
Open Interest		59,199		
Change in Open Interest		1,286		
% Change in Open Interest		2.22		

Order Book		Intra-day	
Buy Qty.	Buy Price	Sell Price	Sell Qty.
25	66.2675	66.2750	4
17	66.2650	66.2775	30
40	66.2625	66.2800	4
1	66.2600	66.2825	23
1	66.2575	66.2850	8
7,102	Total Quantity		4,275

We are essentially looking at the rate of 100 Japanese Yen, stated in Indian Rupees. In other words, it costs Rs.66.2750 to buy 100 Japanese Yen. Since the lot size is 100,000 the contract value is –

$$= (100000 * 66.2750) / 100$$

$$= \text{Rs. } 66,275/-$$

The margin required for the JPY INR contract is Rs. 2,808/-, which translates to about 4.2%.

Exchange CDS	Product Futures	Combined margin requirements
Symbol JPYINR Aug 2016		Span Rs: 2,344
Net quantity 1	Add Reset	Exposure margin Rs: 464
Buy Sell		Total margin ? Rs: 2,808

Clearly, the margins required for JPY INR contract is the highest in the currency segment, and I guess this is because this contract could be the most volatile (owing to

lower liquidity). Of course, this is just a casual observation, I'd encourage you to calculate the actual value on Excel to get a perspective on volatility of JPY INR.

Spread contracts are available on all the currency pairs across all the expiries. Here is the snapshot of the same from NSE's website –

RBI Reference Rate		As on Aug 04, 13:30:00				Option Chain Daily Reports	
		1 \$ ₹ 66.9447	1 £ ₹ 89.0699	1 € ₹ 74.5965	100 ¥ ₹ 65.9500		
Price Watch	Live Chart	Spread Contracts	Most Active	Trade History	Information		
Contracts							
USDINR		Best Bid		Best Ask		Volume (Contracts)	LTP Difference
SP AUG 16 SEP 16	20	0.3350	0.3400	253	502	0.3400	-
SP AUG 16 OCT 16	100	0.6425	0.6675	100	-	-	-
SP AUG 16 NOV 16	2100	0.6750	-	-	-	-	-
<i>More contracts ▾</i>							
GBPINR		Best Bid		Best Ask		Volume (Contracts)	LTP Difference
SP AUG 16 SEP 16	110	0.4500	0.4575	129	466	0.4575	-
SP AUG 16 OCT 16	1	0.7300	-	-	-	-	-
SP AUG 16 NOV 16	300	0.2200	-	-	-	-	-
<i>More contracts ▾</i>							
JPYINR		Best Bid		Best Ask		Volume (Contracts)	LTP Difference
SP AUG 16 SEP 16	916	0.3350	0.3375	10	204	0.3375	-
SP AUG 16 OCT 16	2	0.5025	-	-	-	-	-
SP AUG 16 NOV 16	200	0.2200	-	-	-	-	-
<i>More contracts ▾</i>							
EURINR		Best Bid		Best Ask		Volume (Contracts)	LTP Difference
SP AUG 16 SEP 16	149	0.3925	0.4100	100	2,776	0.3925	-
SP AUG 16 OCT 16	20	0.6075	-	-	60	0.2500	-
SP AUG 16 NOV 16	500	0.7550	-	-	-	-	-
<i>More contracts ▾</i>							

But as you can see, the spread contracts (apart from USD INR) are not really liquid.

Finally, if you were to select contracts to trade based on liquidity, here is what I'd suggest you look at, in order of preference –

1. USD INR Futures
2. USD INR ATM Options
3. GBP INR Futures
4. EUR INR Futures
5. JPY INR Futures

With this I'm assuming that you are clear with the logistics involved in currency trading. We now focus on developing some basic trading approach.

6.2 – The test for seasonality

There is often a lot of debate on the seasonality involved in currencies. By seasonality I mean things like “USD INR always goes down in December” or something like “USD INR always goes up a week before expiry”. In fact, many people base their trades based on this expectation without actually validating for seasonality. Given this, we thought we should check for the seasonality in currencies, and needless to say we picked the USD INR spot data to run the required test.

**** Warning****

The following discussion can get a bit technical, and this is not meant for regular Varsity readers. If you want a direct answer for whether any sort of seasonality exists in the USD INR pair, then the straight forward answer is – no, there is seasonality of any sort across any time frame. With this conclusion you can jump directly to the next section. However, if you have a statistical approach to things then you may just want to read through. Of course, I’ll try my best to keep it brief.

Also, this section is contributed by our good friend Prakash, any queries regarding this should be directed to prakash.lekkala at gmail dot com.

Seasonality in any time series can be checked by employing a statistical test called “Holt Winters test”. A typical Holt-Winters method has 3 components –

- Level
- Trend
- Seasonality

Level: this indicator measures the average change in USD INR on a YOY basis

Trend: This indicator measures the average change in USD INR on a month on month basis

Seasonality: This indicator measures if there is any seasonal impact on price change. For example – USD INR almost always rises in January, and almost always falls in April etc.

There are two possibilities for components (level, trend, and seasonality)

- Additive
- Multiplicative

I guess the details of this are beyond the scope of this discussion.

Holt-Winters test for seasonality:

In Holt-Winters test, we check for seasonality in a time series by building a forecast model (let us call it Model 1) and study its residuals. Model 1 does not have any seasonality component inbuilt. We then build another forecast model with a seasonality component (Model 2) and check for the errors of this model.

We compare the errors of both the models and compare to check if model 2 is gives us a better forecast when compared to Model 1. We do this by employing ‘Chi Square’ test to determine if accuracies are better. If Model 2 is statistically better than Model 1 then we conclude that there is some seasonal pattern in data. However, if the accuracies are same for both models or if Model 1 has better accuracy, there is no seasonality in data.

Seasonality results for USD INR

Check for weekly seasonality:

Model 1 (without seasonality component): The best model is (M, N, N) with coefficients 0.9999

This model indicates that weekly data has only level component and no trend component. The coefficient of “level” is 0.9999 i.e. next week’s price is about 0.9999 times this week’s price.

For readers who are aware of Random Walk Theory will be able to appreciate these parameters. The model is suggesting that on a weekly basis USD INR price movement is a random walk.

Model 2 (with seasonality component): The best model is (M, N, M) with coefficients 0.7 and 0.0786

This model indicates that weekly data has level and seasonality component. The interpretation is that next week’s price is 0.7 times of this week’s price and the remaining price is contributed by seasonality.

Conclusion: Chi square test concluded that there is 100% chance that model 2 accuracy is same as model 1 accuracy i.e. forcing a seasonality model on USD INR isn't increasing its accuracy.

This can only happen when there is no seasonality in the data. As the data is prepared for weekly analysis, we can conclude that there is no seasonality on weekly a basis.

Monthly seasonality:

Model 1: The best model is (A, N, N) with coefficients 0.9999

Like in the case of a weekly model, model on monthly data also suggests a random walk.

Model 2: The best model is (A, N, A) with coefficients 0.9999 and 0.0001

This model indicates that next month closing price is almost same as this month's closing price with a small impact of seasonality.

Conclusion: Chi square test concluded that there is a 20% chance that model 2 accuracy is better than model 1 accuracy. In statistical terms, such improvement in accuracy might happen due to randomness, like the window period you choose, the sample data etc.

Typically, in statistics, the norm is to look for at least 95% chance that model 2's accuracy is better than model 1's to conclude there is seasonality in data. So in case of USD-INR, we can conclude that there is neither monthly nor weekly seasonality.

The last 8 years USD INR spot data for this is taken from **RBI's website**.

So the next time you hear someone make a random statement like "the USD INR pair almost always goes down before Christmas", then you know he is just trying to sound smart with no real insights.

6.3 – Classic TA

Think about conducting a fundamental analysis on a company, for example – Hindustan Uniliver Limited. Typically, you would study its business, financial

statements, corporate governance, study its peers, and perhaps build a financial model to identify if the stock is worth investing in. Fundamental analysis is kind of a straight forward affair when it comes to equities. However, when you look at currency pairs, USD INR for example, there are a lot more fundamental dimensions – the macro economics of the USA which is dependent on multiple domestic and international factors and the macro economics of India which is again dependent on multiple domestic and international factors. Once you understand these, you need weigh each one of these against another and build a relative view.

Frankly speaking, this is no easy task and not many are capable of doing this. You need to be an economist with a trader's mind-set to pull off quality fundamental analysis on currency pairs. Perhaps, this is the reason why Technical Analysis (TA) is so much more popular when it comes to trading currencies and commodities. As you probably aware, Technical Analysis assumes that the price that you see on the screen discounts everything including all the complex fundamental views that are panning out at the moment. With this assumption you go ahead and analyse the charts and develop a view point.

TA on currencies and commodities works just like it does on equities. If you are not conversant on how to use Technical Analysis, I'd strongly suggest you read through this **module on TA**.

I'll post few snapshots of TA based trade setups –



The two encircled candles form a classic candlestick pattern called ‘Piercing pattern’. The piercing pattern suggests the trader to go long on the USD INR pair. As you can see, the trade panned out well without triggering the stop loss.

Here is a bearish Marubozu on GBP INR –



The bearish Marubozu suggests you to short the underlying with an expectation that the asset will continue to slide down.

Naturally, the trade setups can be endless. I know many people are under the belief that currency and commodities requires one to know a different set of technical analysis, but this is not true. TA works exactly the same way on any time series data, be it – stocks, commodities, currencies, or bonds.

And with this, I would like to end our discussion on Currencies and would like to start our discussion on the 2nd part of this module i.e. commodity trading.

Key takeaways from the chapter

1. The underlying for EUR INR is the spot rate of 1 Euro in Indian Rupees.
2. The lot size for EUR INR is €
3. The underlying for GBP INR is the spot rate of 1 GBP in Indian Rupees. GBP INR is the 2nd most traded contract in the currency segment.

4. The lot size for GBP INR is £
5. Internationally GBP USD is also referred to as the ‘Cable’.
6. JPY INR has the highest margin requirement in the currency segment, perhaps due to the higher volatility.
7. Lot size in JPY INR is 100000.
8. The underlying in JPY INR is the rate of 100 Japanese Yen in Indian Rupees.
9. As opposed to popular belief, there is no seasonality in the USD INR pair – either on the weekly basis or on a monthly basis.
10. TA can be applied to currencies just like the way it can be applied to stocks.

CHAPTER 7

Gold (Part 1)

7.1 – Orientation

As you know, there are two commodity exchanges in India – Multi Commodity Exchange (MCX) and National Commodity and Derivative Exchange (NCDEX). MCX is particularly popular for the Metals and Energy commodities while NCDEX for all the agri commodities. However, there is a lot of activity picking up on MCX for agri commodities as well. My job over the next few chapters is to discuss these commodities which are traded on the exchanges, and get you familiar with the commodity contracts.

We will look into each and every commodity that is actively traded on the commodity exchanges. The idea is to know how the commodity contract works (contract specification), figure out which contract to trade, and identify the factor which influences the commodity. I will skip the usual background to commodities market part, the one which talks about the history, forwards markets, the farmers in US, the Chicago Mercantile Exchange etc. You will find this in almost any material on Commodity market. I would like get straight to the heart of the topic by slicing and dicing the contract specifications of commodities and other details around them.

Here is the list of commodities available on MCX to trade; of course I got this list from the MCX website –

Sr. No.	List of Commodities Available for Trading on MCX	List of Commodity Contracts Available for Trading on MCX
1	ALUMINIUM	ALUMINIUM MINI ALUMINIUM
2	CARDAMOM	CARDAMOM
3	COPPER	COPPER COPPER MINI
4	COTTON	COTTON
5	CRUDE OIL	BRENT CRUDE OIL CRUDE OIL CRUDE OIL MINI
6	CRUDE PALM OIL	CRUDE PALM OIL

7	GOLD	GOLD GOLD GLOBAL GOLD GUINEA GOLD MINI GOLD PETAL GOLD PETAL DELHI
8	KAPAS	KAPAS
9	LEAD	LEAD LEAD MINI
10	MENTHA OIL	MENTHA OIL
11	NATURAL GAS	NATURAL GAS
12	NICKEL	NICKEL NICKEL MINI
13	SILVER	SILVER SILVER 1000 SILVER MINI SILVER MICRO
14	ZINC	ZINC ZINC MINI

The idea is to cover all the major commodities that one can trade. Needless to say, one has to know how ‘Derivative Futures’ function before attempting to understand Commodities. So if you are not familiar with Futures, I’d encourage you to read the module on **futures trading**.

Anyway, assuming you are familiar with Futures, we will now start with Gold.



7.2 – The Gold Contract

Gold is a very actively traded contract in MCX. It has ample liquidity, with daily trades of roughly 15,000 contracts translating to a Rupee value of over 4500 Crore. Note, these numbers belong to just one type of Gold contract, often nicknamed “Big Gold”.

Gold comes in quite a few variants that one can choose to trade in. Newbie and sometimes even the experienced commodity traders often get confused with these contracts, not knowing which one to trade and the difference between them. To begin with, let me list down all the different types of Gold contracts –

1. Gold (The Big Gold)
2. Gold Mini
3. Gold Guinea
4. Gold Petal

All these variants belong to the same underlying i.e. Gold. I guess the best way to understand the difference is by understanding the contract specification of each of these variants. We will start with the big boy first, i.e. ‘The Gold’.

Here is the contract specification as per MCX, let me list the important things first and then we will understand them one by one –

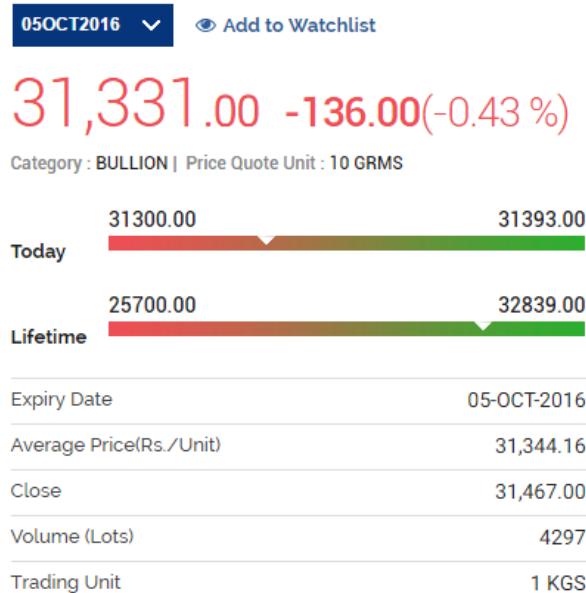
Particular	Value
Price Quotation	Rupee per 10 grams inclusive of all taxes and levies relating to import duty
Lot Size	1 kilogram
Tick Size	1 rupee
P&L per tick	Rs. 100
Expiry Date	5 th day of contract month
Delivery Logic	Compulsory
Delivery Unit	1 kilogram

Let me discuss these details in the same sequential order, so that it becomes easy for you to understand the subsequent contracts. We’ll start with the price quotation.

The price quotation as you can see is for 10 grams of Gold. This price includes all the import duties and taxes, of course we will talk more about this at a later stage. For now,

just be aware that the price on MCX is all inclusive. Have a look at the following snapshot, it shows the last traded price of Gold futures on MCX –

GOLD



As you can see, the last traded price of Gold is Rs. 31,331/- . Do note, this is the quote for 10 grams of gold. Since the lot size is 1 Kg (1000 Grams), we can calculate the contract value –

$$(1000 * 31331) / 10$$

$$= \text{Rs.} 31,33,100/-$$

So what is the margin required to trade this? We can check this from Zerodha's margin calculator –

Exchange	MCX	Combined margin requirements
Symbol	GOLD 05-OCT-16	Span
Net quantity	(Lot size 1) 1	Exposure margin
	<input type="button" value="Add"/> <input type="button" value="Reset"/>	Rs: 1,25,868
Buy/Sell		Total margin ?
		Rs: 1,25,868

The margin amount required is Rs.1,25,868/-, which means the margin percentage is roughly –

1,25,868 / 31,33,100

= **4.017%**

As you can see the margin percentage is just about 4%, which is pretty much similar to the currency contracts. However, the Rupee value of the margin is way too high and it therefore prohibits many retail traders to initiate positions in Gold. In fact, this is the reason we have contracts like Gold Mini and Gold Petal, where the Rupee value of the margins is lower. We will talk about these contracts a little later.

Now assume you buy 1 lot of Gold on MCX, this means you have to park close to 1.25 lakhs as margin and with each tick you will either make Rs.100 or lose Rs.100, and how did we arrive at that? Well, it is fairly simple –

P&L per tick = (Lot Size / Quotation) * Tick Size

Let us apply this on Gold –

= (1000 Grams / 10 Grams) * 1 Rupee

= **100 Rupees**

In fact, you can apply this formula to any futures and options contract to calculate the P&L per tick. Let me demonstrate this formula for the JPY INR contract. If you recollect the lot size for this contract is 100000 JPY, and the quotation was for 100 JPY, and the tick size is 0.0025, using this we can calculate the P&L per tick –

(100000/100) *0.0025

= 2.5 Rupees

Anyway, let us now focus on the expiry. If you look at the expiry of Gold, it simply says 5th day of contract month. Gold contracts are introduced every 2 months and each contract stays in the system for a year, and at any point you will have 6 contracts to choose from. Considering we are in August 2016, the following table should give you an idea of how this works –

Current available contract	Expires on
October 2016	5 th Oct 2016
December 2016	5 th Dec 2016
February 2017	5 th Feb 2017
April 2017	5 th April 2017
June 2017	5 th Jun 2017
August 2017	5 th Aug 2017

Needless to say, the most recent contract is the most liquid contract to trade; in this case it would be October 2016 contract. Now when the October 2016 contract expires on 5th Oct 2016, September 2017 contract will be introduced, and the most active contract from 5th Oct 2016 would now be the December 2016 contract.

Do recall, settlement in equities is always in cash and not physical. However, when it comes to commodities the settlement is physical and therefore ‘delivery’ is compulsorily. This means if you hold 10 lots of gold and you opt for delivery then you will get 10 kg of gold. In order to get the delivery of the commodity, one has to express his intention to do so. This has to be done any time before 4 days to expiry. So given that the expiry is on 5th, one has to express his intent to take delivery anytime on or before the 4th (1st, 2nd, 3rd, 4th).

If you are trading with Zerodha then do note, we do not allow you to get into the physical delivery of commodities. So you will be forced to close the position before 1st of the expiry month. In fact, I personally prefer to close the positions early on and not really get into the physical delivery of commodities.

For all practical purposes if you know these things about the Gold contract, you pretty much know what is really required before you trade the big Gold contract.

We will now move on to know the other variants of gold that gets traded on the exchange.

7.3 – The other contracts (Gold Mini, Gold Guinea, Gold Petal)

The big gold contract as you realize demands a heavy margin requirement in terms of Rupee value. This prevents a lot of traders from trading the big gold contract and

perhaps this is the reason the exchanges introduced contracts with much lesser margin requirement.

The other gold contracts that are available to trade is –

- Gold Mini
- Gold Guinea
- Gold Petal

The details for the other gold contracts are as follows –

	Price Quote	Lot Size	Tick Size	P&L/tick	Expiry	Delivery Logic	Delivery Unit
Gold Mini	Rs. per 10 gm	100 gm	1 rupee	Rs.10	5 th day	Compulsory	100 gm
Gold Guinea	Rs. per gm	8 gm	1 Rupee	Rs.1	Last day	Compulsory	8 gm
Gold Petal	Rs. per gm	1 gm	1 Rupee	Rs.1	Last day	Compulsory	8 gm

I'm assuming the table above is a lot easier to understand now considering we have discussed these details earlier. Let's dig straight into the margin details.

Last updated: 22 Aug 2016

#	Commodity	Lot size	Price	NRML Margin
1	GOLD	1 KGS	31404	157020
2	GOLDGUINEA	8 GRMS	25033	1251
3	GOLDM	100 GRMS	31365	15682
4	GOLDPETAL	1 GRMS	3111	155
5	GOLDPTLDEL	1 GRMS	3094	154

As you can see, Gold Mini (GoldM) contract requires a margin of Rs. 15,682/- . In terms of percentage –

$$= \text{Margin} / \text{Contract Value}$$

$$\text{Contract Value} = (\text{Price} * \text{Lot size}) / \text{Price Quotation}$$

$$= (31365 * 100) / 10$$

$$= \text{Rs. } 313,650$$

$$= 15682 / 313650$$

$$= 5\%$$

In terms of margin percentage, this is roughly the same as big Gold. For the sake of completeness let us quickly calculate the P&L per tick for Gold Mini. We know –

$$\text{P&L per tick} = (\text{Lot Size} / \text{Quotation}) * \text{Tick Size}$$

$$= (100 / 10) * 1$$

$$= \text{Rs. } 10/- \text{ per tick.}$$

Beyond the Gold Mini contract, we have Gold Guinea and Gold Petal contract. These are extremely tiny contracts which demand a very low margin, as low as Rs.1251 (Gold Guinea) and Rs.154 (Gold Petal). The lot size is small and therefore the contract value is small as well. You will find few variants like Gold Petal (Delhi), Gold Guinea (Ahmadabad) etc., I would suggest you ignore these, especially if your idea is to just trade Gold.

Here is my honest opinion – if you are trading Gold stick to either the Big Gold contract or the Gold Mini contract, simply because the liquidity is quite bad in all the other contracts. To give you a perspective on liquidity on a regular trading day (on MCX) –

- 12 – 13K lots of big gold contracts get traded
- 14-15K lots of Gold mini contracts get traded
- 1-1.5K lots of Gold Guinea contracts get traded
- 8-9K lots of Gold Petal contracts get traded

The number of lots in Gold Petal should not entice you believe that the liquidity is high, do remember Gold Petal lot size is just 8 grams, and therefore 8-9K lots translates to roughly 2-2.5 Crs.

Another important thing to note – liquidity is highest in the nearest month contract, so always stick to these. The thumb rule here is – farther the contract expiry, lower is the liquidity.

With this, I assume you are familiar with the Gold contracts and the logistics. In the next chapter we will discuss few interesting topics such as the parity in domestic and International gold contracts, factors influencing Gold, relationship between gold, equities, and dollar etc.

Key takeaways from this chapter

1. Gold is one of the most popular bullion contracts that gets traded on MCX.
2. Gold contract comes in a few variants – Big Gold, Gold Mini, Gold Guinea, and Gold Petal.
3. Big Gold is the most popular contract, but requires a margin in excess of Rs.1,25,000/-.
4. The P&L per tick for the big Gold is Rs.100.
5. P&L per tick can be calculated as = (Lot Size / Quotation) * Tick Size.
6. Gold Mini is the 2nd most popular Gold contract, requires a margin of roughly 15K.
7. Gold Petal and Guinea are other variants demanding much lower margin requirement. However, the liquidity in these contracts is quite low.
8. It is always a good idea to stick to the nearest month contract as liquidity is high in these contracts.
9. Delivery is compulsory for all these contracts; therefore, it makes sense to close these contracts at least 4 days before the expiry of the contract.

CHAPTER 8

Gold (Part 2)



8.1 – The London fix

In the previous chapter we discussed the various Gold contracts that are available on MCX. I'd like to begin this chapter by discussing how the prices of Gold in the spot market are arrived at internationally and in India. However, I have to mention this – this method to ‘fix’ gold prices are merely symbolic and holds very little relevance to trading gold futures at MCX. I'm discussing this simply because it is an interesting thing to know. J

Internationally, the price of Gold is fixed in London on a daily basis, twice a day in two different sessions. The morning session at 10:30 AM is referred to as ‘AM Fix’ and the evening session at 3:00 PM is called the ‘PM Fix’. The prices are fixed by the gold dealers from London’s biggest bullion desk. The whole process is facilitated by Nathan Mayer Rothschild & Sons.

There are about 10-11 participating banks, which include names like JP Morgan, Standard Chartered, ScotiaMocatta (Scotiabank), Société Générale etc. Do note, the general public and other banks are not permitted to participate in this process. The dealers from these banks call the dedicated conference line at the designated time and submit their bids to buy and sell gold. From all the bids and offers an average price is arrived at, and the same price is relayed to the market which then becomes the benchmark for gold trading. The whole process lasts for about 10-15 minutes. The process is again repeated in the ‘PM session’ and the gold prices are again discovered and relayed to the markets.

The gold price that is fixed by the AM and PM sessions is very close to the actual price of gold that is traded in London and other international markets. So in a sense, the price that is relayed holds no surprise to traders or bullion dealers, in fact some participants even believe that like many things in England, even this is conducted more to keep up with tradition.

India too follows a somewhat similar practice, but less elaborate. India, being one of the biggest consumers of Gold, imports the yellow metal. The gold is imported by designated banks and the banks in turn supply this gold to bullion dealers (after adding the necessary charges; more on this a little later). The Indian Bullion Association then bids for the gold through its network of bullion dealers. These dealers mainly base their quotes on how much gold they would like to buy or sell at a given price, the rates are averaged out, and this roughly sets the floor for the Gold prices in India. In fact, there is some sort of circularity here because dealers tend to look at the Gold futures price traded on MCX before placing their bids with the Indian bullion association. Anyway, this price is relayed to the dealers’ and jewellers’ network and the price for the day is set.

8.2 – Gold price disparity

Traders tend to compare the Gold futures rate in Chicago Mercantile Exchange (CME) and the Gold Futures rate on MCX and assume there is an arbitrage opportunity lurking around. The rationale for this is that Gold being an international commodity should often trade at around the same price, in the absence of which an arbitrage opportunity

arises. So for example if 10 grams of 995 purity Gold in CME is quoted at \$430, then on MCX the price of 10 grams of 995 purity should be in and around \$ 430.

But this is often not the case, they trade at a significantly different price and due to this a disparity between gold futures in CME and MCX always exists. The question however is, why does this disparity between the two gold future contracts exist?

Let us figure this out –

To understand the disparity between the two future contracts, one should understand how the Gold spot rate evolves in India.

Remember, India is a net importer of gold. In the international markets, US especially, Gold is quoted on a per troy ounce basis. One troy ounce is approximately 31.1035 grams. Assume Gold in the US spot market is traded at \$1320 per troy ounce – given this, what do you think should be the spot price of gold in India. Assume \$ 1 = Rs 65.

The general tendency is to identify the cost for 10 gram of gold in USD and multiply the same with the current USD INR rate and figure out the price. Let us do this math quickly –

31.1 Grams = \$1320, therefore 10 grams = \$424.43. Since USD INR is at 65, the price of Gold in India should be approximately = Rs. 27,588/-.

Unfortunately, in reality this is not so straightforward. Gold when imported (remember it is the banks which import gold) attracts duties and taxes. The spot price of Gold in India should include all these charges. In fact, let me list down all the costs that are applicable when a bank imports gold –

1. CIF applicable in Dollars (CIF stands for cost, insurance, and freight)
2. Custom duty
3. Cess
4. Bank cost

With all these charges, the landed price of Gold tends to increase. In fact, **this post on TradingQ&A** beautifully illustrates how the cost adds up.

So for example if the rate of spot Gold in US is \$420 per 10 grams, then in India after adding all the additional costs, the spot rate will be much higher. For the sake of this

discussion, let us assume the rate in India is \$435 – leading to a \$15 disparity in spot rates.

Now, this explains the disparity in spot rates, but what about the futures price? Remember the futures prices is a derived from spot rates, the formula linking futures price with spot price is –

$$F = S \cdot e^{(rt)}$$

You can read more on **futures pricing**.

So in the US markets, the basis for the future pricing will be the spot price of Gold in the US, i.e. \$420, while at the same time the basis for the future price in India will be the spot price of gold in India i.e. \$435. Given this, naturally the futures price of gold in CME and MCX will differ. This difference should not be mistaken for an arbitrage opportunity.

8.3 – What drives the gold price?

Investors across the world have this strange, but predictable behavior – at times of uncertainties, well at least economic uncertainties, they are all in a hurry to buy gold. Gold has always been considered a safe haven capable of safeguarding investments against any sort of economic meltdown.

Consider the Brexit (June 2016) event, the most recent event which kind of shook the world, and here is how Gold behaved before and after the event –



There was a clear run up in Gold before the event and post the event, in fact the big candle that you see during this period is on 24th June, the day after the Brexit verdict was out. Naturally, gold rallied owing to the outcome of Brexit. In fact, each and every time there is any sort of global/domestic uncertainty, investors flock to buy gold. This is mainly driven by the fact that Gold is considered a safe haven, capable of preserving your wealth.

Almost all the major events in the past has had an impact on Gold, think about it – Oil crisis, middle eastern uprising, Israel-Palestine, EU migrant crisis, Greek economy, Euro crisis, Lehman Brothers; the list is never ending. But the point to note is that every world event impacts the prices of gold.

This leads us to an important conclusion – Gold tends to increase in value in the backdrop of economic uncertainties. In fact, in the backdrop of economic uncertainties, demand for risky assets such as equities goes down, and the demand for safe haven assets such as Gold tends to increase.

Now besides the uncertain events, even on a day to day basis, investors tend to buy gold considering it a safe hedge against inflation. They believe, in the long run the value of gold will continue to rise. This perception is justified if you look at a very long term chart of gold –



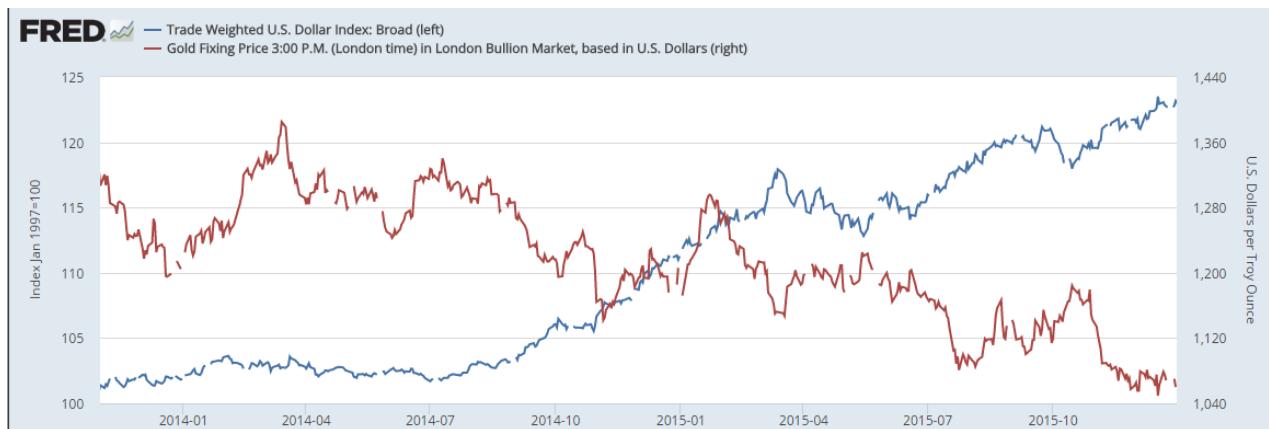
Source: <http://www.lbma.org.uk/pricing-and-statistics>

Take a look at the chart above, in 1970 Gold was at roughly \$35 and today in 2016, Gold is at \$1360, translating to a 37x return. However, when you look at it from a CARG perspective, this translates to about 8% year on year growth. The world average inflation is roughly between 5-6%. This means if you are an investor in gold, on one hand you are expected to make 8% and on the other you lose about 6% (owing to inflation) netting you with an out performance of 2%. However, in countries such as India where inflation is high, investment in Gold does not really fetch much.

8.4 – Gold, Dollar, Rupee, and Interest rates

The movement in gold is also related to how the currencies and interest rate of the economy moves. So if you are a trader in Gold, then it is not only important to keep track of world economics, but also important to keep track of currencies and interest rates. The equations are simple; let us start with the dollar and build on it.

Have a look at this graph below –



Source: <https://fred.stlouisfed.org/graph/?g=33vD>

This is the graph of USD versus Gold. The inverse relation between the two is quite evident. This inverse relation can broadly be attributed to two reasons –

1. When the dollar decreases in values with respect to another currency, then the value of the other currency increases. With the increase in the currency value, the demand for commodities including Gold tends to increase. As the demand for gold increases, the prices too tend to increase.
2. A falling US dollar becomes less attractive to investors; the investors tend to look at parking their money in safer havens such as gold.

Having said this, one should be aware that this may not always be true. There could be instances when both gold and USD tends to increase. For example, think about a crisis in Saudi Arabia (declining oil prices), domestic investors may want to move away from investments in Saudi and park it in safer assets such as Gold and USD, thereby increasing the value of both these assets.

Either ways, it must be clear to you now that USD has a role to play in the directional movement of Gold. Having said, one must study the correlations between various variables and gold to see if any correlations actually exist. For example, increase in the US federal rates tends to strengthen the US Dollar, by virtue of this Gold price should reduce. But this does not necessarily happen all the time, and if I'm right the correlation between Gold and Federal rates is just under 0.3.

I understand the discussion above is kind of counter intuitive, as in earlier I mentioned a strong dollar tends to push gold prices down, but the factors that influence USD may not actually have a strong bearing on Gold itself.

Confusing? Yes it is, I agree.

So how would one actually trade gold? One of the best ways to trade gold is by studying its demand and supply. Demand and supply factors are many and complex, especially for an international commodity such as Gold. However, the demand and supply pressures reflect themselves in prices and in a sense manifest themselves in the form of charts, and charts can be read by means of ‘Technical Analysis’, and this is how you can develop trading insights in gold.

I’m a huge fan of Fundamental Analysis when it comes equities, but when it comes to commodities and currencies, I resort to charts.

8.5 – Technical Analysis on Gold

If you are not familiar with Technical Analysis (TA), then I’d suggest you read the **module on TA**.

One of the key attributes of TA is that TA can be applied to any asset class including currencies and commodities. Let me develop some trading notes on Gold by employing TA, hopefully this will give you a sense of how to apply TA on Gold.

When I trade Gold, the objective is very clear – it is a short term trade and there are no intentions to carry the trade for say more than few days.

The very first thing that I do when developing a trading view is to look at the long term chart of the asset, by long term I mean at least 2 years. I’ll do the same here; I’ll look at the end of day Gold Bees (ETF) chart for this. Do note, I will use this chart to develop a rough idea on the primary trend of Gold and also observe critical price points, if any.



From the chart above, I note the following points –

1. Gold declined starting from late 2013, all the way to late 2015.
2. Prices kind of bottomed over the last few months of 2015.
3. Gold in fact formed a double bottom between Sept – Dec 2015.
4. Prices have been trending up since early 2016.
5. Traders have bought Gold at every decline starting from early 2016.
6. Clearly the bearishness in gold is no longer there, this is evident given the fact that gold has scaled back to 2013 prices.

With all this, I can conclude that I'd be more comfortable with long trades than short, but this does not mean that I will not short Gold. I would, if the risk to reward is enticing enough. However, if I short Gold, I will always be aware that traders out there are looking for opportunities to buy gold at every dip; hence I will be quick to cover my short position. Do note, until this stage I have only developed a broad based view on Gold and have not ventured into any specific price levels.

I would now be interested in looking at a short term chart of Gold, to identify trading opportunities if any. Have a look at the chart below, before we get into identifying trading opportunities (for which we will have to look at the right side of the chart), let's spend a little time on the left side of the chart.



The starting point of this chart is sometime in the late 2015, and till about end of June 2016, there is pretty much no activity. This is evident when you look at both the price and volume. The volume is almost non-existent, and the prices just tend to gap up and down. Can you guess why?

Well, remember Gold contracts are introduced almost a year in advance, for example the Oct 2016 contract (which we are looking at), would have been introduced around Oct 2015. However, this contract does not attract any liquidity till it nears its actual expiry i.e. October 2016. If on the other hand, our markets were very vibrant with lots of liquidity, then probably this contract would have attracted liquidity much earlier.

Anyway, let us now look into the left side of the chart and identify trading opportunities if any. I'll repost the chart emphasizing the recent candles; I have overlaid 9 and 21 day exponential moving averages on the prices –



1. The current market price is below both the short term averages.
2. There are three price action zones in the recent past at around 30956 (I've encircled the same in blue circles), and since the current market price is below this level, 30956 becomes an immediate resistance.
3. In the recent past, we can see a Bearish Marubuzo formed (circled in black), which has played out well. Traders may be booking profits on this one.

Considering all the above, I would be looking at buying opportunities in Gold, the moment it crosses the resistance level of 30956. Notice, this also coincides with the two short term moving averages, which further encourages me to go long. However, if the price of gold stays below the resistance level, I would hesitate to short for reasons we discussed earlier. So in summary my trade would be something like this –

- Position: Long
- Price: Above 30956
- Target: 31418 (have placed a short blue line)
- Stoploss: 30700 (current market price)
- Reward to risk assuming I'm going long at 30956: 1.8
- % move from entry – 1.5%

Not a bad trade from a reward to risk perspective I'd think. Also, since we are looking a 1.5% move, this may pretty much happen in a single day.

Anyway, the whole point here is to elaborately explain to you that TA can easily be applied to commodities such as Gold.

I hope the last two chapters have given you enough information on Gold, this according to me is put you in a good spot to get started in trading Gold.

Onwards to Silver!

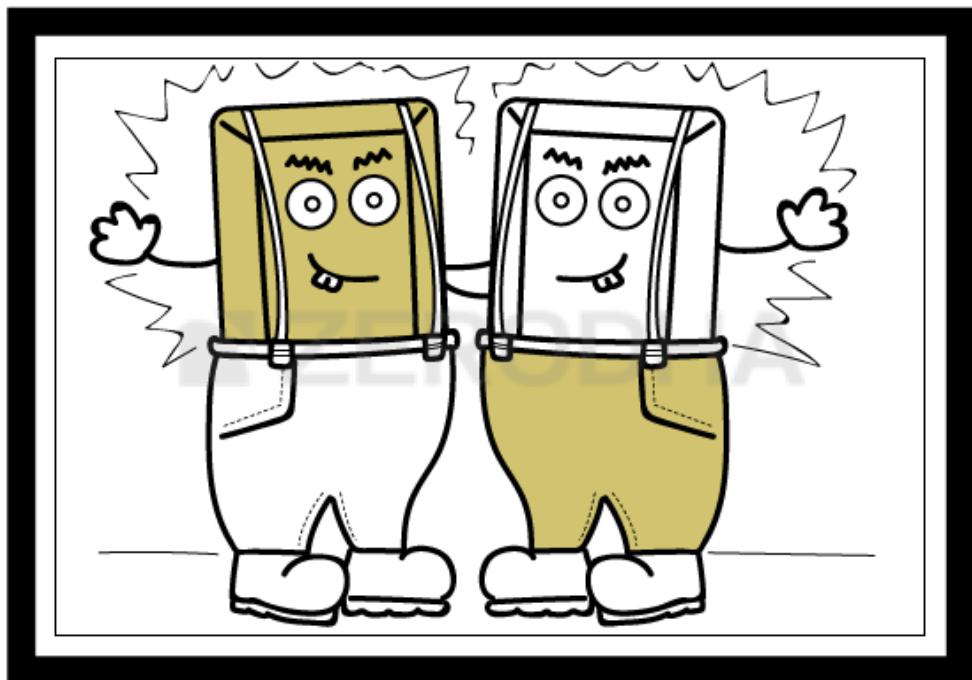
Key takeaways from this chapter

1. The price of Gold is fixed twice a day in the AM & PM session in London
2. Only designated banks can participate in the London fix

3. India too has a gold fix, similar to London fix – however there is some sort of circularity here as traders tend to look at the prices of MCX
4. Spot price of gold in US and India differs mainly owing to the additions duties, taxes, and charges that get added in India
5. Since spot prices vary, so does futures price
6. Dollar and Gold are inversely related
7. Commodity fundamentals are complex to understand, hence traders tend to look at demand and supply
8. Demand & supply reflects in the current price, and also manifests itself in charts
9. You can apply technical analysis on Gold and other commodities

CHAPTER 9

Silver



9.1 – The Bullion Twins

To begin with, I need to apologise for the delay in putting up this chapter. Perhaps this is the longest ‘in between chapter’ break I’ve taken from the time I have started writing for Varsity. I’ve been working on another high priority project which required my time and attention, hence the delay.

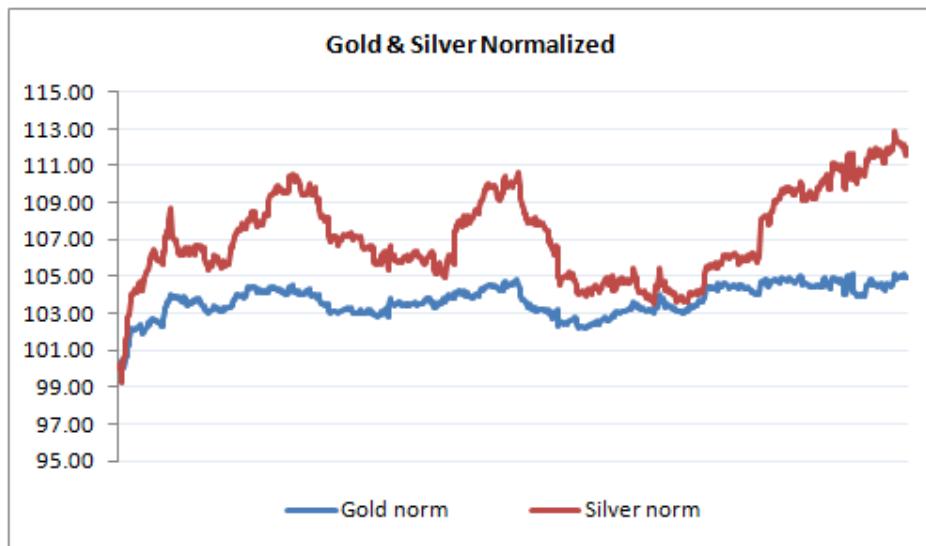
Anyway, let us get straight to work and discuss Silver. Precious metals such as Gold, Silver, and Platinum are collectively referred to as ‘Bullion’. There is a common perception that the market price of gold and silver makes similar moves. If this is true, then it gives raise to many trading opportunities such a ‘pair trading’. We will discuss pair trading in detail, perhaps in a different module altogether. However, let us go ahead and investigate if Gold and Silver move in tandem. I did run a correlation check on Gold and Silver using 30 minutes’ intraday data for the last 3 months (note this is over a 1000 data points) and here are the results –

Period	Gold Close	Gold Rt	Gold norm	Silver Close	Silver Rt	Silver norm	
5/10/2016 11:30	30000		100.00	43040		100.0	
5/10/2016 11:00	30000	0.000%	100.00	43068	0.065%	100.1	
5/10/2016 10:30	30015	0.050%	100.05	43100	0.074%	100.1	
5/10/2016 10:00	30025	0.033%	100.08	43163	0.146%	100.3	Correlation 0.70600911
4/10/2016 23:00	30149	0.413%	100.50	42925	-0.551%	99.7	
4/10/2016 22:30	29885	-0.876%	99.62	42708	-0.506%	99.2	
4/10/2016 22:00	29970	0.284%	99.90	43016	0.721%	99.9	
4/10/2016 21:30	30016	0.153%	100.05	43239	0.518%	100.5	
4/10/2016 21:00	30016	0.000%	100.05	43275	0.083%	100.5	
4/10/2016 20:30	30140	0.413%	100.47	43353	0.180%	100.7	
4/10/2016 20:00	30180	0.133%	100.60	43617	0.609%	101.3	
4/10/2016 19:30	30250	0.232%	100.83	43723	0.243%	101.6	
4/10/2016 19:00	30200	-0.165%	100.67	43821	0.224%	101.8	
4/10/2016 18:30	30350	0.497%	101.17	44253	0.986%	102.8	
4/10/2016 18:00	30380	0.099%	101.27	44275	0.050%	102.9	
4/10/2016 17:30	30500	0.395%	101.67	44321	0.104%	103.0	
4/10/2016 17:00	30641	0.462%	102.14	44632	0.702%	103.7	
4/10/2016 16:30	30660	0.062%	102.20	44700	0.152%	103.9	
4/10/2016 16:00	30630	-0.098%	102.10	44770	0.157%	104.0	
4/10/2016 15:30	30630	0.000%	102.10	44808	0.085%	104.1	
4/10/2016 15:00	30625	-0.016%	102.08	44750	-0.129%	104.0	

The correlation on an intraday basis is **0.7**, which is quite remarkable. I'm guessing the correlation on end of day basis would be even better. So what does this mean? Well, the correlation suggests that the two metals make similar moves on an intraday basis. If you recall, we discussed the concept of correlation in detail in the USD INR chapter. I'd suggest you read up [section 5.3](#) of chapter 5 if you haven't already done so.

If the intraday correlation is as tight as 0.7, then we can think about exploring trading ideas of going long on gold and short on silver or vice versa. This will be a kind of hedged strategy as you are long and short (on similar assets) at the same time. The idea here is just to let you know that building such a trading strategy is a possibility, please don't jump in and set up a trade just with this information. J

There are lots of other things to take care of when you initiate such trades; more on pair trading at a later point. Meanwhile, have a look at the intraday graph of both gold and silver; I've normalized it to start at 100 so that the graphs are more comparable –



If you were to just look at the graph and take a call on how closely the two metals move, then chances are you would have disregarded any sort of correlation between them J, but the actual numbers paint a completely different picture!

Anyway, as I mentioned earlier, I've used intraday data here to develop both the correlation and the graph. Longer term data will portray more meaningful information. In fact, I dug up the correlation data between silver and gold from a recent survey by Thomson Reuters, and here is what they suggest –

CORRELATIONS OF CHANGES IN DAILY PRICES					
	Q1 15	Q2 15	Q3 15	Q4 15	Q1 16
Gold	0.87	0.70	0.62	0.95	0.93
US\$ Index	-0.35	-0.05	-0.05	-0.75	-0.85
Oil (WTI)	-0.16	-0.08	0.32	0.84	0.42
CRB Spot Metals	0.42	0.50	0.25	0.85	0.85
GSCI	-0.42	0.08	0.44	0.84	0.64
Copper	-0.48	0.59	0.39	0.92	0.74
S&P 500	-0.30	0.29	0.27	-0.13	0.41

Source: GFMS, Thomson Reuters

The correlations are broken down on a quarterly basis (clearly a longer term approach here) and as you can see the correlation between Gold and Silver is on average is about 0.8, which is why traders prefer to call this pair the ‘Bullion Twins’.

The tight EOD correlation implies that traders and investors consider both gold and silver as safe havens in times of economic crisis. This further implies that any global geo political tensions tend to drive the price of not just gold, but silver as well.

Also, please do note the correlation of Silver with Oil, it is quite erratic and gives a sense on unreliability here.

9.2 – The Silver Basics

Silver has applications in industrial fabrication, photography, fashion, electrical, and electronics industries. Hence, there is always a demand for silver. In fact, the recent survey from “The Silver Institute” in the United States suggests that the global silver demand stands at 1170.5 million ounces. Historically, the demand for silver has grown at roughly 2.5% year on year. Out of the total global demand, bulk of it comes from industrial fabrication and manufacturing. This directly suggests that the price of silver is kind of influenced by growth of manufacturing and industrial economies such as China and, to some extent, India.

On the supply side, global mining production along with scrap and sovereign sales stands at 1040.6 million ounces, clearly indicating that silver as a commodity is under slight deficit. The supply has not really improved over the years; in fact, the data suggests that the growth in supply has just been about 1.4%.

Here is the table which gives you the complete demand supply scenario in silver –

TABLE 1 - WORLD SILVER SUPPLY AND DEMAND

(million ounces)	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Supply										
Mine Production	643.4	667.7	684.7	717.3	753.0	757.6	790.8	823.7	868.3	886.7
Net Government Sales	78.5	42.5	30.5	15.6	44.2	12.0	7.4	7.9	-	-
Scrap	207.1	204.2	202.0	201.2	227.5	261.5	255.5	192.1	168.3	146.1
Net Hedging Supply	-11.6	-24.1	-8.7	-17.4	50.4	12.2	-47.1	-34.8	16.8	7.8
Total Supply	917.3	890.3	908.6	916.7	1,075.2	1,043.3	1,006.6	988.9	1,053.3	1,040.6
Demand										
Jewelry	174.5	182.3	177.6	176.9	190.0	187.9	185.4	217.8	224.0	226.5
Coins & Bars	50.7	56.1	192.3	91.6	144.4	210.4	160.5	242.1	236.1	292.3
Silverware	62.1	60.2	58.4	53.2	51.6	47.2	43.7	58.8	60.7	62.9
Industrial Fabrication	648.9	661.0	656.8	542.6	650.3	676.3	615.0	619.1	611.2	588.7
...of which Electrical & Electronics	242.3	262.5	271.7	227.4	301.2	290.8	266.7	266.0	263.4	246.7
...of which Brazing Alloys & Solders	54.7	58.3	61.6	53.6	60.9	62.7	60.6	63.2	66.1	61.1
...of which Photography	142.2	117.0	98.2	76.4	67.5	61.2	54.2	50.5	48.5	46.7
...of which Photovoltaic*	-	-	-	-	-	75.8	62.9	62.5	63.2	77.6
...of which Ethylene Oxide	6.6	7.9	7.4	4.8	8.7	6.2	4.7	7.7	5.0	10.2
...of which Other Industrial*	203.1	215.3	217.9	180.4	212.1	179.4	165.8	169.3	165.1	146.4
Physical Demand	936.3	959.6	1,085.1	864.2	1,036.4	1,121.8	1,004.6	1,137.9	1,131.9	1,170.5
Physical Surplus/Deficit	-19.0	-69.3	-176.6	52.5	38.8	-78.5	2.0	-149.0	-78.6	-129.8
ETP Inventory Build	126.8	54.8	101.3	156.9	129.5	-24.0	55.3	2.5	1.5	-17.7
Exchange Inventory Build	-9.0	21.5	-7.1	-15.3	-7.4	12.2	62.2	8.8	-8.8	0.3
Net Balance	-136.8	-145.5	-270.7	-89.2	-83.3	-66.7	-115.5	-160.2	-71.3	-112.5
Silver Price, \$ per oz.	11.55	13.38	14.99	14.67	20.19	35.12	31.15	23.79	19.08	15.68

*Photovoltaic demand included in "Other Industrial" prior to 2011

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You can read the complete [**survey report**](#).

Given how the supply and demand scenario plays out, there is a lot of scope to trade silver as a commodity. This leads us back to the most important question – who decides the rate of silver? Well, silver rates are fixed the same way as that of gold, in London, by a pool of participating banks. To know how gold/silver rates are fixed, I'd recommend you [**read this**](#).

9.3 – The Silver contracts

There are four variants of silver contracts that are available for you to trade on MCX. They differ mainly in terms of contract value, and therefore the margin required. These contracts are as follows –

Contracts	Price Quote	Lot Size	Tick Size	P&L/tick	Expiry	Delivery Units
Silver	1 kilogram	30 kgs	Rs.1/tick	Rs.30/tick	5th day of expiry month	30 kgs
Silver Mini	1 kilogram	5 kgs	Rs.1/tick	Rs.5/tick	Last day of expiry month	30 kgs
Silver Micro	1 kilogram	1 kg	Rs.1/tick	Rs.1/tick	Last day of expiry month	30 kgs
Silver 1000	1 kilogram	1 kg	Rs.1/tick	Rs.1/tick	Last day of expiry month	1 kg

Of all the four contracts, the ‘Silver’ 30 kg contract and ‘Silver Mini’ are most actively traded on MCX, we shall discuss both these contracts detail. Let us begin with the main Silver contract.

The price quotation for the Silver contract is 1 kilogram. This means when you check the price of Silver on MCX or on your trading terminal, the price that you see is for 1 kg of silver. This price includes the import duties, taxes, and all the other applicable duties. Have a look at the screenshot below (taken from Kite) –

SILVER DEC FUT MCX				+0.51 %	42266.00
BIDS			OFFERS		
PRICE	ORDERS	QTY.	PRICE	ORDERS	QTY.
42266.00	1	4	42270.00	2	2
42265.00	1	1	42272.00	1	1
42260.00	1	4	42274.00	1	2
42257.00	1	4	42276.00	1	4
42256.00	2	2	42278.00	1	2
Total		582	Total		770
EXPIRY	2016-12-05		VOL. TRADED	2,357	
O	42300.00	H 42400.00	L	42235.00	C 42051.00

The current price of Silver December Future is Rs. 42,266/-, note this is quoted on a per kg basis. Since the contract is for 30 kgs (lot size), the contract value will be –

$$= 30 * 42,266$$

$$= \mathbf{Rs.12,67,980/-}$$

The margins on Silver is roughly 5%, in fact here is the snapshot of the margin required to trade this contracts –

Exchange	Combined margin requirements
MCX	Span
Symbol	Rs: 68,619
SILVER 05-DEC-16	Exposure margin
Net quantity 30	Rs: 0
(Lot size 30)	Total margin ?
<input type="radio"/> Buy <input checked="" type="radio"/> Sell	Rs: 68,619

This works out to –

$$= 68619 / 1267980$$

$$= \mathbf{5.41\%}$$

The P&L per tick can be calculated using the following formula –

$$\text{P&L per tick} = (\text{Lot Size} / \text{Quotation}) * \text{Tick Size}$$

= (30 kgs /1 kg) * Rs.1/-

= **Rs. 30/-**

So for every tick on Silver, you either make Rs.30/- or lose Rs.30/-.

As far as the contracts expiries are concerned, here are the set of contracts that are available to trade as of now (as of Oct 2016), note all contracts expire on the 5th of the contract month –

- December 2016
- March 2017
- May 2017
- July 2017
- September 2017

When the December 2016 contract expires, the December 2017 contract gets introduced to the market. You must be aware by now that the most liquid contract to trade would be the one which has the closest expiry date. For example, we are now in Oct 2016 and if I were to trade Silver, I'd choose the December 2016 contract.

Do recall, settlement in equities is always in cash and not physical. However, when it comes to commodities, the settlement is physical and therefore ‘delivery’ is compulsorily. This means if you hold 10 lots of Silver and you opt for delivery then you will get delivery on 300 kg of Silver. In order to get the delivery of the commodity, one has to express his intention to do so. This has to be done any time before 4 days to expiry. So given that the expiry is on 5th, one has to express his intent to take delivery anytime on or before the 4th (1st, 2nd, 3rd, 4th).

If you are trading with Zerodha, note that we do not allow you to get into the physical delivery of commodities. So you will be forced to close the position before 1st of the expiry month. In fact, I personally prefer to close the positions early on and not really get into the physical delivery of commodities just because of the logistics involved.

Another important point to note here – while the delivery is mandatory for Silver (30 kgs) contract, delivery is not mandatory for the Silver Mini and Silver Micro contracts. This means to say that you can let the Silver Mini/Micro contract expire and settle for

cash (or opt for delivery). However, you do not have the option to cash settle the Silver 30 kg contract.

Finally, here is something else you should know. Have a look at this snapshot below –

Commodity	Unit	Location
SILVER1000	1 KGS	NEWDELHI
SILVERMIC	1 KGS	AHMEDABAD
SOYABEAN	100 KGS	INDORE
SUGARMDEL	100 KGS	DELHI
SUGARMKOL	100 KGS	KOLHAPUR
SUGARSKLP	100 KGS	KOLHAPUR
TIN	1 KGS	MUMBAI
WHEAT	100 KGS	DELHI
ZINC	1 KGS	MUMBAI
ZINCMINI	1 KGS	MUMBAI

The table above maps a commodity with a location, for example Silver Micro is mapped to Ahmedabad. Ever wondered what this really means?

We all know that upon expiry, the price of the underlying in the spot market and its futures price converge to a single price point. Now in case of equities, the underlying and its futures are traded on the same platform i.e. NSE (and now BSE as well). So for example Infosys Spot in NSE will converge with Infosys Futures on NSE. However, in case of commodities there are many different spot markets. For example, Pepper and Rubber are prominently traded in Kochi. Gold is traded in both Mumbai and Ahmedabad and so on. Given this, upon expiry, the futures of Gold should merge with which spot price? Should it be the one in Mumbai or the one in Ahmedabad? For this exact reason, MCX has mapped each commodity with a spot market, and upon expiry the futures price will converge with the price of the designated spot market.

9.4 – The other Silver contracts

If you are comfortable with the contract details of Silver mentioned above, then it is fairly easy to understand the other silver contracts that are traded on MCX. They vary mainly in terms of the lot size and therefore the margin requirement.

I'll skip working out the math, but instead put up the margin numbers and the delivery option directly for you. The delivery option helps you decide whether you would like to take delivery of the contract or simply cash settle.

Contract	Margin Required	Margin as a %	Delivery options
Silver Mini	Rs.13,158/-	6.27%	Cash/Physical
Silver Micro	Rs.2,618/-	5.1%	Cash/Physical
Silver 1000	Rs.2,711/-	6.2%	Physical only

As you can see, the margins required are much lesser (quite naturally) compared to the big silver contract.

As far as trading is concerned, similar to Gold, the Silver Fundamentals are quite complex – tracking them on a day to day basis may not really be possible and in fact is not really required. Most traders I know trade commodities based on technical analysis. I personally think this a much better way to go about active commodity trading.

Apart from technical analysis, one can even choose to trade based on quantitative techniques such as ‘Pair Trading’. As stated earlier in this chapter, we’ll discuss this technique in a separate module altogether.

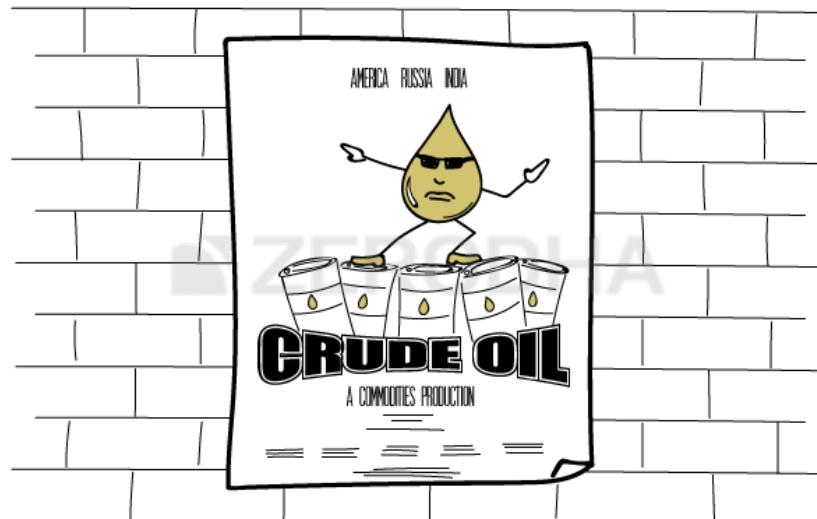
Key takeaways from this chapter

1. Gold and Silver are correlated both on an intraday basis and on an end of day basis.
2. Gold and Silver make a good pair for trading based on the ‘Pair trading technique’.
3. Silver does not have a great correlation with crude oil.
4. There are 4 variants of silver traded on MCX.

5. The main Silver contract has a lot size of 30 kgs and requires a margin close to Rs. 75,000/-.
6. The average margin requirement for silver is roughly between 5-6% of the contract value.
7. Technical analysis works quite well on Silver.

CHAPTER 10

Crude Oil (Part 1), digging the past



10.1 – The Commodities super star

If I have to pick one international commodity which can give you all the dramatic ups and downs of stock markets as portrayed in the movies, then it has to be the 'Crude Oil'. Wonder why? Have a look at the chart below –



The dramatic rise to \$140 per barrel to the immediate sharp correction, then a recovery back to near \$110 to a merciless crash to sub \$30, the crude oil chart can invoke all human emotions, just like a perfectly well directed movie! The fact that this is an international commodity, actively traded by hundreds of thousands of traders across the globe only adds to the complexity of it all.

So what is really going on in crude? Why did crude crack from the highs of \$115 all the way down to \$28? What caused this manic panic? What is happening to crude now? Where are we headed now? To understand this fully, we need to rewind and dig into the recent history of 2014 – 15.

This is exactly what we will do in this chapter. For the sake of this chapter, let us go back to first half of 2015 and see how things looked back then.

10.2 – The crisis revisited

From over \$110 per barrel in January 2014 to a low of \$28 per barrel in January 2016, the Brent Crude oil has perhaps seen the worst decline in prices over the recent 5 years. While this dramatic price decline has brought cheer to a few corporate and perhaps few countries, it has disrupted oil producing economies. Literally nobody saw this coming; even if someone did, the magnitude of this fall (over 75%) was beyond everybody's wildest imagination. Is this the bottom of the crash? Well, your guess is as good as mine, but the intensity of the crash in crude oil is so severe, it would be hard to believe the bottom is in sight.

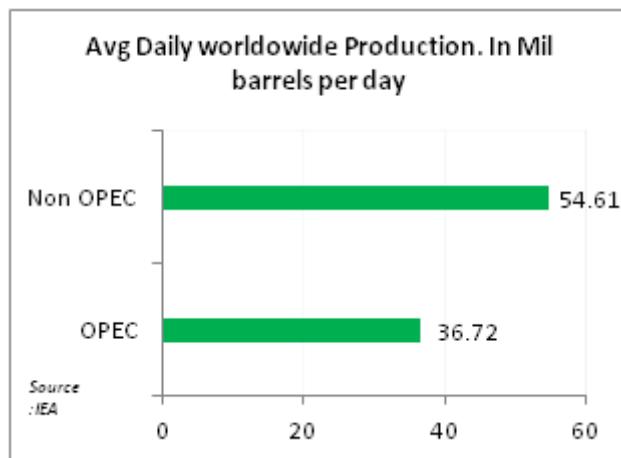
So what really went wrong?

To understand what went wrong, we need to understand the dynamics of crude oil and how business was carried out before the recent crash. This discussion also doubles up as 'oil basics' for you. Oil rich countries produced several million barrels of crude oil which were exported to The US, China, India, and European countries on a daily basis. The oil producing countries are split into two baskets –

1. “Organization of the Petroleum Countries (**OPEC**)” nations which include countries like Saudi Arabia, Qatar, Kuwait, UAE, etc., and

2. Other oil producing countries such as – Brazil, Canada, Russia, Mexico, Norway, etc., choose not be part of the oil cartel i.e. OPEC. Hence they are just referred to as ‘**Non OPEC** countries’.

Between the OPEC and non OPEC countries, close to 90 million barrels of oil were pumped on a daily basis. The graph below shows the daily oil production split between OPEC and non OPEC countries –



The Trigger

Different countries produce oil at different rates; this rate at which they produce mainly depends on the individual country’s finances and technology. While production depends on internal factors, the sale of oil has always been driven by markets. Clearly the breakeven point (expressed on a per barrel basis), is the rate at which countries need to sell per barrel of oil to cover the expense of producing the same, varies from country to country. Naturally, selling oil below the breakeven point implies that the country cannot balance their state budget. The table below shows the breakeven points for the OPEC countries –

Country	Breakeven point on a per barrel basis*
Iran	\$130.7
Algeria	\$130.5
Nigeria	\$122.5
Venezuela	\$117.5
Saudi Arabia	\$106.0
Iraq	\$100.6
UAE	\$77.3
Qatar	\$60.0
Kuwait	\$54.0

In the backdrop of these trade dynamics, a triple digit oil price till early 2013 worked really well for the oil producing economies. However, the recent developments changed the landscape of crude oil business dynamics. Specifically, the following three major events turned the tables around for crude oil prices –

1. **American Shale Oil** – The American shale oil, which comes from oil shale (sedimentary rocks containing bituminous material), which is an alternate to crude oil became technologically viable and the cost of producing the same became relatively cheaper. The output from the American Shale oil production increased, flooding the market with cheaper oil. By current estimates, it is believed that US has enough shale oil reserves to last generations. Shale oil from Texas and North Dakota displaced exports from OPEC members to The USA. This set the stage for a collapse in crude oil prices.
2. **Lack of co-ordinate action** – In the backdrop of increased shale oil production in The USA and the ongoing slide in crude oil price, one of the methods for oil producing countries to control the situation was to lower the supplies and regulate the demand supply situation. However, OPEC was not really successful in convincing OPEC and other non OPEC oil producing countries to cut the crude oil production to support the crude price. In fact, cutting oil production is considered more expensive than pumping oil.
3. **China Factor** – China has been one of the largest consumers of major international commodities including iron ore, coal, and crude oil. In fact, in 2013 China surpassed The US in oil imports. However, reports suggest that the Chinese economy is not growing at the same pace as it used to, resulting in lower demand for international

commodities. Needless to say, this has a significant impact on the spiralling crude oil prices.

4. **Market Dynamics** – The above three points triggered a steep sell off in crude oil, adding fire to this sell off was the heavy short positions built up on Crude Oil contracts.

Generally, when the price of crude oil falls, the US dollar tends to get stronger especially over the currencies of the emerging economies. This is quite natural as **an increase in oil** price widens the US current account deficit (remember US also imports oil from the Middle East), which obviously is not a great factor for the US Dollar, and the reverse helps the dollar strengthen. **Hence the Dollar and oil share an inverse relation.** Do recollect, in 2008 when Oil hit a peak of \$148, US Dollar was trading at 1.6 to the EURO.

The Russian Episode

Russia is one of the largest (non OPEC) producers and exporters of oil. The Russian federation's oil exports contribute nearly 40% of the total exports. With a slump in oil prices, the Russian economy seems considerably weakened. There are three factors working against Russia, two of which can be directly attributed to the oil prices –

1. **Oil Price** – Russia needs the oil prices to be approximately in the region of \$105 – \$107 to balance its budget and keep its finances in order; clearly with oil at \$50, Russia gets a severe blow on its budget.
2. **Ruble Trouble** – Remember, Russia is an emerging economy. With the slide in oil price, the Russian Ruble has massively weakened against the US Dollar. So much so, that the Russian Central Bank increased the interest rate overnight by 7.5% in order to defend the Ruble (yes, this did happen back in 2015).
3. **Crimea Curse** – Western countries continue to impose sanction cuts on Russia for its aggression on Ukraine. This means access to external capital is extremely difficult (especially when it's most required) for Russia.

Add to this the Syrian crisis, and a host of other local factors, there is little hope that that Russia may not actually slip into a financial coma dragging the federation into a recession.

The India macro angle

On the face of it, the fall in crude oil seems to significantly benefit India as the pressure on petroleum subsidy eases. India being a net oil importer (nearly two-third of India's oil is imported) pays a heavy bill for its oil imports. Naturally the fall in crude oil means improvement in the fiscal deficit, easing of inflation and possibility of an interest rate cut. All of which is desirable for India in the backdrop of the current economic situation.

But there is another angle to low oil prices. While low oil prices help the domestic import bill, it will also impact our exports receipts. Most of the exports from India are to countries whose economy depends on oil – UAE, US, Saudi Arabia, Kuwait, Iran, China etc. Quite naturally, with low oil prices the spending by these countries also decreases, thereby impacting business with India.

In fact, if you go back and look at the October 2014 import & export data from RBI, it clearly suggests the same – while the oil import bill reduced by 19% (y-o-y), the exports also declined by 5%. Clearly the advantage of low oil price is not the boon it seems to be. In fact, on 6th January 2015 we got a glimpse into what can happen if the oil price continues its fall – the NSE Nifty fell over 255 (~ 3.0% decline) points creating a ruckus on the street.

Impact on the Indian Companies

State owned oil marketing companies (OMC) such as HPCL, BPCL, and IOC are a direct beneficiary of low oil prices. Low oil price has a positive impact on oil marketing companies (OMC) in terms of reducing the stress on their working capital requirements. In fact, both BPCL and HPCL have retired over 50% and 30% of their short term borrowings over the last two years respectively. If the price of crude oil prices stabilizes around the current level of \$50 per barrel, then naturally it will be great for these companies in term of cleaning up their balance sheets and improving their bottom line.

Is this the end?

Well, this just depends on the supply-demand situation. Clearly as Saudi Prince Al-Waleed Bin Talal says, "If the supply stays where it is and the demand continues to be where it is, then there is little hope for the oil prices to bottom out here". Besides, the US has withdrawn the 40-year ban on export of oil– which means more supply to the market, thereby putting more pressure on prices.

Last month, i.e., September 2016, OPEC has finally agreed to cut the production in order to support the oil price. You can read the [article on Bloomberg](#).

American shale oil has no doubt created a ripple in the market but there is another angle to this – how strong are the balance sheet of these companies fracking shale oil? Are they over leveraged? Are they overstating the reserves? These are things the market will learn sooner or later; which will again impact crude oil prices.

However, at this stage if you ask me – is this the bottom of the oil price crash? Well, your guess is as good as mine.

Please note, unlike all the previous chapters on Varsity, this chapter will not have any key take away points as I've just narrated what really happened to crude. What we have discussed today could just be a piece of irrelevant history going forward!

PS: I have taken all the inputs for this chapter from [The special report](#) on oil crisis was published by Dalal Street Investment journal, authored by me.

CHAPTER 11

Crude Oil (Part 2), the crude oil ecosystem

11.1 – Mapping companies

I'm hoping that the previous chapter gave you some insight into the current situation of the crude oil fundamentals. Some of you may also be interested in learning how crude oil is extracted from the ground and supplied to various stakeholders such as the refineries. The 'Oil and Gas videos' channel on YouTube, has done a stellar job in putting up short animated videos on this topic. If not all the videos, I'd encourage you to at least [watch this one](#).

This animated video gives a beautiful, high level understanding of how oil is extracted from the ground and ocean beds. You will also understand what 'oil rigs' are in this video. They are those huge pad-like things, floating in the ocean, with flames spewing out of the exhaust. Companies such as Aban Offshore, Selan Exploration, Cairn India etc., are involved in setting this infrastructure up. I know a lot of traders and even investors investing in these asset heavy companies, without knowing the operational core of such companies. Personally, I think this is not a great idea; one should always know what they are dealing with. Given this, and the relevance of crude oil on many listed companies, I would like to briefly discuss how the oil industry is structured.

11.2 – Upstream, Downstream, and Midstream

A note of warning here – I'm no oil and gas expert; my knowledge is limited to just the basics. As a crude oil trader, I do think it is extremely important to know the industry dynamics simply because the trading opportunities may not always be presented to you directly. For example, there could be some fundamental change brewing in crude oil, it may not manifest into a trade in crude oil directly, but instead a trade opportunity may come about in the downstream companies. For you to benefit from this, it

becomes imperative to know the layout of the industry and identify areas of opportunity. My objective here is to familiarize you with the industry layout and help you map companies and how they fit into the overall oil and gas ecosystem.

So let us get started.

The oil and gas industry can be segregated into three sections –

1. The upstream industry
2. The downstream industry
3. The midstream industry

Let us briefly discuss each one of the starting from the upstream companies.



Upstream companies

The upstream companies are the ones that do the dirty work – they take on geological surveys, dig up bore wells to get a sense of what's in the ground underneath, and if they find oil reserves, they then begin the drilling and extraction of crude oil. It takes many years for upstream companies to identify an asset (potential oil well) and convert it into a fully functional, profitable oil well. Upstream companies manufacture and store crude oil in barrels (millions of barrels are produced every day). These companies do R&D and engineering, and are asset heavy. Therefore, they end up spending a lot of money (read as capital expenditure) to extract oil.

However, the price at which they can sell this oil in the open market is not really in their control. The price is determined by the markets in which market participants like you and I participate and influence the international oil price. Every upstream company has a breakeven point – defined as the cost of producing one barrel of oil. The breakeven point is also referred to as the ‘full cycle cost’. Naturally, these companies would strive hard to keep their costs low and bring down the full cycle cost.

Companies such as ONGC, Carin India, Reliance Industries, Oil India are some of the Indian upstream companies. Internationally companies such as Shell, BP, Chevron etc., fall in this category.

The key point to note here is that low oil prices do not really favor upstream companies in general, especially the ones which have high economies of scale (the ones which have high full cost cycle). Obviously, higher oil price is good for these companies as their efforts to extract oil remain the same, but margins improve drastically.



Downstream companies

We will talk about the **downstream industry** first, and then discuss the mid stream industry. Generally speaking, the job of the upstream companies ends at producing crude oil. ‘Crude oil’ as you realize is produced in its raw form. If we have to use it as petrol or diesel, then the crude oil has to be refined. This is where the downstream industry comes into the picture. These companies purchase the crude oil from upstream companies and refine the crude oil to various forms such as – petrol, diesel,

aviation fuel, marine oil, kerosene, lubricants, waxes, asphalts, liquefied petroleum gas etc.,

Companies in this sector also go the extent of distributing these products across the value chain, right from business to business (B2B distribution) to business to consumer (B2C) distribution. In fact, petrol bunks are a good example of this phenomenon. Petrol bunks are nothing but a retail outlet, retailing petroleum products and owned by downstream companies.

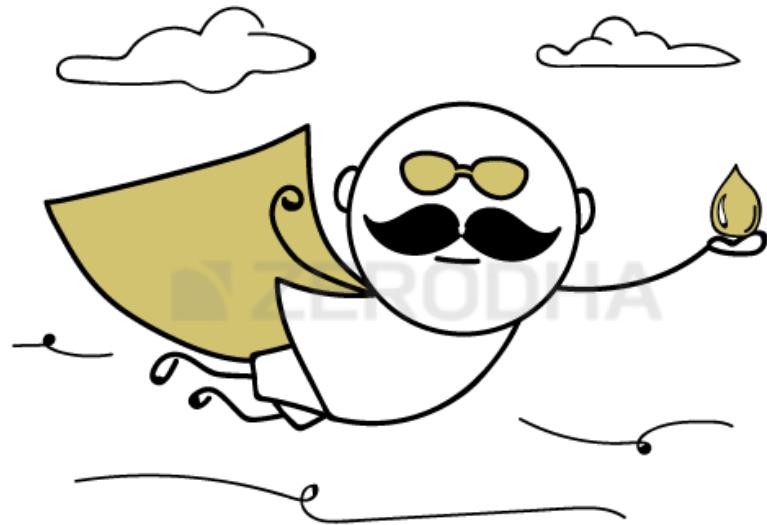
Good examples of downstream companies in the Indian context are – BPCL, HPCL, IOC etc. Some companies try and integrate and operate across the value chain i.e., they try and do both upstream and downstream operations. Companies that successfully combine these operations are often referred to as the ‘Super Major’. Classic example of this is the US based ‘Exxon Mobil Corp’. They produce close to 4 million oil barrels per day and operate around 40 oil refineries across 21 countries. An operation of this scale is a mammoth management and operational undertaking; clearly not everybody’s cup of tea.

So, if the oil prices cool off, then it implies that the downstream companies can buy oil at cheaper prices from the upstream company (which is not so good for upstream boys as their efforts to produce oil is still the same). However, the benefit of lower oil price is not passed on to the end user i.e. you and me, but in developed countries like US and UK, this benefit is passed on to the end users quite quickly.

Anyway, here is what you need to remember at this stage –

- Upstream and downstream companies share a see-saw relationship
- Low oil prices are bad for the upstream boys but good for the downstream fellows
- Higher oil price is good for upstream fellows but bad for downstream boys.

So the next time you see oil prices going down, don’t be in a hurry to short ONGC or BPCL. Take a minute to understand whether the company is downstream or upstream company, and analyse the impact of oil prices on the company.



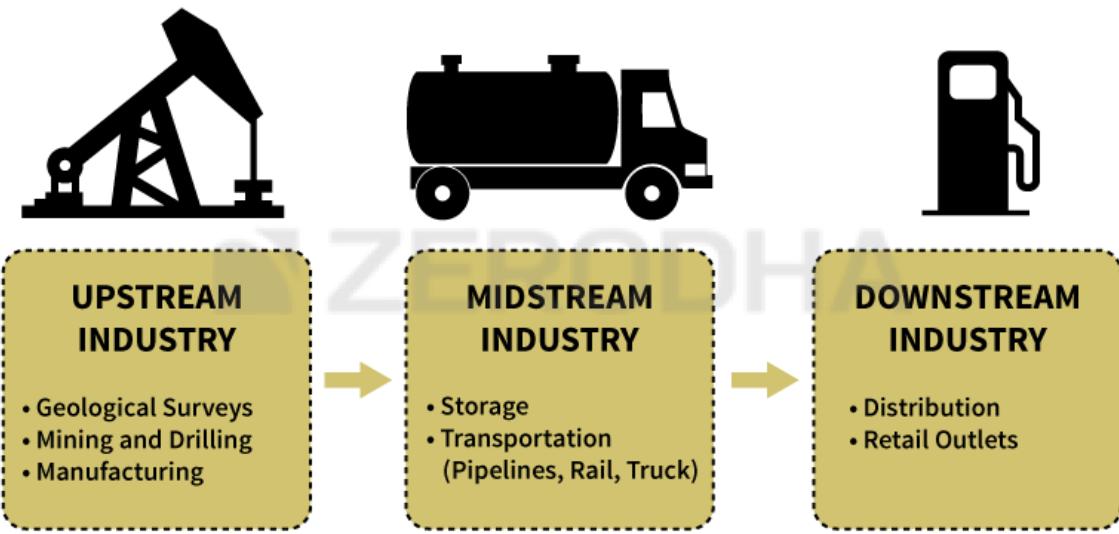
Midstream companies

We will quickly discuss the **midstream companies** before looking into other aspects.

In very loose terms, midstream companies are the ones act as a courier between the upstream and downstream companies. They are responsible for the transport of oil from the oil well to the refineries. They do this via pipelines, road transportation (oil takers), and by ocean shipments. Consider them as the wholesalers of crude oil. Some midstream companies try to deliver more on the value chain by refining the crude oil to some extent, hence their operations sometimes overlap with downstream companies. Since midstream companies deal with both up and downstream companies, they are kind of caught in the middle, they neither want oil prices to increase or decrease, but seek stability in oil prices. If oil price decreases, then upstream companies are affected, this is not good for them. Likewise, if the prices increase downstream companies are affected, this is again not so great for them.

Some of the top players in this segment are TransCanada, Spectra Energy, Williams and Company etc.

Here is a snapshot which gives you a quick overview of all the three industries –



11.2 – Difference between WTI Crude and Brent

Many people tend to speak about ‘Crude Oil’ like as if it is a single uniform entity, something like Gold. However, this is not true. Did you know there are many varieties of crude oil which can be extracted from the ground below? The difference comes in mainly from the geographic variation and its unique characteristics. The impact of geography is so much that the characteristics of crude oil, right from thickness, colour (light yellow, golden yellow, deep black), viscosity, sulfur content, volatility etc., change drastically.

Given this, naturally, there are many different types of Crude oil. I’ll not get into details of the many different types of oil – not that I don’t want to, it’s simply because I don’t know them myself J. I know the basic difference between to West Texas Intermediate (WTI) and Brent Blend, which is what matters to most of the crude oil traders and hence we will stick to it.

Before we get into the difference between the two, let us touch upon two distinct characteristics of crude oil, which basically define the variation of crude.

API Gravity – API here stands for ‘American Petroleum Institute’, which is essentially a metric to compare the lightness of crude oil with that of water. If the ‘API Gravity’ of a particular variety of oil is higher than 10, it simply indicates that the oil is lighter than water, therefore the oil can float on water. API gravity less than 10 indicates that the oil is heavier than water; hence the oil will sink in water.

Sweetness – Crude oil of any form will naturally contain sulfur. The lesser the content (I was told sub 0.5%) the ‘sweeter’ the oil is considered. Higher the content of sulfur, then the oil is not considered ‘not so sweet’.

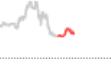
The difference between WTI and Brent mainly comes from the API Gravity and its sweetness.

West Texas Intermediate (WTI) – This is considered a very superior quality of crude, hence the final refined products are also meant to be of superior quality. The API gravity is 39.6 (recall higher than 10, then it’s lighter than water) therefore WTI is considered super light. Further, the sulfur content is just 0.26 percent, making it a very sweet crude oil

Brent Blend – Much like blended scotch, crude oil can also be blended to create variants with certain properties. Apparently, the Brent blend is created by blending oil from over 15 oil wells. Brent has a sulfur content of 0.37%, which makes it sweet, but not as sweet as WTI. The API gravity is around 38.06, which makes Brent quite ‘light’.

Clearly, due to the variation in the characteristics, the two are traded at different prices. Have a look at the price quote for these two variants –

Energy

INDEX	UNITS	PRICE	CHANGE	%CHANGE	CONTRACT	TIME (EST)	2 DAY
CL1:COM WTI Crude Oil (Nymex)	USD/bbl.	44.93	-0.49	-1.08%	Dec 2016	2:11 AM	
CO1:COM Brent Crude (ICE)	USD/bbl.	46.13	-0.36	-0.77%	Jan 2017	2:12 AM	

Source: Bloomberg

Brent crude is priced higher compared to WTI. Most importantly, you need to know that crude oil traded on MCX follows the Brent crude and not WTI. In fact, Brent crude is the benchmark for International crude oil pricing.

11.3 – Crude oil inventory levels

Supply-demand effects crude oil prices and therefore the profitability of many companies linked at various points in the oil and gas eco-system. This makes tracking

the inventory levels of crude oil prices important on several counts. You can use this information to trade not just crude at MCX, but also set up trades on companies such as BPCL, HPCL, IOC, ONGC etc.

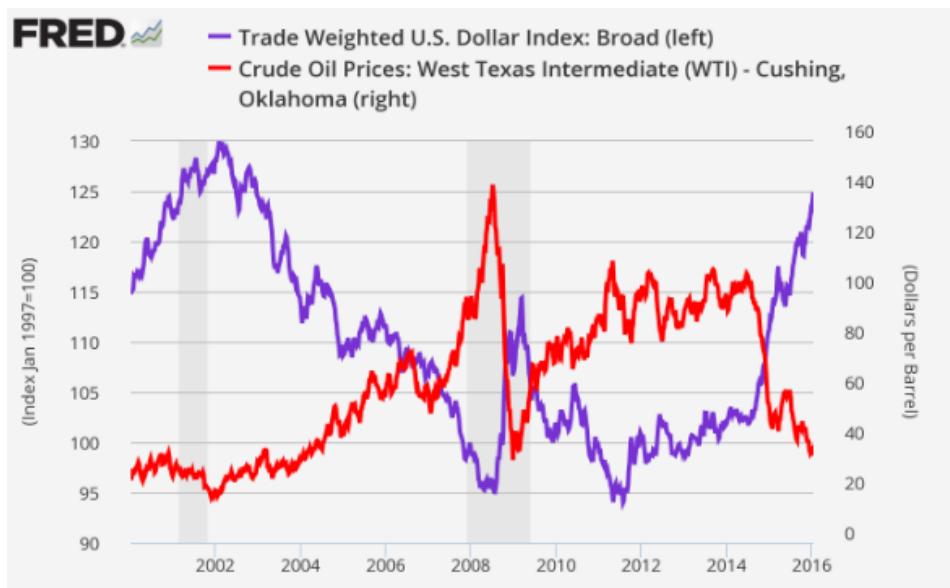
There are two organizations which put out the inventory details –

1. **US Energy Information Administration (US EIA)** – They report the inventory levels on a weekly basis. You can track the [information here](#). Remember inventories tend to increase when the demand is low or there is an oversupply, either which way, it is bad for oil prices, and hence the upstream companies. Likewise, lower inventories mean either there is a lot of demand or there is a cut in production, both ways it's good for crude prices and upstream companies.
2. **OECD Crude Oil inventory** – OECD stands for ‘Organization of Economic Co-operation and Development’. OECD also gives out crude oil inventory (but not at a weekly forecast like EIA). You can track the inventory position on [OECD’s website](#).

11.4 – The relationship between US Dollar and Crude Oil

The crude oil and US Dollar share an inverse relationship with each other. A strengthening US Dollar tends to drive the price of crude oil down. Likewise, weakening USD tends to drive the prices of crude oil higher. At this point it is very important to note that both these assets have their own supply demand dynamics influencing their price movement; however, they are also somewhat linked to one another.

If you do an image search for ‘Crude Oil versus Dollar’, you will find many charts which display this inverse relationship. Here is one for example –



The interesting thing to note here is, the dollar used in these charts is not the “USD Dollar Spot” but instead the ‘Dollar index’, which is a representation of dollar against major world currencies. This makes absolute sense as crude oil is an international currency priced in dollars, therefore irrespective of who is buying crude oil, payments happen in US dollars.

Given this, if the Dollar increases (for whatever reasons), then countries tend to purchase more oil for the same level of dollar (more oil can be purchased for the same dollar level). This leads to quicker depletion of inventory levels, therefore the price of oil increases.

The argument above is generally true over long time periods. However, please do remember that both these assets have their own fundamental dynamics playing. So there could be instances where both of them may break their inverse correlation and head in same direction.

Also, remember the inverse correlation only suggests that the two assets move in opposite direction but does not say anything in magnitude. So for example if the dollar declines 10%, this does not imply that the Crude oil will increase 10%.

In the next chapter, we will discuss the contract specification of Crude oil on MCX.

CHAPTER 12

Crude Oil (Part 3), the crude oil contract

12.1 – The contract

Crude oil is the most actively traded commodity on MCX. The combined value of crude oil (across all contracts) traded on MCX, on average, exceeds Rupees 3000 crores on a daily basis. This translates to roughly 8500 barrels of crude oil traded daily. Active market participation in crude oil comes in from both corporate and retail individual traders. On any given day, you can expect both upstream companies (ONGC, CAIRN, Reliance) and downstream companies (IOC, BPCL, HPCL) placing orders on MCX. If I were to guess, these institutional orders are mainly to hedge their exposure in the spot (physical) market. On the other hand, the retail traders mostly speculate on the crude oil prices.

I'd encourage you to check the [**MCX ‘Bhav Copy’**](#). This gives you a perspective on a particular contract's liquidity and volume.

There are two main Crude oil contracts which are traded on the MCX –

1. Crude Oil (the big crude or the main contract)
2. Crude Oil Mini (the baby version)

In this chapter, we will learn how these contracts are structured – right from expiry to margins to P&L per tick.



12.2 – Crude Oil, the big contract

With an average daily traded value of Rupees 2500 Cr, the big crude oil contract is certainly one of the biggest contracts (value wise) that gets traded on MCX. Without wasting much time, let's get straight to the contract details of the big crude.

The contract details are as follows –

- Price Quote – Per barrel
- Lot size – 100 barrels
- Tick Size – Rs.1/-
- P&L per tick – Rs.100/-
- Expiry -19/20th of every month
- Delivery units – 50,000 barrels
- Physical Delivery – Mumbai / JNPT Port

Let's understand this information in better detail. The crude oil on MCX is quoted on a per barrel basis (one barrel is equal to 42 gallons or about 159 liters). Have a look at the image below; this is the snap shot of Crude oil's market depth –

CRUDEOIL DEC FUT MCX				-1.72 %	▼	3197.00
BIDS			OFFERS			
PRICE	ORDERS	QTY.	PRICE	ORDERS	QTY.	
3197.00	12	98	3198.00	5	7	
3196.00	9	77	3199.00	19	123	
3195.00	16	67	3200.00	44	108	
3194.00	6	28	3201.00	10	38	
3193.00	9	51	3202.00	26	114	
Total		2,395	Total		3,907	
EXPIRY	2016-12-19		VOL. TRADED	60,386		
O	3255.00	H 3255.00	L	3176.00	C 3253.00	

As you can see, the Crude Oil contract expiring on 19th Dec 2016 is trading at Rs.3197/- per barrel, quite obviously as we know price quote is **on a per barrel basis**.

The **lot size is 100 barrels**, which means to say that if you want to buy (or go long) on crude oil, the value of such a contract will be –

Lot size * price quote

= 100 * 3198 (offer price to go long)

= **Rs. 319,800/-**

This is the contract value of the crude oil, but what about the margins? Unlike the margins on other commodities, the margin on crude oil is slightly higher. If you wish to carry the position forward overnight, then the margin requirement is roughly 9%.

This means, 1 lot of crude oil (100 barrels) requires a margin deposit of –

9% * 319800

= **Rs. 28,782/-**

In fact, you can use the [margin calculator](#) on Zerodha's website to get a ready reference of approximate margin requirement. Here is the snap shot of the same –

#	Commodity	Lot size	Price	NRML Margin	MIS Margin
8	CRUDEOIL	100 BBL	3253	29114	14557
9	CRUDEOILM	10 BBL	3251	2912	1456

The margin requirement under NRLM (for overnight position) is Rs. 29,114/-, assuming the price of Crude is Rs. 3,253/-. However, if you wish to make an intraday trade using MIS, then the margin requirement is roughly 4.5%. Clearly, as you can see from the snapshot above, margin under MIS is just Rs. 14,557/-.

12.3 – Selecting the right contract to trade (expiry logic)

New crude oil contracts are launched every month. The newly introduced crude oil contracts have an expiry scheduled six months later. For example, the contract introduced in November 2016, will have its expiry in 6 months i.e., May 2017. MCX puts up this information regularly in their circulars, but I find it a little confusing to interpret the expiry table. Here is what MCX intends to convey –

Current month	Contract Introduced	Expiry on
November 2016	May 2017	19 th May
December 2016	June 2017	19 th June
January 2017	July 2017	19 th July
February 2017	August 2017	21 st August
March 2017	September 2017	19 th September
April 2017	October 2017	18 th October
May 2017	November 2017	17 th November

And this is how the table in the circular reads –

Contract Launch Calendar of Crude Oil

Contract Month	Contract Launch Date	Contract Expiry Date
January 2017	20 th July 2016	19 th January 2017
February 2017	22 nd August 2016	17 th February 2017
March 2017	20 th September 2016	20 th March 2017
April 2017	20 th October 2016	19 th April 2017
May 2017	21 st November 2016	19 th May 2017
June 2017	20 th December 2016	19 th June 2017
July 2017	20 th January 2017	19 th July 2017
August 2017	20 th February 2017	21 st August 2017
September 2017	21 st March 2017	19 th September 2017
October 2017	20 th April 2017	18 th October 2017
November 2017	22 nd May 2017	17 th November 2017
December 2017	20 th June 2017	18 th December 2017

So, as I write this, its November 2016, which means to say the November 2016 contract must have been introduced in May 2016.

Anyway, the point to note here is this –

1. Every month a new contract, 6 months in advance is launched (long dated contracts).
2. These contracts expire on or around 19th of the expiry month, 6 months later.
3. Given this, each contract lasts for 6 months in the market.

For active trading, always choose the near month contract. Now, assuming today is November 5th 2016, I'd choose the November 2016 contract expiring on 19th November to trade. Maybe around 15th or 16th November (as we progress closer to expiry), I'd shift to the December 2016 contract. The reason for this is simple. Liquidity is highest for the current month contract (November 2016 in this example). Liquidity picks up in the next month's contract (i.e. December 2016) as we move closer to the expiry of current month's contract.

All the other contracts, even though exist in the market, pretty much lead a meaningless life, until they become current.

12.3 – The Crude Oil Mini contract

The Crude Oil mini is quite a favourite amongst the trading community. The reason for this is straightforward –

1. The margin required is lesser
2. The P&L per tick is lot lesser – *did you know people prefer to see lesser loss than seeing higher profits?*

Here are the contract details –

- Price Quote – Per barrel
- Lot size – 10 barrels
- Tick Size – Rs.1/-
- P&L per tick – Rs.10/-
- Expiry -19/20th of every month
- Delivery units – 50,000 barrels
- Physical Delivery – Mumbai / JNPT Port

Have a look at the quote below –

CRUDEOILM DEC FUT MCX				+3.12 %	3210.00
BIDS			OFFERS		
PRICE	ORDERS	QTY.	PRICE	ORDERS	QTY.
3210.00	1	1	3211.00	11	89
3209.00	6	105	3212.00	8	26
3208.00	9	160	3213.00	5	23
3207.00	4	83	3214.00	12	32
3206.00	3	53	3215.00	20	54
Total		10,448	Total		2,478
EXPIRY	2016-12-19		VOL. TRADED	88,728	
O	3125.00	H 3230.00	L	3125.00	C 3113.00

The Crude Oil Mini, December future is trading at Rupees 3,210/- per barrel. The contract value for this would be –

Rs. 3,210 * 10

= Rs. 32,100/-

The margin required in percentage terms is little higher – around 9.5% for NRML and 4.8% for MIS.

This puts the margin requirement for NRML at Rs. 3,049/- and Rs. 1,540/- for MIS. Clearly, way lower compared to the margin required for the big Crude oil.

Except for lot size, and therefore the margins, the other remaining features don't change for both the crude oil contract contracts.

12.4 – Crude Oil Arbitrage

Have a look at the image below –

CRUDEOIL DEC FUT MCX				+3.47 %	▼	3221.00
BIDS			OFFERS			
PRICE	ORDERS	QTY.	PRICE	ORDERS	QTY.	
3221.00	1	1	3222.00	11	93	
3220.00	9	71	3223.00	7	84	
3219.00	5	51	3224.00	8	51	
3218.00	7	47	3225.00	36	110	
3217.00	4	25	3226.00	12	23	
Total		4,864	Total		1,518	
EXPIRY	2016-12-19		VOL. TRADED	73,529		
O	3135.00	H 3232.00	L	3128.00	C 3113.00	
CRUDEOILM DEC FUT MCX				+3.47 %	▲	3221.00
BIDS			OFFERS			
PRICE	ORDERS	QTY.	PRICE	ORDERS	QTY.	
3221.00	1	1	3222.00	9	151	
3220.00	9	53	3223.00	3	59	
3219.00	10	24	3224.00	11	78	
3218.00	5	67	3225.00	80	202	
3217.00	3	56	3226.00	16	79	
Total		11,838	Total		2,835	
EXPIRY	2016-12-19		VOL. TRADED	1,00,439		

The first part of the snapshot captures Crude Oil December future (big crude contract) along with its market depth. The second part of the snapshot captures the Crude Oil Mini December contract along with its market depth.

All else equal, both these contracts at the same time should trade at the same price. They are not supposed to trade at different prices, since the underlying is the same. In fact, this is what we notice here – both Crude oil contracts trade at Rs. 3,221/-.

But, what if they don't?

Let's say, for whatever reason, both these contracts trade at different prices? For example, Crude Oil is trading at Rs. 3,221/- and the Crude Oil Mini is trading at Rs. 3,217/-. Do we have a trading opportunity here? Yes, of course, we do have an arbitrage opportunity here, and here is how we can trade this.

Crude Oil – 3221

Crude Oil Mini = 3217

Risk free profit potential (arbitrage) = 3221 - 3217 = 4 points

Trade Setup –

We know the rule of thumb in any arbitrage trade – always buy the cheaper asset and sell the expensive one. So in this case –

We buy the crude oil mini at 3217 and sell the crude oil at 3221. However, please note, for a perfect arbitrage opportunity, we should always trade similar values.

The contract value of Crude oil is – 3221 * 100 = Rs. 3,22,100/-

The contract value of Crude oil mini is 3217 * 10 = Rs. 32,170/-

Given this, one should buy 10 lots of Crude oil mini at 3217 and sell 1 lot of crude oil at 3221. By doing so, the contract sizes are similar and therefore the arbitrage holds.

Once we execute this trade (efficiently), the arbitrage profit is locked in. Remember, in all arbitrage cases, the price will converge to a single price point. So assume the price finally converges to 3230 –

We make +13 points on the crude oil mini and we lose -9 points on crude oil, and on a net basis we make 4 points.

In fact, irrespective of where the price heads the 4 points are guaranteed.

It is unlikely you will find such sweet opportunities on a daily basis, and even if you do, algorithms grab them. However, I have occasionally witnessed such opportunities lasting for several minutes.

So do watch out for such trading opportunities, and if it indeed comes by, you know what to do.

This brings us to the end of our conversation on Crude Oil. Over the next few chapters, we will focus our attention towards ‘Metals’.

Key takeaways from this chapter

1. There are two crude oil contracts available – Crude Oil and Crude Oil mini
2. Both the contracts vary in the lot size. Lot size of the big crude is 100 barrels while the crude mini’s lot size is 10 barrels.
3. Price quote is on a per barrel basis
4. Every month new crude oil contracts are introduced which expire 6 months later.
5. Expiry is on 19th of every month.
6. The current month contract attracts maximum liquidity.
7. Arbitrage between the two crude contracts can be executed – but one has to ensure contract values are similar.

CHAPTER 13

Copper & Aluminium

13.1 – Sumitomo Copper scandal

If you are remotely connected to the commodity world, then this is one story you must have heard of – ‘The Sumitomo Copper Scandal’. This scandal unfolded in Japan, around 1995, but the severity of this event sent a ripple down the spine of entire commodity trading world. So much so, that it’s talked about even today and it gets a special mention whenever the financial world talks about ‘rouge trading’.

Sumitomo Corporation is a huge conglomerate, incorporated and listed in Japan. The company is involved in general trading of goods and commodities. Back in the days, Sumitomo had a significant copper trading division. Sumitomo’s copper trading involved buying of copper in spot market and physically storing them in its warehouses. The company also had a large exposure to copper futures on the London Metals Exchange (LME). Yasuo Hamanaka, was Sumitomo’s chief ‘Copper Trader’. He was Sumitomo’s go-to man for anything related to Copper.



So here is what happened –

- Yasuo Hamanaka bought copper in physical form (spot market) and hoarded them in warehouses.
- He bought copper not just in Japan, but across the world and stored it at different locations/ports.
- Essentially, he was long copper in the spot market.
- His exposure in the spot market was around 5% of the entire world's outstanding reserves. At that point, he was probably the only man on the planet with so much copper. This meant he could control the prices of copper, quite literally.
- At the same time, he also bought Copper Futures at LME.
- Every trader knew that Yasuo Hamanaka was copper bull, but nobody knew the extent of his exposure (as LME wasn't publishing open interest data at the time).
- Whenever traders or trading firms shorted copper, Hamanaka would buy. He could buy because Sumitomo was cash rich and funded these trades.
- Since he bought in such large quantities, copper prices went up.
- Remember, copper is an international commodity and the price is market driven (LME futures).
- So LME prices went up – short traders were squeezed, Hamanaka made profits on futures.
- Short traders would eventually default, which meant they had to deliver copper upon expiry.
- Invariably these traders would end up buying copper from Sumitomo at a premium, which meant Sumitomo minted crisp profits on their spot position as well.
- The profits snowballed and Yasuo Hamanaka became the undisputed king of copper.

This set up functioned really well for over a decade. However, sometime around early 90s, China upped their copper production, to an extent where they flooded the market with excess supply. Naturally, the prices started to cool off and Yasuo Hamanaka started feeling the heat. His exposure was so large that it was difficult for him to off load the contracts (especially since he was doing most of the buying)! He went to the extent of borrowing funds to maintain his long positions. Remember, these were all leveraged positions, and when you have super large quantities of any leveraged positions, a small move against you can result in massive losses.

This is exactly what happened – copper prices crashed and Yasuo Hamanaka's copper kingdom collapsed. Losses piled to an extent that the Sumitomo Corporation filed for bankruptcy. The estimated losses were close to a whopping \$5 billion, in 1995!

What followed next were the routine blame games, law suits, denials, and all the resulting drama. However, the key take away from this story is the importance of **risk management**. We will talk about this soon in a separate module all together.

Anyway, that was that; let's move ahead to copper basics.

13.2 – Copper Basics

Copper is a base metal, highly traded on MCX. A metal is classified as a 'base' if it is not precious like gold and silver.

The daily traded value is approximated at INR 2,050 crores across an average of 55,000 lots. So, as you can imagine, copper on MCX is a very liquid contract. The liquidity matches that of crude oil and gold.

Copper is a very interesting metal. It is the 3rd most consumed metal after steel and aluminium. The price of copper (much like aluminium) is directly dependent on global economics. You may know, copper is one of the best conductors of electricity, and therefore, copper is the preferred choice of metal in electrical wires. In fact, did you know, at the core of Tesla's hybrid car there is a copper motor as opposed a regular engine motor (permanent magnet motor)?

Check this [article](#).

Of course, apart from this, copper finds its application in a whole host of other things such as –

- Building and construction
- Copper alloy molds
- Electrical and electronics
- Plumbing solutions
- Industrial uses
- Telecom

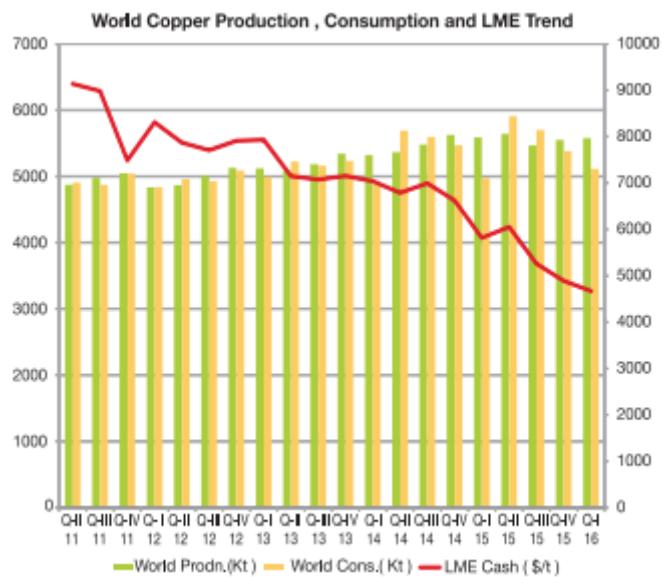
- o Railways

But my favourite application of copper has to be this –



Can you guess what this is? If you can, then probably you and I have a common interest.

The demand – consumption of copper showcases similar trends as aluminium. Have a look at this snapshot –



Source: Hindalco annual Report (2015-16)

In 2015, the global demand for refined copper was 24 million tons; half of this demand was from China and Japan. The supply was higher than the demand (look at the last two bars from right), and thanks to the recent commodity glut, the price has considerably cooled off over the last few years.

It's good to know basic fundamentals, but like any other commodity; I'd rely on charts to trade copper. Given this, let's focus on the contract specifications. Of course, both aluminium and copper have two contracts – the big copper contract and its mini version. Let me list down the contract specs of the big copper contract.

- Price Quote – Per kilogram
- Lot size – 1 metric ton
- Tick size – Rs.0.05
- P&L per tick – $\text{Rs.}0.05 * 1000 = \text{Rs.}50/-$
- Expiry –Last day of the month
- Delivery units – 10 MT

Here is the snap quote of copper, expiring in Feb 2017 –

COPPER 17FEB FUT MCX				-0.13 %		389.10
BIDS			OFFERS			
PRICE	ORDERS	QTY.	PRICE	ORDERS	QTY.	
389.10	1	5	389.15	4	12	
389.05	2	3	389.20	7	31	
389.00	9	19	389.25	2	9	
388.95	3	7	389.30	3	8	
388.90	8	30	389.35	2	27	
Total		2,059	Total		2,643	
EXPIRY	%2017-02-28		VOL. TRADED	15,170		
O 391.50	H 393.65		L 388.75	C 389.60		

The price as seen here is Rs.389.1 per Kg. The contract value therefore would be –

Lot size * price

$$= 1000 * 389.1$$

$$= \mathbf{Rs. 389,100/-}$$

The NRML margin is as shown below –

COPPER	1 MT	389.6	30544	15272
COPPERM	250 KGS	389.55	7674	3837

Rs. 30,544/-, which works out to 7.8%. MIS margin is half this amount.

The Copper Mini contract has a lesser lot size, therefore lesser P&L per tick, and lesser margins.

- Price Quote – Per kilogram
- Lot size – 250 Kgs
- Tick size – Rs.0.05
- P&L per tick – $\text{Rs.}0.05 * 250 = \text{Rs.}12.5/-$
- Expiry –Last day of the month
- Delivery units – 10 MT

I'd suggest you look at technical analysis to trade copper, and commodities in general. They work really well on liquid commodities such as copper. So essentially, you just need to know the contract details to get started.

Onwards to Aluminium!

13.3 – Aluminium Basics

Remember, our objective here is to understand basic information. We are not going deep into the subject, simply because most of us would be trading this commodity with an average holding period of not more than 2-3 days. When this is the objective, it makes more sense to spend time on the price dynamics rather than the fundamentals. Hence, I'll stick to basics, and for ease of reading, highlights of the chapter are presented as bullet points. Post this; we will dig deeper into contract specifications.

Talk about Aluminium and chances are you will think about that wafer thin, silvery foil, which wraps your leftover food in your refrigerator. Well, Aluminium's applications go beyond that.

Here are few things you need to know (have collected this information from various online sources) –

1. There is plenty of Aluminium (supply is not an issue) – roughly 8% of the earth's crust is made up of Aluminium. This makes aluminium the third most abundant, after oxygen and silicon.
2. The fact that aluminium resists corrosion makes it a very desirable metal
3. Aluminium manufacturing is power intensive – it takes a whopping 17.4 megawatt hour of power to manufacture 1 metric ton of Aluminium. Check this –

CONSOLIDATED STATEMENT OF PROFIT AND LOSS FOR THE YEAR ENDED 31ST MARCH, 2016

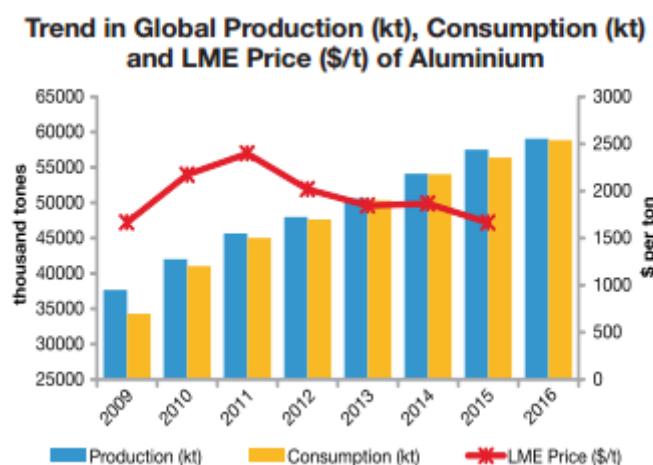
	<u>Note No.</u>	<u>Year ended 31/03/2016</u>	<u>(₹ crore) Year ended 31/03/2015</u>
INCOME			
Revenue from Operations:		'27'	
Gross Revenue from Operations		102,84.77	106,695.56
Less: Excise Duty		2,442.61	2,414.46
Net Revenue from Operations		100,042.16	104,281.10
Other Income	'28'	1,215.30	1,104.74
Total Income		101,257.46	105,385.84
EXPENSES			
Purchases of Stock-in-Trade		1.48	36.55
Cost of Materials Consumed	'29'	58,100.95	66,133.05
Changes in Inventories of Finished Goods, Work-in-Progress and Stock-in-Trade	'30'	1,285.22	(1,237.89)
Employee Benefits Expenses	'31'	8,238.34	7,991.23
Power and Fuel	'32'	9,316.92	8,378.56
Finance Costs	'33'	5,048.94	4,178.42
Depreciation and Amortization	'34'	4,126.56	3,493.38
Impairment Loss/(Reversal) (Net)	'35'	160.63	97.18
Other Expenses	'36'	14,307.72	14,035.03
Total Expenses		100,586.76	103,105.51

This is power and fuel cost of Hindalco (leading manufacturer of Aluminium), and as you can see nearly 10% of the expense is on power and fuel. Remember, Hindalco has its own captive power units. So, I'm guessing this power is consumed over and above what Hindalco generated internally

1. That said, recycling aluminium is a power friendly affair. It requires just about 5% of the power to recycle.
2. Aluminium has a wide range of applications – right from a smart phone to a Boeing 747. Did you know you need approximately 70,000 kilograms of aluminium is used up in a single Boeing 747?

3. Aluminium is also used up in other industries – automotive, building & construction, defense, electrical, electronic, pharmaceuticals, white goods, etc.,
4. Aluminium is one metal that has abundant supply and demand.
5. Aluminium prices on MCX closely follow the international prices of aluminium which is traded on the London Metal Exchange (LME).

In fact, here is a snapshot which gives you the trends in production, supply, and average price of aluminium on LME –



Source: Hindalco Annual Report (2015-2016)

This is a very interesting chart; in fact, based on this chart alone, a few basic trading principles can be formulated. Let's break this graph up in smaller bits –

1. The global production (blue bar) of aluminium in 2015 stands at 56 million tonnes. This represents a growth of about 4% from the previous year.
2. The global production nets a CAGR of 6% over the last 8 years.
3. The demand (yellow bar) on the other side matches up to the global production – this implies that there are no supply-demand disruptions.
4. In fact, the demand and the supply have remained more or less stable over the years.
5. The price of aluminium over the last few years has declined. Its averages to \$1,500/- per ton, which is a decline from its recent peak of \$2,500/- per ton. You must have heard about the global commodity glut. Clearly, the Chinese demand plays a key role to the aluminium's global pricing

6. The Indian demand on the other hand is better than the global demand (in percentage terms). Hindalco, in its annual report claims the demand for aluminium in India is about 2 million tonnes. Much of this demand is met by importing aluminium.

I guess these basic points should help you get started on Aluminium fundamentals. However, I'd be happy to trade aluminium based on technical analysis, simply because of my short holding period, usually not exceeding few trading sessions.

So, with this, I'd like to move ahead and discuss contract specifications, which will help you understand the practicality of trading aluminium on MCX.

13.4 – Aluminium contract specifications

As you may have guessed, there are two main aluminium contracts to trade on MCX. They are the big aluminium contract and the aluminium mini contract. Clearly, both of them differ on the lot size and therefore contract value. We will discuss the big aluminium contract first.

The daily average traded value of big aluminium is roughly about INR 375 Cr. On a good day, the volume could reach a little over INR 500 crores. As you may have realized, the value is not as high as commodities such as gold and crude oil.

The contract details are as follows –

- Price Quote – Per kilogram
- Lot size – 5 metric ton

At this point you may have realized that this is a huge contract. A metric ton is 1000 kilograms, so 5MT makes it 5000 kgs. Since the price is quote per kg, and the lot size is 5000 kgs, each tick will cause a P&L of Rs.5000/- PROVIDED the tick is Rs.1/-. Since this would be very large, especially for retail trading, MCX has reduced the tick size to the lowest possible value i.e. Rs.0.05

- Tick size – Rs.0.05
- P&L per tick – $\text{Rs.}0.05 * 5000 = \text{Rs.}250/-$
- Expiry – Last day of the month
- Delivery units – 10 MT

Let's understand this information in better detail. Aluminium on MCX is quoted on a per kilogram basis. Have a look at the image below; this is the snap shot of Crude oil's market depth –

ALUMINIUM DEC FUT MCX		+0.42 %		118.40	
BIDS			OFFERS		
PRICE	ORDERS	QTY.	PRICE	ORDERS	QTY.
118.35	2	2	118.40	1	1
118.30	10	14	118.45	11	22
118.25	8	20	118.50	6	9
118.20	12	43	118.55	12	42
118.15	6	7	118.60	6	13
Total		543	Total		383
EXPIRY	%2016-12-30		VOL. TRADED	1,051	
O 117.85	H 118.60		L 117.85	C 117.90	

As you can see, the aluminium expiring in Dec 2016 is trading at Rs.118.4/- per kg/

The **lot size is 5 MT (5000 kgs)**, which means to say that if you want to buy (or go long) on Aluminium, the value of such a contract will be –

Lot size * price quote

= $5000 * 118.4$ (offer price to go long)

= **Rs. 592,000/-**

The price movement in aluminium is 0.05, which means, if aluminium moves from 118.4 to 118.45, the profit will be –

$118.45 - 118.4$

= 0.05

= $0.05 * 5000$

= Rs.250/-

What about the margins? Have a look at the following snapshot –

Zerodha is among select few brokerages to not levy the additional 5% special margin and hence has the lowest margin(NRML) requirement for trading futures for overnight/positional.

Last updated: 15 Dec 2016

[Commodity margin \(PDF\)](#)

#	Commodity	Lot size	Price	NRML Margin	MIS Margin	
1	ALUMINI	1 MT	117.9	6779	3389	CALCULATE
2	ALUMINIUM	5 MT	117.9	33719	16859	CALCULATE

The NRML margin charged is Rs. 33,719/- which works out to 5.6%. However, MIS margin is almost half of NRML margin.

Here are the contract details of Aluminium mini –

- Price Quote – Per kilogram
- Lot size – 1 metric ton
- Tick size – Rs.0.05
- P&L per tick – $\text{Rs.}0.05 * 1000 = \text{Rs.}50/-$
- Expiry –Last day of the month
- Delivery units – 10 MT

The contract value is quite small –

$$= 1000 * 118.4$$

$$=\text{Rs. }118,400/-$$

NRML margin is Rs. 6,779/-, which is 5.7%. MIS margin is much lesser at Rs. 3,389 or just about 2.8% of the contract value.

P&L per tick is Rs.50/-, a value which is much ‘deal-able’ while trading.

I guess, this info is good enough to get started on trading with Aluminium. Frankly, you just need to look at the chart, develop a point of view, and place trades based on the chart pattern. If you are keen on digging deeper into aluminium I’d recommend you spend time reading up on www.world-aluminium.org and www.aluminium.org.

Key takeaways from this chapter

1. Both Copper and Aluminium are base metals.
2. Aluminium is found in abundance (next only to silicon and oxygen).
3. The demand-consumption of aluminium and copper seem to have some sort of equilibrium.
4. The prices of both aluminium and copper have declined over the years.
5. The prices of aluminium and copper on the London Metal Exchange (LME) act as a reference price for these international commodities.
6. Both copper and aluminium have two contracts – the big one and mini.
7. The contracts vary in lot size and therefore contract values and margins.

CHAPTER 14

Lead & Nickel



14.1 – Lead – some history, some basis.

Would you believe, if I said that ‘Lead’, as in the metal Lead, played a role in bringing down the Roman Empire? Not Gold nor Silver, not diamonds or rubies – but lead, which is found in abundance.

Don’t worry; I don’t intend to make this a history lesson! However, lead and the Roman Empire are somewhat related, and I’d like to take this opportunity to share this interesting information with you.

I don’t intend to take too much of your time – here is an interesting perspective of how lead could have acted as a catalyst to the fall of the mighty Roman Empire.

The characteristics of Lead make it a very unique metal –

- It's a lustrous heavy metal
- Highly malleable and ductile
- Poor conductor of electricity
- Quite resistant to corrosion
- Very dense
- Reasonably available

Lead was discovered and has been in use since pre historic times. In fact, lead is the earliest metal discovered. Lead figurines found in Egypt that date back to 4,000 BC are testimony to this. Perhaps, the most popular use of lead and therefore the peak of lead production was during the Roman Empire. Romans used lead extensively, especially as water pipes, aqueducts, tank linings, cooking pots, and even as cosmetics.

In fact, here is a picture on a Roman era water pipe –



Welcome Images

Source: Welcome Images, UK.

Apparently, during the Roman era, it was considered 'aristo' to have water pipes running into the residence, directly plumbing water. The owner's name was inscribed

on the lead water pipe (you can notice this on the picture as well), to showcase the aristocracy. Talk about customized water pipes

Romans gradually paid a price for such extensive use of lead. Lead, unlike iron has no use for the human body. It is toxic and carcinogenic. The extensive use of lead, especially as water pipes proved to be fatal. Lead poisoning eventually claimed the lives of many people – especially people from the higher strata, involved in decision making. This mass loss of lives is believed to have played a crucial role in the eventual collapse of Roman Empire.

Well, there you go, that's about it – I'm not a historian, so if you want to know more, I'd advise you to do your research on this, and here is an [interesting link](#) to get started.

Humans have evolved since the Roman era, and we have put lead to better use since then. Here is wide variety of uses for lead –

- Solders
- Industrial lining of sinks, tanks, chambers
- Protective shield against radiation
- Lead acid storage batteries (largest application of lead)
- Lead foil used for covering cables
- Pigments and compounds
- Ship building

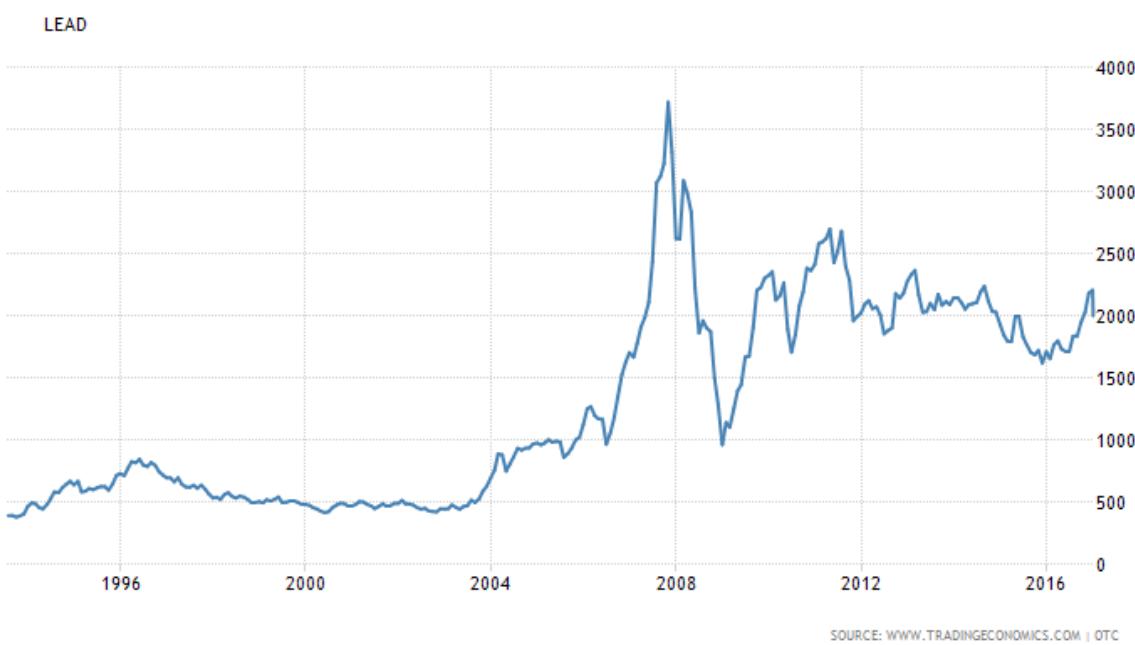
By the way, many people think of 'lead' and immediately imagine the pencil lead found at the tip of pencil. Although, the one found in the pencil is called lead, it is not lead. It is graphite.

The supply demand of lead has more or less been stable over the last few years, have a look at the data below –

World Refined Lead Supply and Usage 2011 - 2016					
000 tonnes	2011	2012	2013	2014	2015
Mine Production	4617	4902	5244	4929	4763
Metal Production	10684	10646	11157	10959	10836
Metal Usage	10536	10589	11154	10949	10864

Source: www.ilzsg.org

In fact, the price of lead has more or less remained range bound over these years. Have a look the long term chart of Lead; do pay attention to the last few years –



If you intend to trade Lead futures on MCX, then it pretty much has to be a play on price action. I would personally refrain from setting up trades based on news or fundamentals for Lead.

However, if you do plan to set up trades based on fundamentals, [click here](#) to get all the fundamental data –

14.2 – Contract Specifications

Let's take a quick look at the contract specifications. Like many other commodities listed on MCX, Lead too comes in two variants – Lead (big contract) and Lead Mini. Let me list down the contract specs of the big Lead first and then look into Lead Mini.

The specs are as below –

- Price Quote – Per kilogram
- Lot size – 5 metric tonnes (5000 kgs)
- Tick size – Rs. 0.05

- P&L per tick – Rs. 0.05 * 5,000 = Rs. 250/-
- Expiry – Last day of the month
- Delivery units – 10 MT

Here is the snap quote of the Lead contract expiring in Jan 2017 –

LEAD JAN FUT MCX		+0.81 %		137.05	
BIDS			OFFERS		
PRICE	ORDERS	QTY.	PRICE	ORDERS	QTY.
137.05	1	1	137.10	2	3
137.00	2	2	137.15	5	5
136.95	6	6	137.20	10	16
136.90	7	11	137.25	7	11
136.85	8	17	137.30	8	16
Total		528	Total	652	
EXPIRY	%2017-01-31		VOL. TRADED	1,202	
O 136.60	H 137.35		L 136.50	C 135.95	

The price, as seen here, is Rs. 137.05 per Kg. Therefore, the contract value would be –

Lot size * price

$$= 5,000 * 137.05$$

= **Rs. 685,250/-**

The NRML margin is as shown below –

#	Commodity	Lot size	Price	NRML Margin	MIS Margin
16	LEAD	5 MT	135.95	80482	40241
17	LEADMINI	1 MT	136	16442	8221

As you can see, the NRML (for overnight positions) margin is Rs. 80,482/- and MIS (for intraday) margin is Rs. 40,241/-.

This makes it about 11.7% for NRML and about 5.9% for MIS, clearly one of the highest margin requirements in the commodities market.

And now for the Lead Mini contract –

- Price Quote – Per kilogram
- Lot size – 1 metric ton (1000 kgs)
- Tick size – Rs. 0.05
- P&L per tick – Rs. 0.05 * 1,000 = Rs. 50/-
- Expiry –Last day of the month
- Delivery units – 10 MT

Here is the snap quote of Lead Mini, expiring in Jan 2017 –

LEADMINIJAN FUT MCX				+0.47 %	▼	137.50
BIDS			OFFERS			
PRICE	ORDERS	QTY.	PRICE	ORDERS	QTY.	
137.50	4	4	137.55	2	4	
137.45	14	16	137.60	8	17	
137.40	19	31	137.65	6	15	
137.35	8	21	137.70	6	14	
137.30	13	22	137.75	4	13	
Total		1,179	Total		1,326	
EXPIRY	%2017-01-31		VOL. TRADED	4,232		
O	136.40		H	138.35		L 136.15 C 136.85

The price as seen here is Rs.137.50 per Kg. The contract value therefore would be –

Lot size * price

$$= 1,000 * 137.50$$

$$= \mathbf{Rs. 137,500/-}$$

The NRML margin is as shown below –

#	Commodity	Lot size	Price	NRML Margin	MIS Margin
16	LEAD	5 MT	135.95	80482	40241
17	LEADMINI	1 MT	136	16442	8221

As you can see, the NRML margin is Rs. 16,442/-and MIS margin is Rs. 8,221/-.

This makes it about 11.7% for NRML and about 5.9% for MIS. The margin for Lead Mini (for both NRML & MIS) is similar to the margins charged for Lead big contract. However, because the lot size is smaller, the financial outlay towards margins is lot lesser.

14.3 – Lead contract logic

MCX introduces new contracts every month, and each new contract introduced expires on the last day of the 5th month. For example, in January 2017, MCX will introduce May 2017 contract. The May 2017 contract will expire on the last working day of May 2017.

Note, the January 2017 contract would itself expire on the last working day of January 2017. Further, as you can see in the table below, the January contract would have been introduced 5 months prior, i.e., in September 2016.

This introduction pattern ensures that there is a current month contract available at any point in the system.

Have a look at the table below –

Contract Months	Launch	Contract Months	Expiry
September		January	
October		February	
November		March	
December		April	
January		May	
February		June	
March		July	
April		August	
May		September	
June		October	
July		November	
August		December	

Although, the contract is commissioned 5 months before expiry, it gains liquidity only in its last month. Therefore, it makes sense to always trade the current month contract. Remember, higher liquidity means tighter bid ask spreads, tighter spreads mean lower impact cost, lower impact cost means, less damage especially when you place market orders.

14.4 – Nickel basics

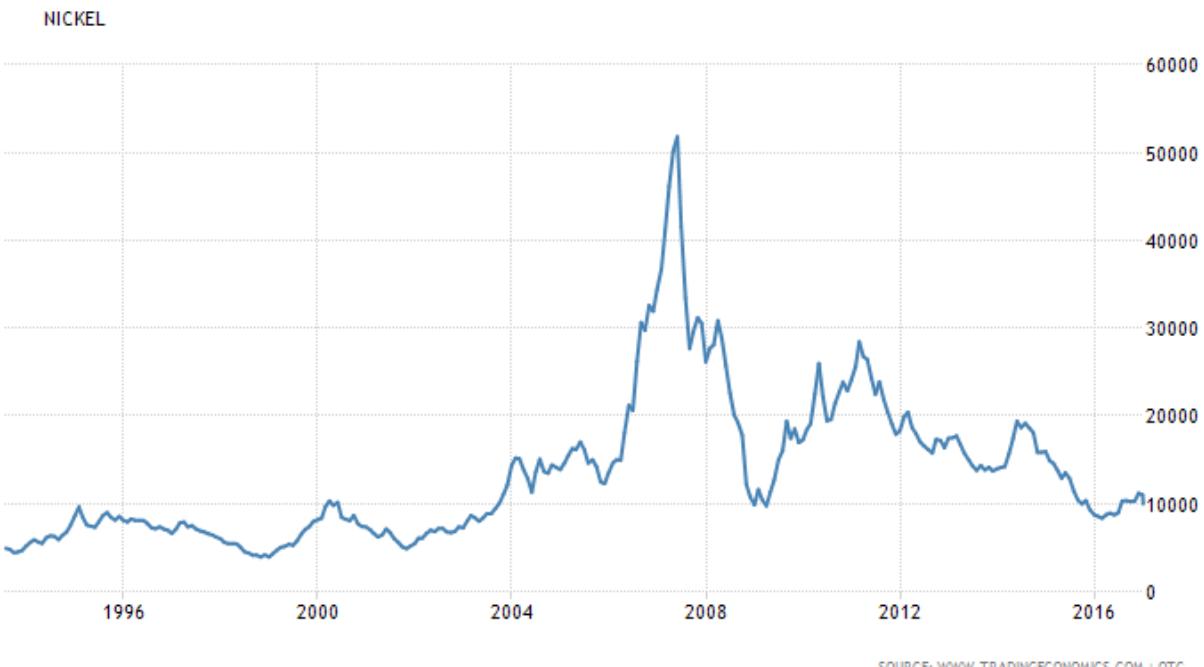
Nickel and its alloys find extensive used in our day to day lives. Be it kitchenware, mobile phones, medical equipment, building, power generation, or even transport – Nickel is almost always used, either directly or as an alloy. The largest application of Nickel has to be in the manufacturing of stainless steel. In fact, about 65% of nickel produced is used towards the manufacturing of stainless steel.

Here is the ‘demand – supply’ situation of Nickel –

Primary Nickel Production ('000 tonnes)	2009	2010	2011	2012	2013	2014
Africa	36,6	36,3	36,7	41,2	59,0	75,2
America	234,1	223,1	268,0	306,1	293,3	295,7
Asia	432,0	537,6	631,2	728,0	922,5	939,6
Europe	446,1	503,4	515,7	510,3	498,3	483,4
EU27	81,5	108,7	119,2	117,8	116,6	109,6
Oceania	167,6	141,4	150,2	174,1	189,9	199,8
World Total	1316,4	1441,8	1601,8	1759,7	1963,1	1993,6

Primary Nickel Usage ('000 tonnes)	2009	2010	2011	2012	2013	2014
Africa	31,7	24,0	23,9	24,6	22,9	21,4
America	121,8	153,2	165,0	166,4	174,8	181,9
Asia	760,4	929,4	1050,6	1109,9	1233,7	1308,6
Europe	317,7	355,9	364,5	364,1	350,8	353,9
EU27	279,9	317,4	325,5	322,0	310,6	313,5
Oceania	2,7	2,7	2,7	2,7	2,7	2,7
World Total	1234,3	1465,2	1606,7	1667,7	1784,9	1868,5

As you can see, Nickel production has overtaken the demand. This probably explains why Nickel prices have been down over the year –



Again, my advice when it comes to trading Nickel would be the same – trade the price and not really the fundamentals.

14.5 – Contract Specifications of Nickel

No prize for guessing, Nickel too comes in two variants – Nickel (big contract) and Nickel Mini. Let me list down the contract specs of the big Nickel first and then look into Nickel Mini.

Nickel (big) specs are as below –

- Price Quote – Per kilogram
- Lot size – 250 Kgs
- Tick size – Rs. 0.10
- P&L per tick – Rs. 0.10 * 250 = Rs. 25/-
- Expiry – Last day of the month
- Delivery units – 3 MT

Here is the snap quote of Nickel, expiring in Jan 2017 –

NICKEL JAN FUT MCX			+0.39 %		686.50
BIDS			OFFERS		
PRICE	ORDERS	QTY.	PRICE	ORDERS	QTY.
686.30	2	13	686.60	1	1
686.20	2	5	686.70	2	7
686.00	3	7	686.80	1	5
685.90	1	2	686.90	2	9
685.80	3	21	687.00	4	11
Total		630	Total	1,164	
EXPIRY	%2017-01-31	VOL. TRADED	3,903		
O 687.30	H 689.40	L 685.20	C 683.80		

The price as seen here is Rs. 685.50 per Kg. The contract value therefore would be –

Lot size * price

$$= 250 * 686.5$$

$$= \text{Rs. 1,71,625/-}$$

The NRML margin is as shown below –

#	Commodity	Lot size	Price	NRML Margin	MIS Margin
20	NICKEL	250 KGS	683.8	16924	8462
21	NICKELM	100 KGS	683.8	6694	3347

As you can see, the NRML (for overnight positions) margin is Rs. 16,924/- and MIS (for intraday) margin is Rs. 8,462/-.

This makes it about 10% for NRML and about 5% for MIS.

And now for the Nickel Mini contract –

- Price Quote – Per kilogram
- Lot size – 100 kgs
- Tick size – Rs. 0.10
- P&L per tick – Rs. 0.10 * 100 = Rs. 10/-
- Expiry – Last day of the month
- Delivery units – 3 MT

Here is the snap quote of Nickel Mini, expiring in Jan 2017 –

NICKELM JAN FUT MCX				+0.32 %	O	686.00
BIDS			OFFERS			
PRICE	ORDERS	QTY.	PRICE	ORDERS	QTY.	
686.00	14	22	686.40	2	2	
685.90	5	13	686.50	2	3	
685.80	2	7	686.60	1	6	
685.70	3	8	686.70	11	24	
685.60	4	24	686.80	2	6	
Total		826	Total		1,570	
EXPIRY	%2017-01-31		VOL. TRADED	4,439		
O	686.80	H 689.40	L 685.40	C 683.80		

The price as seen here is Rs. 686/- per Kg. The contract value therefore would be –

Lot size * price

$$= 100 * 686$$

$$= \mathbf{Rs. 68,600/-}$$

The NRML margin is as shown below –

#	Commodity	Lot size	Price	NRML Margin	MIS Margin
20	NICKEL	250 KGS	683.8	16924	8462
21	NICKELM	100 KGS	683.8	6694	3347

As you can see, the NRML (for overnight positions) margin is Rs. 6,694/- and MIS (for intraday) margin is Rs. 3,347/-.

This is consistent with the big contract – works out to 10% for NRML and about 5.0% for MIS.

The contracts are introduced on a monthly basis, in the same exact way as Lead. I'd suggest you stick to the current month contract for trading as these contracts have the highest liquidity.

Key takeaways from this chapter

1. There are two contracts for Lead Futures; Lead and Lead Mini.
2. Lot size of Lead is 5000 MT and Lead Mini is 1000 MT.
3. P&L per tick is Rs. 250 for Lead and Rs. 50 for Lead Mini.
4. ‘Demand supply’ has remained stable for Lead over the last few years
5. There are two contracts for Nickel futures; Nickel and Nickel Mini.
6. Lot size of Nickel is 250 Kgs and 100 kgs for Nickel Mini.
7. P&L per tick is Rs. 25 for Nickel and Rs. 10 for Nickel Mini.
8. Nickel production has outstripped its demand.
9. It is advisable to stick to the current month futures of both Lead and Nickel.
10. It makes sense to look at price data to place short term trades in both Lead and Nickel.

CHAPTER 15

Cardamom & Menthah Oil



15.1 – Monsoon blues

Back in the day, I traded stocks with ICICI Direct. Around the same time, MCX had just started operations and ICICI was one of the first brokers to get a membership. MCX was aggressively campaigning and were conducting workshops and seminars to educate market participants, hoping to get more activity on the exchange. I was in the discovery phase, curious to know about everything tradable in India. I attended some of these sessions and, for some reason, believed I would be far more efficient trading an alternate asset like commodities as opposed to trading equities.

I was quite excited to start trading commodities. I quickly showed up at my broker's office with all the necessary documents to open my commodities trading account. To my surprise, I was one of their earliest clients from Bangalore to open an account with MCX. It took about 12 days (that seemed like an eternity to set up my account with MCX).

Finally, my broker called me to say I'm good to go live and place trades the next day. I actually took a day off from work to trade commodities! I was thrilled to put my new found commodities knowledge (although half-baked) to practice.

I chose to trade 'Pepper futures'. Though the rationale behind this choice eludes memory, Pepper futures it was!

So, my first commodities trade was 'Long pepper', 10 lots (I guess it was a 1 metric tonne contract), I don't remember the exact price, but I suppose it was somewhere around Rs.7,500/- per quintal. I had bet my entire trading account on Pepper futures!

What followed through was quite predictable. To my dismay, Pepper hit its 52-week low over the next two days, I brought in additional capital, but Pepper continued to crash, as did my account until there was nothing left in it.

Dejected, I did some post-mortem analysis to figure out what went wrong and realised the monsoons were expected to be great in Kochi, which would result in a very good harvest of Pepper.

Only now did I understand that one really needs to have some sort of understanding of monsoons and harvest cycles before trading agri commodities. Unfortunately, I learnt this lesson at very high price. No wonder I remember it to this day.

Anyway, considering this, we will spend a little time understanding a bit of this topic, and hopefully, you will not make the same mistakes I did in the past.

And, just so you know – right after I burnt my trading account with my first commodities trade, what happened next is easy to guess – Pepper futures bottomed out and rallied nonstop to Rs. 12,500/- per quintal!

15.2 – Understanding Rainfall

The Indian economy's dependence on agriculture has reduced over the years. A few decades ago, agriculture contributed to over 30% to our GDP, but this has now reduced to about 10%. However, agriculture and allied services are still the largest employers in India. This perhaps explains why the Central Government most often takes a populist stance when it comes to reforms and policies in this sector.

Have a look at the snapshot below, this gives you an idea of which sector contributes how much to the Indian economy –

Percentage contribution to Indian Economy (by sectors)

Year	Agriculture, Forest and Fishing	Industry	Mining	Manufacturing	Energy	Services	Construction	Hotels	Transport, Logistics	Financial services, Real Estate & Insurance	Public, Defence & Admin
2011-12	10.21%	12.63%	1.77%	9.58%	1.27%	32.27%	5.28%	6.01%	3.60%	10.40%	6.97%
2012-13	10.10%	12.47%	1.72%	9.45%	1.29%	32.77%	5.09%	6.34%	3.66%	10.70%	6.42%
2013-14	10.19%	12.14%	1.59%	9.19%	1.37%	33.28%	4.99%	6.42%	3.70%	11.16%	5.98%
2014-15	9.66%	11.81%	1.47%	8.94%	1.40%	34.09%	4.86%	6.55%	3.82%	11.43%	5.98%
2015-16	9.49%	11.94%	1.44%	9.04%	1.45%	34.24%	4.61%	6.72%	3.62%	11.49%	5.97%

This data is published by RBI and is freely available on RBI website. The data is available for as long back as the 50s. I've just manipulated the data to show the percentage contribution of each sector. As you can see, the percentage contribution of agriculture has declined over the years, while the % contribution of services (mainly software and allied services) has steadily increased.

But, like I just mentioned, agriculture is still the largest employer in India and this entire industry and workforce is dependent on how the yearly rainfall pans out. This is quite natural as 2/3rd of India's arable land is rain-fed.

There are two main rainfall seasons (monsoons) in India –

1. The Southwest Monsoon (principal rainfall season), and
2. The Northeast Monsoon

I will not get into the technicalities of how these spells are caused, clearly not my area of expertise. However, these are the things you need to know about these two seasons –

1. The south-west monsoon occurs from the southern India and covers all the regions up to central India. This spell is expected to start around June/July through September/October
2. The North-eastern monsoon covers the north eastern India, North India, Himalayas, and the western parts, and a large part of Tamil Nadu. This spell occurs from early December through March.

During each of these monsoon seasons, seeds are sown and crops harvested. Based on how good or bad the monsoon is, the harvest can be estimated.

- Crops sown during the south-west monsoons is called the **Kharif Crop** (it is even referred to as the monsoon crops). These are mainly pulses, millets, rice, urad dal, moong dal, cotton etc. The sowing of kharif crop takes place around end May-early June (before the south-west spell) and harvesting is done post the monsoons i.e around October.
- Crops sown during the northeast monsoons is called the **Rabi Crop** (it is even referred to as the winter crops). Rabi crops are mainly **wheat**, gram, coriander, mustard, oats etc. The sowing of rabi crop occurs at the onset of winter and harvest of Rabi crops is around end April.

Rice and Wheat are India's staple, contributes close to 40% of the food grain production, and hence plays a crucial role in India's food security. Do note, they are harvested and sown in Kharif and Rabi season respectively.

The progress of sowing and harvesting is continuously monitored and is reported across leading publications. Have a look at this –

RABI CROP SOWING DATA

Area sown (m ha)

Crops	2012-13	2011-12
Wheat	29.76	28.53
Rice (rabi)	1.48	2.04
Sorghum	3.88	3.77
Coarse cereals	6.19	5.89
Gram	9.32	8.96
Pulses	14.45	14.59
Rapeseed & mustard	6.72	6.54
Oilseeds	8.62	8.46
Total rabi area	60.50	60.84

Source: Ministry of agriculture

This one reports the progress of Rabi crops –

OVERALL KHARIF ACREAGE (AS ON JULY 13)

Crops	(in lakh ha)			
	Normal Area	This year	Last year	Change
Rice	111.63	96.79	120.4	-23.61
Coarse cereals	79.82	39.76	74.39	-34.63
Pulses	32.88	20.54	32.83	-12.29
Oilseeds	78.33	67.70	86.97	-19.27
Sugarcane	46.97	52.85	50.77	2.08
Cotton	70.43	65.22	59.22	6
Jute+Mesta	8	8.18	8.79	-0.61
Total Kharif area	428.06	351.04	433.37	-82.34

In fact, with whatever basic knowledge we have gathered so far, I'd request you to read this [news piece](#).

The idea is to make sure, we understand what is being discussed here and relate to the news article. If you are a serious agri trader, I'd expect you to continuously keep track of such news pieces and strategies your trades.

The following agri commodities are available to trade on MCX –

1. Cardamom
2. Castor Seed
3. Cotton
4. Crude Palm Oil
5. Kapas
6. Menthha Oil

Of all these agri commodities, I'd recommend you trade Cardamom and Menthha Oil, simply because the liquidity reasons.

Let's discuss these two commodities. Also, note that agri commodities (especially the Indian agri commodities) are traded till 5:00 PM.

15.3 – Cardamom

Cardamom is a spice mainly grown in Southern India (Karnataka & Kerala). The cardamom variety grown in India is called ‘Small Cardamom’. India is the 2nd largest producer and 1st largest consumer of Cardamom, while Guatemala is the world’s largest producer of Cardamom. The Cardamom produced by Guatemala is mainly for export.

Cardamom, as you may know, is mainly used in India sweets. It also has few therapeutic applications like skin and dental care – not that savouring sweets is less therapeutic.

Cardamom, is a Kharif crop, the demand supply dynamics mainly depends on –

1. The southwest monsoons
2. The quality – flavour, colour, size, and aroma of the harvest
3. Production parameters – like inset attack on plantation
4. Stock available at both India and Guatemala
5. Domestic consumption patterns (although this is quite steady over the years)

Let’s take a quick look at the contract specifications. Unlike other commodities listed on MCX, Cardamom does not have two variants. So don’t go looking for Cardamom and Cardamom mini. J

The supply and demand for cardamom is kind of steady. Co incidentally, I read a news piece today related to this, and I thought it would be interesting to shares the same here –

CARDAMOM FEB FUT MCX				+0.56 %	○	1564.00
BIDS			OFFERS			
PRICE	ORDERS	QTY.	PRICE	ORDERS	QTY.	
1563.60	1	1	1566.50	1	1	
1563.50	1	1	1566.60	1	1	
1563.30	1	1	1567.50	1	1	
1563.10	1	1	1568.00	1	1	
1560.50	1	1	1569.40	1	2	
Total		83	Total		81	
EXPIRY	2017-02-15		VOL. TRADED	320		
O	1560.00	H 1580.00	L 1554.00	C 1555.30		

The contact specs for Cardamom are as below –

- Price Quote – Per kilogram
- Lot size – 100 kgs
- Tick size – Rs. 0.10
- P&L per tick – Rs. 10/-
- Expiry – 15th of every month
- Delivery units – 100 Kgs

Here is the snap quote of the Cardamom expiring in Feb 2017 –

#	Commodity	Lot size	Price	NRML Margin	MIS Margin	
1	ALUMINI	1 MT	121.75	7061	3530	<button>CALCULATE</button>
2	ALUMINIUM	5 MT	121.8	36905	18452	<button>CALCULATE</button>
3	CARDAMOM	100 KGS	1555.3	16237	N/A	

The price, as seen here, is Rs. 1,564 per Kg. Therefore, the contract value would be –

Lot size * price

$$= 100 * 1564$$

$$= \text{Rs. 156,400/-}$$

The NRML margin is as shown below –

Contract Launch Calendar for cardamom contracts expiring during the year 2016 and 2017 onwards

Contract Launch Months	Contract Expiry Months
August	January
September	February
October	March
November	April
December	May
January	June
February	July
March	August
April	September
May	October
June	November
July	December

As you can see, the NRML (for overnight positions) margin is Rs. 16,237/-. This makes it about 10.5% margin for NRML orders.

Further, as you can notice the MIS margin for Cardamom is not available. In fact, there is no MIS margin for any agri commodities. There is a reason for this – agri commodities are quite volatile and they tend to hit the circuit limits frequently, and therefore unwinding the position by end of day would not be easy. For this reason, a trader is better off trading NRML for intraday as well.

Here is the contract introduction table of Cardamom –

Small cardamom maintains steady aroma

OUR CORRESPONDENT

COMMENTS · PRINT · T+



KOCHI, JANUARY 16: Small cardamom prices remained unchanged last week at auctions held in Kerala and Tamil Nadu. The matching demand and supply during the week has been attributed to the steady market trend.

Harvesting is almost over and hence the supply is unlikely to increase in the coming days, PC Punnoose, General Manager, CPMC, told *BusinessLine*.

He said buyers were active and were covering apprehending short supplies in the coming weeks. Exporters were also covering and they have bought and estimated 60-70 tonnes of exportable variety capsules last week, he said.

Total arrivals during the season from August 1 up to January 13 were at 10,897 tonnes and sales were at 10,330 tonnes. The individual auction average for the season as on January 13 stood at ₹1,092.50 a kg.

(This article was published on January 16, 2017)

Post Comment

As you can see, every month a six month futures contract is introduced. For example, in the month of January, June futures are introduced. Hence, June futures will continue to stay in the system till 15th of June (remember, expiry is on 15th of every month). For all practical purposes, it makes sense to always trade the current month contract for liquidity.

For example, as I write this article (it is 17th Jan 2017), if I were to trade Cardamom, I'd opt to trade Feb 2017 Cardamom contract (Jan 2017 contract expired on 15th Jan).

15.4 – Mentha Oil

Mentha is an aromatic herb which is used in its raw form for Indian cooking. Besides, it distilled and filtered to produce the Mentha oil. It is Mentha Oil is traded on MCX. Mentha oil is used in food, pharmaceutical, perfumery, and flavouring industry.

Mentha oil is also imported to countries such as US, China, and Singapore. This clearly indicates that Mentha Oil contract is sensitive to fluctuations in USD-INR rates. Besides this, other factors such as rainfall, insect attack, and crop acreage also exerts its influence on the contract.

The contact specs for Mentha Oil are as below –

- Price Quote – Per kilogram
- Lot size – 360 kgs
- Tick size – Rs. 0.10
- P&L per tick – Rs. 36/-
- Expiry – Last day
- Delivery units – 360 Kgs

Of all the things listed in India, probably Mentha Oil is the only asset which has Rs.36/- P&L per tick

Here is the snap quote of the Mentha Oil, expiring 2017 –

MENTHAOIL JAN FUT MCX				-0.44 %	O 1023.20
BIDS			OFFERS		
PRICE	ORDERS	QTY.	PRICE	ORDERS	QTY.
1023.00	1	1	1023.90	1	1
1022.50	1	1	1025.00	1	1
1022.10	1	6	1025.40	1	1
1022.00	2	2	1025.50	1	1
1021.00	5	7	1026.00	2	2
Total		253	Total		212
EXPIRY	%2017-01-31		VOL. TRADED	531	
O 1029.10	H 1030.90		L 1020.20	C 1027.70	

The price, as seen here, is Rs. 1,023.2 per Kg. Therefore the contract value would be –

Lot size * price

$$= 360 * 1023.2$$

$$= \text{Rs. 368,352/-}$$

The NRML margin is as shown below –

#	Commodity	Lot size	Price	NRML Margin	MIS Margin	CALCULATE
19	MENTHAOIL	360 KGS	1027.7	29893	N/A	

As you can see, the NRML (for overnight positions) margin is Rs. 29,893/-. This makes it about 8.5% margin for NRML orders. For reasons mentioned earlier, there is no MIS margin for Mentha Oil as well.

The contracts are introduced every month, 5 months forward. As usual, I'd suggest you stick to the current month contract to trade.

Key takeaways from this chapter

1. Agriculture as an industry contributes close to 10% to Indian economy, but it is still the largest employer in India.
2. India is still very dependent on rainfall when it comes to agriculture.
3. There are two main rainfalls – Southwest monsoon (principal rainfall) and northeast monsoon.
4. Crops sowed and harvested in southwest monsoon is called Kharif. Rice is a major Kharif crop.
5. Crops sowed and harvested in northeast monsoon is called Rabi. Wheat is a major Rabi crop.
6. Agri commodities are traded till 5:00 PM on MCX.
7. India is the largest consumer of cardamom and 2nd largest producer of Cardamom, stands 2nd to Guatemala in production.
8. Demand supply for cardamom is quite stable.
9. MIS margin is not available for agri commodities.
10. Mentha oil is distilled and filtered from Mentha leaves.

CHAPTER 16

Natural Gas



16.1 – History and background

I know this chapter on Natural Gas is coming in late; we should have discussed this much earlier, probably when we discussed Crude oil. Unfortunately, I missed doing this; but anyway, better late than never!

We will discuss Natural Gas in this chapter, and with that, we will conclude this module on Currencies and Commodities.

As usual, let us start our discussion with some background information, history, and how natural gas is extracted.

Natural gas is a naturally occurring, non-renewable, hydrocarbon gas mixture, primarily consisting of methane. Natural Gas is a fossil fuel and is used as an energy source. Natural gas has many applications in our day to day lives including electricity (generation process), heating, and cooking. Besides, natural gas also has a wide variety of application in the fertilizer and plastics industry.

Apparently, way back in 1000, B.C., natural gas seeped from the ground, on Mount Parnassus in ancient Greece, caught fire and a flame was lit.

The Greeks believed this was the Oracle at Delphi, and a temple was built. This has to be the first ever reference to Natural Gas. By the way, do you wonder how natural gas can seep through the land surface? Well, have a look at this picture of natural gas seeping from ground and catching fire –



Source: Daily mail online, UK.

The Chinese discovered Natural Gas around 500 B.C., and they put this to better use – they started using bamboo “pipelines” to transport natural gas that seeped to the surface and to use it to boil sea water to get drinkable water.

However, the first commercialized application of natural gas occurred in the Great Britain. Around 1785, the British used natural gas produced from coal to lighthouses and streets.

By now, you must have guessed that ‘Natural Gas’ is somewhere hidden deep below the earth’s surface. The question is – how and why is natural gas present there?

Millions of years ago, when plants and animals died, the remains were buried in sand and silt. The buried remains mixed further with sand and silt, got buried deeper, and

decayed further. Pressure and heat converted these materials into coal, oil, and natural gas. This entire process panned across millions of years. In some places, natural gas moved into large cracks and spaces between layers of overlying rocks, while in other places natural gas just settled on the porous surface of rocks. Natural Gas, in its original form, is colorless, odorless, and tasteless. Now, practically this can be an issue – imagine if natural gas leaks and spreads, there is no way one can identify its presence in the atmosphere, which is a highly hazardous situation. Hence, producer of natural gas adds a substance called ‘mercaptan’, which gives natural gas a pungent, sulfuric odor, making it easier to detect in case of a leak.

The search of natural gas is quite similar to the search for crude oil. Geologists identify land parcels which are likely to contain natural gas. Sometimes, these land parcels are on the surface of the earth and sometimes this can be offshore, deep inside, on the ocean floor. Geologists use the seismic surveys to identify the right place to drill in order to maximize the probability of finding natural gas. If the site seems promising, then an exploratory well is drilled to investigate further. Further, if the economics favor then more wells are drilled and the natural gas is extracted from the ground.

India is the 7th largest producer of natural gas in the world, accounting for nearly 2.5% of the natural gas production in the world. The bulk of the natural gas produced in India is used towards power generation, industrial fuel, and LPG. A large chunk is also used in the fertilizer industry as feedstock.

Needless to say, this discussion on Natural Gas – production and application can get quite vast, but I guess we are good to stop here, considering we are looking at Natural gas from a short-term trading approach.

We will move ahead to discuss the contract specification.

However, no discussion on Natural gas is complete without talking about the ‘Amarant Natural Gas gamble’.

16.2 – Amaranth Natural gas gamble

Amaranth Advisors, established around 2000, was a US-based multi-strategy hedge fund operating from Greenwich, Connecticut. The fund had its interest in various hedge fund strategies ranging from convertible bonds, merger arbitrage, leveraged assets,

and energy trading. By mid-2006, the fund had become a \$9 Billion behemoth; this included the profits that were ploughed back to the fund. This positioned Amaranth as one of US's top-performing hedge fund.

Amaranth's energy trading desk picked up activity (and a lot of attention) when a star trader named Brian Hunter joined Amaranth's trading team. Hunter had previously gained a lot of popularity for his energy trading strategies (mainly natural gas) at Deutsche Bank. Apparently, he made few millions of dollars as annual bonuses. His success continued when he joined Amaranth to head the energy desk – where he traded natural gas for obvious reasons. Hunter ensured profits rolled for Amaranth and its clients, so much so that Amaranth netted close to \$2 Billion by April 2006. Both Amaranth's clients and management were quite seduced by Hunter's trading skills.

At this stage, I have to mention this – although an international commodity, natural gas trading was highly vulnerable. Any midsized hedge fund could easily corner the market by taking positions in few thousands of contracts. This made Amaranth one of the largest hedge funds operating in the natural gas market.

Anyway, here is what happened post-April 2006 –

1. Hunter noticed a surplus inventory of natural gas in the US, which would drive the price of natural gas lower in the US
2. Inventory of Natural gas, unlike oil, cannot be easily moved to cater to supply-demand pressures
3. He also expected a harsh winter (or perhaps a hurricane) to ensue, which quite obviously would exert pressure on the supplies and push the price of Natural gas higher
4. Apparently, Hunter had profited when Hurricane Katrina and Rita had hit the US coastlines in 2005
5. He set up complex strategies at multiple points across multiple contracts to benefit from his staggered point of view. These were highly leveraged, speculative futures positions
6. However, nature had a different game plan for Hunter and Amaranth – the possibilities of a hurricane diminished, supplies continued to pour
7. Bulls started to unwind, triggering the price of Natural Gas below the psychological support of \$5.5

8. This further triggered a panic sell leading to a single day fall of 20% Natural gas's price
9. Amaranth was hit quite hard but Hunter's conviction and reputation were still intact. They now borrowed money and doubled down on their positions
10. The leverage was as high as 1 to 8, meaning for every 1 USD of their own capital, they had 8 USD in borrowed capital
11. This didn't stop natural gas prices to tank further, prices continued to crash, and along with the price Amaranth too crashed
12. Amaranth was forced to liquidate and take a hit of \$6 Billion USD, making it one of the largest hedge fund fiascos in the world.

If there is one key lesson you get to learn from the Amaranth's episode, then it has to be (yet again) the importance of risk management. Risk management sits above all and has the authority of question every aspect of your trade.

Respect risk and risk respects you back, ignore it and it will show you the corner.

For this reason, we will dedicate the whole of next module to Risk and trading psychology.

For now, let us proceed to discuss the contract specs of Natural Gas.

16.3 – Contract specifications

The contact specs for Natural Gas are as below –

- Price Quote – Rupee per Million British Thermal Unit (mmBtu)
- Lot size – 1250 mmBtu
- Tick size – Rs. 0.10
- P&L per tick – Rs. 125/-
- Expiry – 25th of every month
- Delivery units – 10,000 mmBtu

Here is the snap quote of the Natural gas expiring in Feb 2017 –

NATURALGAS FEB FUT MCX				+2.11 %		217.30
BIDS			OFFERS			
PRICE	ORDERS	QTY.	PRICE	ORDERS	QTY.	
217.20	14	37	217.30	7	14	
217.10	17	76	217.40	18	49	
217.00	13	38	217.50	29	79	
216.90	8	32	217.60	16	44	
216.80	10	31	217.70	20	50	
Total		1,639	Total		1,255	
EXPIRY	2017-02-23		VOL. TRADED	15,397		
O	212.50	H 217.60	L	212.30	C 212.80	

The price, as seen here, is Rs. 217.3 per mmBtu. Therefore the contract value would be –

Lot size * price

$$= 1250 * 217.3$$

$$= \mathbf{Rs. 271,625/-}$$

The NRML margin is as shown below –

#	Commodity	Lot size	Price	NRML Margin	MIS Margin
20	NATURALGAS	1250 MMBTU	212.8	40644	20322

As you can see, the NRML (for overnight positions) margin is **Rs. 40,644/-**. This makes it about 15% margin for NRML orders (probably one of the highest in the markets) and MIS margin is **Rs.20,322/-** which makes it about 7% for MIS positions.

The contract introduction and expiry logic is quite straightforward, have a look at the table below –

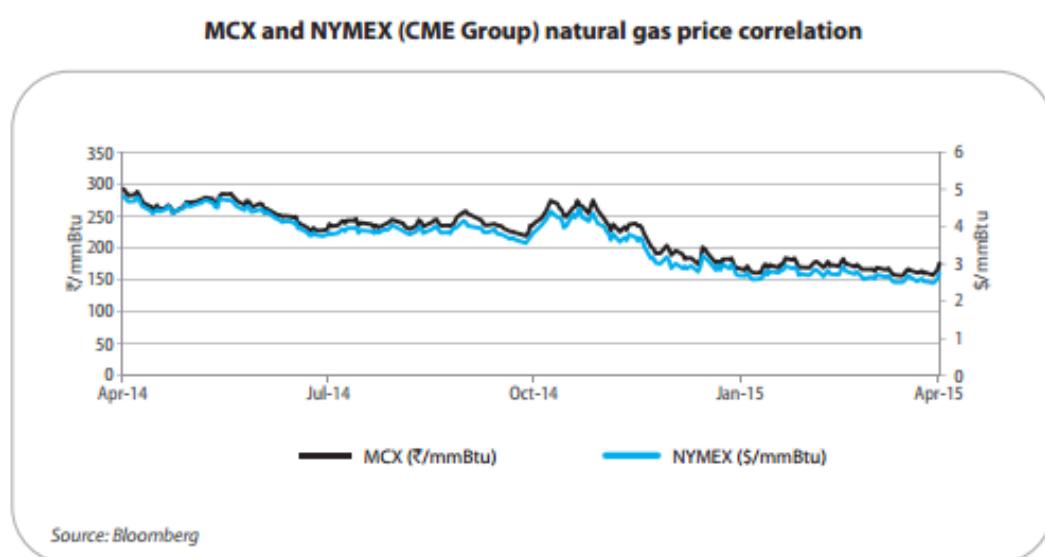
Contract Launch Calendar of Natural Gas

Contract Month	Contract Launch Months	Contract Expiry Months
January 2017	27 October 2016	25 January 2017
February 2017	28 November 2016	23 February 2017
March 2017	28 December 2016	28 March 2017
April 2017	27 January 2017	25 April 2017
May 2017	24 February 2017	25 May 2017
June 2017	29 March 2017	27 June 2017
July 2017	26 April 2017	26 July 2017
August 2017	26 May 2017	28 August 2017
September 2017	28 June 2017	26 September 2017
October 2017	27 July 2017	26 October 2017
November 2017	29 August 2017	27 November 2017
December 2017	27 September 2017	26 December 2017

Every 4 months a new contract is introduced. For example, the January 2017 contract was introduced in Oct 2016, and this contract expires on 25th of Jan 2017.

Here is something that you need to know – although, Natural Gas is an international commodity, its spot price in India is also dependent on how the domestic demand and supply situation pans out. However, the futures contract listed on MCX closely mirrors the Natural gas listed on NYMEX.

Have a look at the image below –



This is the graph of the Natural Gas futures contract on MCX overlaid with NYMEX – quite evidently, both the futures contracts move in unison. Given this, the following events have a significant impact on the natural gas prices on NYMEX and therefore MCX natural gas futures –

- **Natural Gas inventory data** – increase in inventory tends to lower the futures price and decrease in inventory data tends to increase the futures price
- **US weather conditions** – the US is the biggest natural gas market, so US weather conditions really matter. A harsh winter in the US leads to more natural gas consumption (as people use natural gas to heat homes) and therefore the inventory is consumed rapidly leading to increasing in price.
- **Hurricane in the US** – Hurricane besides disrupting the weather conditions also tends to disrupt inventories. Hence, if you see a hurricane approaching the US coast, be prepared to go long in Natural Gas or at least, do not short natural gas contracts
- **The price of Crude oil** – Natural gas is not only a cleaner fuel compared to crude but also costs much lower. Historically, the two contracts are highly correlated, although the correlation is not holding up over the recent few months. **Check this!**

So, next time you are trading natural gas, make sure to check how the sun is shining in the US!

And with this, folks, we will conclude this chapter on Natural Gas and this module on Currencies and commodities. We hope you liked reading this module as much as we enjoyed writing it for you.

Onwards to Risk and Trading psychology!

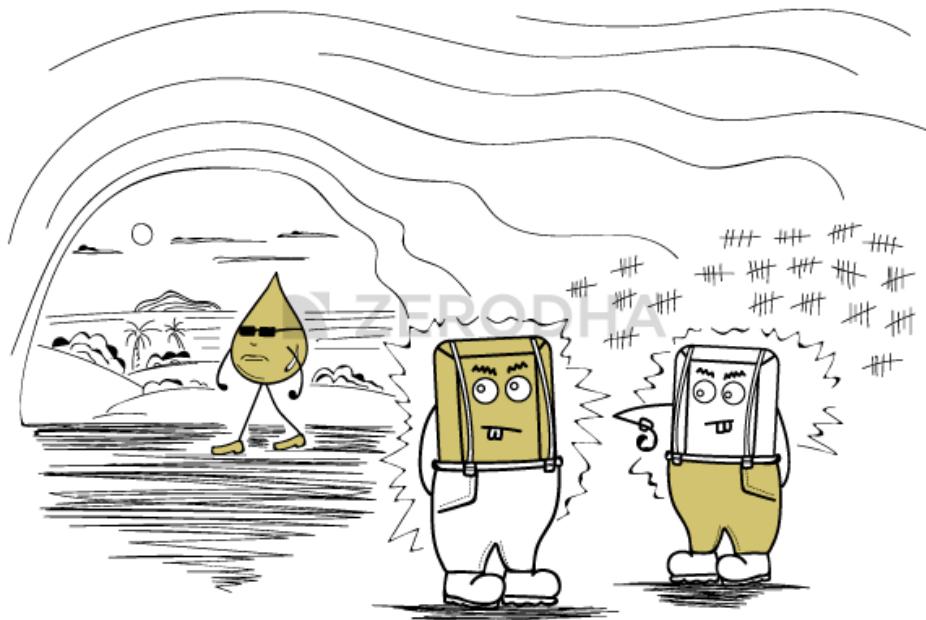
Key takeaways from this chapter

1. Natural gas occurs naturally and is found deep underground.
2. Natural Gas has been in use since ancient times.
3. Primary use of natural gas includes power generation, heating, cooking etc.,.
4. India is the 7th largest natural producer of natural gas.

5. Lot size of natural gas is 1250 MMBtu, price quote if for 100 mmBtu.
6. P&L per tick is Rs.125/- per tick.
7. Natural gas futures on MCX mimic s the price movement of Natural gas on NYMEX.

CHAPTER 17

Commodity Options



17.1 – Commodity options, finally!

My first commodity trade was on pepper futures and this was sometime towards the end of 2005 or early 2006. Since then I've closely tracked the developments of the commodities market and the commodities exchanges in India. MCX has done a tremendous job in promoting commodities market in India. They have continuously introduced new contracts and enhanced the market depth. Liquidity too has improved many fold since then. If I remember right, sometime around 2009, there was an attempt to introduce options in the commodity market. Needless to say, when I first heard about this, I was quite excited thinking about all the possibilities that one would have trading commodity options.

But unfortunately, this never came through and the commodities options were never introduced in the market. Since then, this topic on commodities options has surfaced couple of times but each time, it just remained a market rumor.

However, it now appears that options on commodities will finally hit the market sometime soon. Around June 2017, SEBI cleared the files to permit commodities options.

All clear for commodity options; Sebi notifies criterion, fixes limits

ETMarkets.com | Updated: Jul 13, 2017, 06:09 PM IST

You can read the new article [here](#).

Since then commodities exchanges have been working hard to build a good framework to introduce the commodities options. Given this, I thought it would be good to have this quick note on what to expect and what to look for in the commodities options market.

For those who are not too familiar about options, I'd suggest you start reading the module on Options [here](#).

Just like futures, the options theory for commodities would remain the same. You have to just pay attention to logistics, and that's the objective of this chapter.

17.2 – Black 76

One of the important bits that you need to note with commodity options is that **these are options on Futures** and not really the spot market.

For example, if you look at a call option on Biocon, the underlying for this option is the spot price of Biocon. Likewise, if you look at Nifty options, the underlying is the spot Nifty 50 index value. However, if you were to look at an option on Crude Oil, the underlying here is not the spot price of Crude Oil. This is quite intuitive as we do not have a spot market for Crude Oil or for that matter any commodities in India. However, we do have a vibrant futures market. Hence the commodity options are based on the commodity futures market.

If one were to talk about the crude oil options, then you need to remember the following –

1. The underlying for Crude oil option is Crude oil Futures
2. The underlying for crude oil futures is the price of Crude Oil on NYMEX

So in a sense, this can be considered a derivative on a derivative. For all practical purpose, this should not really matter to you while trading. The only technical difference between an regular option (with spot as underlying) and option on futures is the way in which the premium is calculate. For the former, the premium can be calculated by using a regular Black & Scholes model and for the latter a model called Black 76 is used.

The difference between these two models is the way in which the continuous compounded risk-free rate is treated. I will not get into the details at this point. But do remember this – there are plenty of Black & Scholes calculators online, so don't be in a hurry to punch in the commodities variables in a standard B&S calculator to extract the premium value and Greeks. It simply won't work

17.3 – Contract Specifications

We still do not know how the exchanges will set up the framework for these options. However, we did take a look at the mock framework and I'm guessing it won't be too different from that.

To begin with, exchanges may roll out Gold options, and would slowly but for surely introduce options on other commodities. Here are the highlight.

Option Type – Call and Puts

Lot size – Since these are options on futures, the lot size will be similar to the futures lot size

Order Types – All order types would be permitted (IOC, SL, SLM, GTC, Regular, Limit)

Exercise style – Options are likely to be European in nature

Margins – SPAN + Exposure margin applicable for option writing and full premium to be paid for option buying. A concept of devilmint margin will come into play, I've discussed this towards the end

Last trading day (for Gold) – 3 days prior to the last tender day

Strikes – Considering one ‘At the money strike’ (ATM), there would be 15 strikes above and 15 strikes below ATM, taking the total to 31 strikes.

This is where it gets a little tricky. Equity option traders are used to the following ‘Option Moneyness’ convention –

1. At the Money (ATM) Options = This is when the spot is in and around the strike.
So in a given series, only 1 strike is considered ATM
2. In the Money (ITM) = All call option strike below the ATM and all put option strikes above the ATM are considered ITM options
3. Out of the Money (OTM) = All call option strike above the ATM and all put option strikes below the ATM are considered Out of the Money (OTM) options

However, the commodities options will introduce us to a new terminology – ‘Close to Money’ (CTM) and this is how it will work –

1. ATM – The strikes closest to the settlement price is considered ATM
2. CTM – Two strikes above and two strikes below ATM are considered CTM
3. OTM and ITM – The definition remains the same as in Equity.

Settlement – For daily M2M settlement in Futures, the exchange considers the commodities daily settlement price (DSP) as the reference value. The DSP of the commodity on the expiry day will therefore be the reference value for the options series as well.

Let’s quickly understand how the settlement works. Consider this example – Assume the DSP of a commodity is 100. Assume this commodity has a strike interval at every 10 points. Given this, let’s identify the moneyness of strikes –

1. ATM = 100
2. CTM = 80, 90, 100, 110, and 120. Note, we have included two strikes above and below ATM
3. OTM = All Call option above 100 and all Put options below 100 are considered OTM and therefore worthless
4. ITM = All Call options below 100 (including 80 and 90, which are CTM) are ITM, and all Put options above 100 (including 110 and 120, which are CTM) are ITM.

All long option holders which are ‘CTM’, will have to give something called as an ‘explicit instruction’. An explicit instruction will devolve the option into a futures contract. The futures contract will be at the strike. For example if I hold 80 call option, then upon an ‘explicit instruction’, the call option will be devolved into a long futures position at 80. I’m guessing the ‘explicit instruction’, will be tendered via the trading terminal.

Now, here is an important thing that you need to remember – If you do not give an explicit instruction to devolve your CTM option, then the option will be deemed worthless.

All ITM option, except CTM, will get automatically settled. You need to be aware that settlement in options market is by means of devolving the option into an equivalent futures position. If you are holding a non-CTM, ITM option and **you wish not to settle this automatically**, then you need to give a ‘Contrary instruction’. In the absence of which, the contract will be automatically settled by means of devolvement.

Now, the question is why would you not want to exercise an ITM option?

There could be an instance where the ITM option that you have may not be worth exercising given the taxation and other applicable charges. So in this case, you are better off not exercising your ITM option rather than exercising it. So, this is when you use the ‘Contrary instruction’, privilege and opt not to exercise your ITM option.

17.4 – Devolvement into Futures contract

So assume you have an ITM (including CTM) option, and upon expiry the option will be converted (or devolved) into a Futures position. Now, we all know that a futures position requires margins to be parked with the broker. How do we account for this? I mean, when I go long on option, I just have to pay for the premium right? Naturally, at the time of buying the option, I would not park additional margin anticipating that the option ‘might’ get devolved into a futures position.

To circumvent this, there is a concept of ‘Devolvement Margin’. I will cut through the technicalities and let you know what you should know and expect –

Commodity options will expire few days before the first tender date of the futures contract. This means, there will be few days gap between the expiry of the futures contract and the options contract

Few days before the options can expire, exchanges will conduct a ‘What if scenario’ and generates a ‘Sensitivity Report’ to identify strikes which are likely to be ITM and CTM

For all such options, exchanges will start assigning ‘Devolution Margin’, this means you will have to fund your account with enough margin money to carry forward the option position. Half of the required margin needs to be available a day before the expiry and the remaining half on the day of expiry of the options contract to convert the position to a futures contract
For example, The Expiry of the Gold option contract is on 28 November 2017 and the futures contract expires on 5 December 2017. Half of the margin needs to be added to the account on 27 November and the remaining on 28 November

If you holding a deep ITM option, then the profits arising out of this position will be considered to offset a portion of the margins required

Given the above point, the deeper the option, lesser would be the margin required. This also means CTM options will attract higher margins

In simpler words, if you are holding a commodity option, and it’s likely to expire ITM, and you intend to carry to expiry, then you need ensure you bring in margin money as you approach expiry

How much margin, expiry dates, tender date etc will vary based on the commodity

Here is a quick note on how the options position will be devolved.

Option Position	Devolved into
Long Call	Long Futures

Short Call	Short Futures
Long Put	Short Futures
Short Put	Long Futures.

I guess as and when the option contracts roll out, we will have greater insight into the structure. I will update this chapter when the commodity options roll out with the exact information.

Stay tuned.

Key takeaways from this chapter

1. Options on commodities will be on Futures as underlying
2. One cannot use the regular Black & Scholes Calculator for identifying the premium and Greeks
3. Black 76 is the model used for Options on futures
4. Upon exercising the option devolves into a futures position
5. CTM options are two strikes above and below ATM
6. If a CTM option holder does not give an explicit instruction, then the option is deemed worthless
7. An ITM option holder can give a ‘contrary instruction’, to choose not to exercise the option. You would opt for this if you know that the position is not going to be profitable owing to taxes and applicable charges

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Risk Management & Trading Psychology

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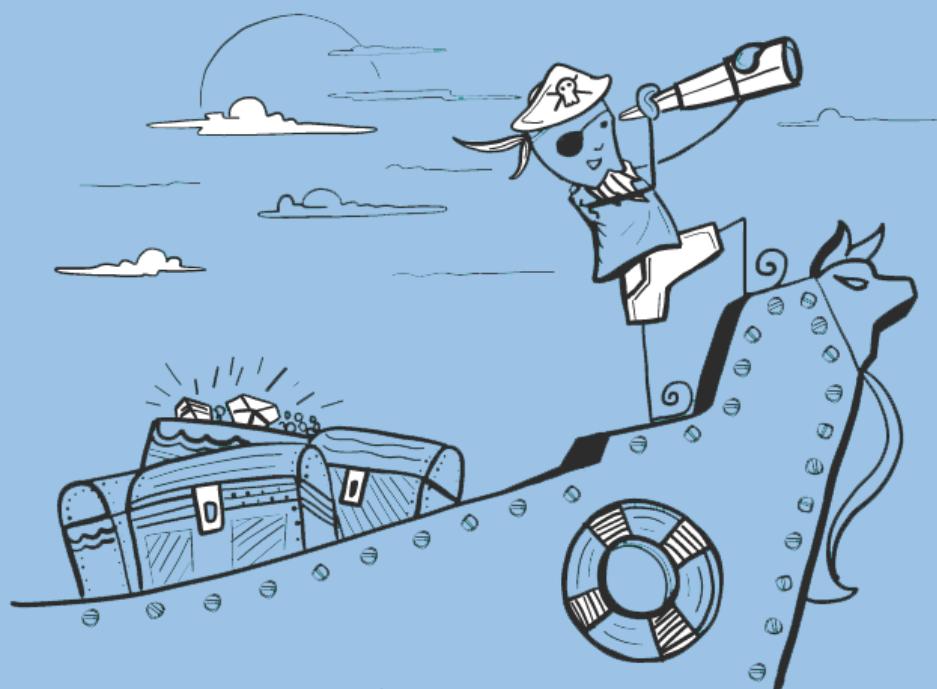


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CHAPTER 1

Orientation Note



1.1 – A unique opportunity

I'm excited about this brand new module on Varsity, wherein we will be discussing two important and closely related market topics – 'Risk Management and Trading Psychology'. While risk management may seem straightforward, 'psychology' may sound boring. Trust me; both these topics can potentially open up new realms of trading. Risk management, for instance, is not what you are thinking – it goes beyond the usual topics of position sizing, stop loss and leverage. While trading psychology is a reflection of your actions in the markets – helps you introspect and find answers to why and how you made a profit or a loss in a particular trade or investment.

Given the exhaustive nature of these topics, I tried looking for ideas on how best I can structure this module, and what chapters to include, and to my surprise, there are no contents related to these topics. Of course, you can find tonnes of content online, but they are all fragmented and lack continuity. This gives us both the opportunity and the responsibility to develop some dependable content around these topics, centered on the

Indian context. We will have to work as a team here – we will take up the responsibility to post the content and you will have to take up the responsibility to enrich it by posting queries and comments.

1.2 – What to expect?

At this stage, I can give you a brief orientation on what to expect, however as we proceed, if necessary I'll take the liberty to alter the learning methodology, although not too drastically.

So there are 2 main topics we are dealing with here –

1. Risk Management
2. Trading psychology

Risk management techniques vary based on how you are positioned in the market. For example, if you have a single position in the market, then your approach to risk management is very different compared to the risk management techniques of multiple positions, which is again completely different compared to the risk management techniques of a portfolio.

Given this, we will look at risk management from multiple angles –

1. Risk Management from a single trading position
2. Risk management from multiple trading positions
3. Risk management for a portfolio

In my attempt to explain the above, I will cover the following topics –

1. Risk and its many forms
2. Position sizing – guess this one is mandatory to cover
3. Single position risk
4. Multiple position risk and hedging
5. Hedging with options
6. Portfolio attributes and risk estimation
7. Value at Risk
8. Asset allocation and its impact on risk (and returns)
9. Insights from the portfolio equity curve

I'm guessing these topics will give you a completely different perspective on risk and how one can manage risk.

Further, we would be discussing trading psychology both from a trader and an investor's perspective. The discussion would largely involve cognitive biases, mental models, common

pitfalls, and the thought process which leads you these pitfalls. Here are some of the topics we would be discussing in this section –

1. Anchoring bias
2. Regency bias
3. Confirmation bias
4. Bandwagon effect
5. Loss aversion
6. Illusion of control
7. Hindsight bias

Of course, we will build upon this as we proceed. This is going to be an exciting discussing these topics.

Stay tuned.

CHAPTER 2

Risk (Part 1)

2.1. Warming up to risk

For every rupee of profit made by a trader, there must be a trader losing that rupee. As an extension of this, if there is a group of traders consistently making money, then there must be another group of traders consistently losing money. Usually, this group making money consistently is small, as opposed to the group of traders who lose money consistently.

The difference between these two groups is their understanding of Risk and their techniques of money management. Mark Douglas, in his book ‘The Disciplined Trader’, says successful trading is 80% money management and 20% strategy. I could not agree more.

Money management and associated topics largely involve assessment of risk. So in this sense, understanding risk and its many forms become essential at this point. For this reason, let us break down risk to its elementary form to get a better understanding of risk.

The usual layman definition of risk in the context of the stock market is the ‘probability of losing money’. When you transact in the markets, you are exposed to risk, which means you can (possibly) lose money. For example, when you buy the stock of a company, whether you like it or not, you are exposed to risk. Further, at a very high level, risk can be broken down into two types – Systematic Risk and Unsystematic Risk. You are automatically exposed to both these categories of risks when you own a stock.

Think about it, why do you stand to lose money? Or in other words, what can drag the stock price down? Many reasons as you can imagine, but let me list down a few –

1. Deteriorating business prospects
2. Declining business margins
3. Management misconduct
4. Competition eating margins

All these represent a form of risk. In fact, there could be many other similar reasons and this list can go on. However, if you notice, there is one thing common to all these risks – they are all risks specific to the company. For example, imagine you have an investable capital of Rs.1,00,000/-. You decide to invest this money in HCL Technologies Limited. A few months

later HCL declares that their revenues have declined. Quite obviously HCL stock price will also decline. Which means you will lose money on your investment. However, this news will not impact HCL's competitor's stock price (Mindtree or Wipro). Likewise, if HCL's management is guilty of any misconduct, then HCL's stock price will go down and not its competitors. Clearly, these risks are specific to this one company alone and not its peers.

Let me elaborate on this – I'm not sure how many of you were trading the markets when the 'Satyam scam' broke out on the morning of 7th January 2009. I certainly was, and I remember the day very well. Satyam Computers Limited had been cooking its books, inflating numbers, mishandling funds, and misleading its investors for many years. The numbers shown were way above the actual, myriads of internal party transactions; all these resulting in inflated stock prices. The bubble finally burst, when the then Chairman, Mr.Ramalinga Raju made a bold confession of this heinous financial crime via a letter addressed to the investors, stakeholders, clients, employees, and exchanges. You have to give him credit for taking such a huge step; I guess it takes a massive amount of courage to own up to such a crime, especially when you are fully aware of the ensuing consequences.

Anyway, I remember watching this in utter disbelief – Udayan Mukherjee read out this super explosive letter, live on TV, as the stock price dropped like a stone would drop off a cliff. This, for me, was one of the most spine-chilling moments in the market, watch the video [here](#)

I want you to notice few things in the above video –

1. The rate at which the stock price drops (btw, the stock price continued to drop to as low as 8 or 7)
2. If you manage to spot the scrolling ticker, notice how the other stocks are NOT reacting to Satyam's big revelation
3. Notice the drop in the indices (Sensex and Nifty), they do not drop as much as that of Satyam.

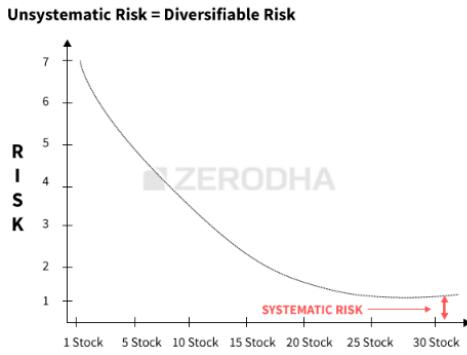
The point here is simple – the drop in stock price can be attributed completely to the events unfolding in the company. Other external factors do not have any influence on the price drop. Rather, a better way of placing this would be – at that given point, the drop in stock price can only be attributable to company specific factors or internal factors. The risk of losing money owing to company specific reasons (or internal reasons) is often termed as "Unsystematic Risk".



Unsystematic risk can be diversified, meaning instead of investing all the money in one company, you can choose to invest in 2-3 different companies (preferably from different sectors). This is called ‘diversification’. When you diversify your investments, unsystematic risk drastically reduces. Going back to the above example, imagine instead of buying HCL for the entire capital, you decide to buy HCL for Rs.50,000/- and maybe Karnataka Bank Limited for the other Rs.50,000/-, in such circumstances, even if HCL stock price declines (owing to the unsystematic risk) the damage is only on half of the investment as the other half is invested in a different company. In fact, instead of just two stocks, you can have a 5 or 10 or maybe 20 stock portfolio. The higher the number of stocks in your portfolio, higher the diversification, and therefore lesser the unsystematic risk.

This leads us to a very important question – how many stocks should a good portfolio have so that the unsystematic risk is completely diversified. Research has it that up to 21 stocks in the portfolio will have the required necessary diversification effect and anything beyond 21 stocks may not help much in diversification. I personally own about 15 stocks in my equity portfolio.

The graph below should give you a fair sense of how diversification works –



As you can notice from the graph above, the unsystematic risk drastically reduces when you diversify and add more stocks. However, after about 20 stocks, the unsystematic risk is not really diversifiable, this is evident as the graph starts to flatten out after 20 stocks. In fact, the risk that remains even after diversification is called the “Systematic Risk”.

Systematic risk is the risk that is common to all stocks in the markets. Systematic risk arises out of common market factors such as the macroeconomic landscape, political situation, geographical stability, monetary framework etc. A few specific systematic risks which can drag the stock prices down are: –

1. De-growth in GDP
2. Interest rate tightening
3. Inflation
4. Fiscal deficit
5. Geopolitical risk

The list, as usual, can go on but I suppose you get a fair idea of what constitutes a systematic risk. Systematic risk affects all stocks. Assuming, you have a well diversified 20 stocks portfolio, a de-growth in GDP will indiscriminately affect all the 20 stocks and hence the stock price of stocks across the board will decline. Systematic risk is inherent in the system and it cannot really be diversified. Remember, ‘unsystematic risk’ can be diversified, but systematic risk cannot be. However, systematic risk can be ‘hedged’. Hedging is a craft, a technique one would use to get rid of the systematic risk. Think of hedging as carrying an umbrella with you on a dark cloudy day. The moment, it starts pouring, you snap your umbrella out and you instantly have a cover on your head.

So when we are talking about hedging, do bear in mind that it is not the same as diversification. Many market participants confuse diversification with hedging. They are two different things. Remember, we diversify to minimise unsystematic risk and we hedge to

minimise systematic risk and notice I use the word ‘minimise’ – this is to emphasise the fact that no investment/trade in the market should be ever considered safe in the markets.

Not mine, not yours.

2.2 – Expected Return

We will briefly talk about the concept of ‘Expected Return’ before we go back to the topic of Risk. It is natural for everyone to expect a return on the investments they make. The expected return on an investment is quite straight forward – the return you would expect from it. If you invest your money in Infosys and expect to generate 20% return in one year, then the expected return is just that – 20%.

Why is this important especially when it sounds like a no-brainer? Well, the ‘expected return’ plays a crucial role in finance. This is the number we plug in for various calculations – be it portfolio optimisation or a simple estimation of equity curve. So in a sense, expecting a realistic return plays a pivotal role in investment management. Anyway, more on this topic as we proceed. For now, let us stick to basics.

So continuing with the above example – if you invest Rs.50,000/- in Infy (for a year) and you expect 20% return, then the expected return on your investment is 20%. What if instead, you invest Rs.25,000/- in Infy for an expected return of 20% and Rs.25,000/- in Reliance Industries for an expected return of 15%? – What is the overall expected return here? Is it 20% or 15% or something else?

As you may have guessed, the expected return is neither 20% nor 15%. Since we made investments in 2 stocks, we are dealing with a portfolio, hence, in this case, the expected return is that of a portfolio and not the individual asset. The expected return of a portfolio can be calculated with the following formula –

$$E(RP) = W_1R_1 + W_2R_2 + W_3R_3 + \dots + W_nR_n$$

Where,

$E(RP)$ = Expected return of the portfolio

W = Weight of investment

R = Expected return of the individual asset

In the above example, the invested is Rs.25,000/- in each, hence the weight is 50% each. Expected return is 20% and 15% across both the investment. Hence –

$$E(RP) = 50\% * 20\% + 50\% * 15\%$$

$$= 10\% + 7.5\%$$

$$= 17.5\%$$

While we have used this across two stocks, you can literally apply this concept across any number of assets and asset classes. This is a fairly simple concept and I hope you've had no problem understanding this. Most importantly, you need to understand that the expected return is not 'guaranteed' return; rather it is just a probabilistic expectation of a return on an investment.

Now that we understand expected returns, we can build on some quantitative concepts like variance and covariance. We will discuss these topics in the next chapter.

Key takeaways from this chapter

1. When you buy a stock you are exposed to unsystematic and systematic risk
2. Unsystematic risk with respect to a stock is the risk that exists within the company
3. Unsystematic risk affects only the stock and not its peers
4. Unsystematic risk can be mitigated by simple diversification
5. Systematic risk is the risk prevalent in the system
6. Systematic risk is common across all stock
7. One can hedge to mitigate systematic risk
8. No hedge is perfect – which means there is always an element of risk present while transacting in markets
9. Expected return is the probabilistic expectation of a return
10. Expected return is not a guarantee of return
11. The portfolio's expected return can be calculated as – $E(RP) = W_1R_1 + W_2R_2 + W_3R_3 + \dots + W_nR_n$

Risk (Part 2) – Variance & Covariance



3.1. Variance

In the previous chapter, we touched upon the topic of expected return, continuing on it, we will understand the concept of ‘Portfolio variance’. Portfolio Variance helps us understand the risk at a portfolio level. I’m hoping you are familiar with ‘Standard Deviation’ as a measure of risk. We have discussed standard deviation multiple times in the previous modules (refer to [Module 5, chapter 15 onwards](#)). I’d suggest you get familiar with it if you are not already. While we can easily measure the risk of a single stock by calculating its standard deviation, calculating the risk of a portfolio is a whole different ball game. When you put a few individual stocks together and create a portfolio, it becomes a different animal altogether. The agenda for this chapter is to help you understand how to estimate risk at a portfolio level.

However, before we proceed, we need to understand the concept of Variance and Covariance. Both Variance and Covariance are statistical measures. Let’s deal with the Variance first.

The variance of stock returns is a measure of how much a stock’s return varies with respect to its average daily returns. The formula to calculate variance is quite straight forward –

$$\sigma^2 = \sum \frac{(X - \mu)^2}{N}$$

Where,

σ^2 = Variance

X = Daily return

μ = Average of daily return

N = Total number of observation

Note, the variance is measured as sigma squared; I will not get into the reasons for this as the explanation is quite complex and we could digress. For now, I'd request you to be aware of the fact that variance is sigma squared. Anyway, calculating variance is quite simple, I'll take a simple example to help us understand this better.

Assume the daily return for a stock for 5 consecutive days is as below –

Day 1 – + 0.75%

Day 2 – + 1.25%

Day 3 – -0.55%

Day 4 – -0.75%

Day 5 – +0.8%.

In this case, the average return is +0.3%. We now need to calculate the dispersion of daily return over its average return, and also square the dispersion.

Daily Return	Dispersion from average	Dispersion squared
+ 0.75%	0.75% – 0.3% = + 0.45%	0.45%^2 = 0.002025%
+ 1.25%	+1.25% – 0.3% = + 0.95%	0.95%^2 = 0.009025%
-0.55%	-0.55% – 0.3% = -0.85%	-0.85%^2 = 0.007225%
-0.75%	-0.75% – 0.3% = -1.05%	-1.05%^2 = 0.011025%

Daily Return	Dispersion from average	Dispersion squared
+0.80%	+0.8% - 0.3% = +0.5%	0.50%^2 = 0.002500%

We now sum up the dispersion squared to get 0.0318000%. We divide this over 5 (N) to get the variance i.e.

$$0.0318000\% / 5$$

$$\sigma^2 = 0.0063600\%.$$

So what does this number tell us? It gives us a sense of how the daily returns are spread out from the average expected returns. So you as an investor should look into the variance to determine the riskiness of the investment. A large variance indicates that the stock could be quite risky while a small variance can indicate lesser risk. In the above example, I would consider the variance high, since we are looking at just 5 days' worth of data.

Now, here is something you may be interested in knowing. Variance and standard deviation are related to each other by the following simple mathematical relationship –

Square Root of Variance = Standard Deviation

We can apply this to the example above and calculate the 5-day standard deviation of the stock,

%

~ 0.8%

which is the standard deviation a.k.a. the volatility of the stock (over the last 5 days). Anyway, at this point, I want you to be aware of Variance and what it really means. We will eventually plug variance along with covariance into the portfolio variance equation.

3.2 – Covariance

Covariance indicates how two (or more) variables move together. It tells us whether the two variables move together (in which case they share a positive covariance) or they move in the opposite direction (negatively covariance). Covariance in the context of stock market measures how the stock prices of two stocks (or more) move together. The two stocks prices are likely to move in the same direction if they have a positive covariance; likewise, a negative covariance indicates that they two stocks move in opposite direction.

I understand covariance may sound similar to ‘correlation’, however, the two are different. We will discuss more on this further in the chapter.

I guess calculating the covariance for two stocks will help us get a grip on understanding covariance better. The formula to calculate covariance of two stocks is as follows –

$$\text{Covariance} = \sum \frac{(Rt\ S1 - \text{Avg}\ Rt\ S1) * (Rt\ S2 - \text{Avg}\ Rt\ S2)}{n-1}$$

Where,

Rt S1 = Daily stock return of stock 1

Avg Rt S1 = Average return of stock 1 over n period

Rt S2 = Daily stock return of stock 2

Avg Rt S2 = Average return of stock 2 over n period

n – The total number of days

In other words, you can calculate the covariance between two stocks by taking the sum product of the difference between the daily returns of the stock and its average return across both the stocks.

Sounds confusing? I guess so.

Let us take up an example and see how we can calculate the covariance between two stocks.

For the sake of this illustration, I’ve selected two stocks – Cipla Limited and Idea Cellular Limited. To calculate the covariance between these two stocks, we need to work around with the above formula. We will resort to good old excel to help us implement the formula.

Before we proceed, if you were to guess the covariance between Cipla and Idea, what do you think it would be? Think about it – two large corporate, similar size, but in two completely unrelated sectors. What do you think would be the covariance? Give it a thought.

Anyway, here are the steps involved in calculating covariance in excel (note, although there is a direct function in excel to calculate covariance, I’ll take the slightly longer approach, just to ensure clarity) –

Step 1 – Download the daily stock prices. For the purpose of this illustration, I’ve downloaded 6 months’ data for both the stocks.

Date	Cipla	Idea
1-Sep-16	579.15	83.65
2-Sep-16	577.95	84.45
6-Sep-16	578.6	84.85
7-Sep-16	580.75	83.7
8-Sep-16	595.15	84.5
9-Sep-16	580.5	83.6
12-Sep-16	570.1	82.8

Starting Date	1st Sept 2016
Ending Date	7th Mar 2017

Step 2 – Calculate the daily returns for both the stocks. Daily returns can be calculated by dividing today's stock price over yesterday's stock price and subtracting 1 from the result of this division

Date	Cipla	Daily Rt	Idea	Daily Rt
1-Sep-16	579.15		83.65	
2-Sep-16	577.95	=B3/B2-1	84.45	=D3/D2-1
6-Sep-16	578.6		84.85	
7-Sep-16	580.75		83.7	
8-Sep-16	595.15		84.5	
9-Sep-16	580.5		83.6	
12-Sep-16	570.1		82.8	

Step 3 – Calculate the average of the daily returns

A	B	C	D	E	F	G	H
Date	Cipla	Daily Rt	Idea	Daily Rt			
1-Sep-16	579.15		83.65				
2-Sep-16	577.95	-0.2%	84.45	1.0%			
6-Sep-16	578.6	0.1%	84.85	0.5%			
7-Sep-16	580.75	0.4%	83.7	-1.4%			
8-Sep-16	595.15	2.5%	84.5	1.0%			
9-Sep-16	580.5	-2.5%	83.6	-1.1%			
12-Sep-16	570.1	-1.8%	82.8	-1.0%			

Starting Date 1st Sept 2016
 Ending Date /th Mar 2017
 Cipla Avg Rt =AVERAGE(C3:C128)
 Idea Avg Rt =AVERAGE(E3:E126)

Step 4 – Once the average is calculated, subtract the daily return by its average

A	B	C	D	E	F	G	H	I	J
Date	Cipla	Daily Rt	Rt - Avg	Idea	Daily Rt	Rt - Avg			
1-Sep-16	579.15			83.65					
2-Sep-16	577.95	-0.2%	=C3-\$J\$7	84.45	1.0%	0.70%			
6-Sep-16	578.6	0.1%		84.85	0.5%				
7-Sep-16	580.75	0.4%		83.7	-1.4%				
8-Sep-16	595.15	2.5%		84.5	1.0%				
9-Sep-16	580.5	-2.5%		83.6	-1.1%				
12-Sep-16	570.1	-1.8%		82.8	-1.0%				
14-Sep-16	577.5	1.3%		83.75	1.1%				

Starting Date 1st Sept 2016
 Ending Date /th Mar 2017
 Cipla Avg Rt 0.02%
 Idea Avg Rt 0.26%

Step 5 – Multiply the two series calculated in the previous step

Date	Cipla	Rt1			Rt2			Rt1*Rt2
		Daily Rt	Rt - Avg	Idea	Daily Rt	Rt - Avg		
1-Sep-16	579.15			83.65				
2-Sep-16	577.95	-0.2%	-0.2%	84.45	1.0%	0.70%	=D4*G4	
6-Sep-16	578.6	0.1%	0.1%	84.85	0.5%	0.21%		
7-Sep-16	580.75	0.4%	0.3%	83.7	-1.4%	-1.61%		
8-Sep-16	595.15	2.5%	2.5%	84.5	1.0%	0.70%		
9-Sep-16	580.5	-2.5%	-2.5%	83.6	-1.1%	-1.32%		
12-Sep-16	570.1	-1.8%	-1.8%	82.8	-1.0%	-1.22%		

Step 6 – Sum up the calculation made in the previous step. Take a count of the number of data points. You can do this by using the count function in excel and giving any of the fields as the input array. I've used the count on the dates here.

Starting Date	1st Sept 2016
Ending Date	7th Mar 2017
Cipla Avg Rt	0.02%
Idea Avg Rt	0.26%
Sum	=SUM(H4:H129)
Count (n)	=COUNT(A3:A129)

Step 7 – This is the final step in calculating the covariance. To do so, one needs to divide the sum by count minus 1 i.e. (n-1). The count, in this case, is 127, so count-1 would be 126. Sum calculated in the previous step was 0.006642. Hence, covariance would be

$$= 0.006642/126$$

$$= 0.00005230$$

Date	Cipla	Rt1			Rt2			Rt1*Rt2
		Daily Rt	Rt - Avg	Idea	Daily Rt	Rt - Avg		
1-Sep-16	579.15			83.65				
2-Sep-16	577.95	-0.2%	-0.2%	84.45	1.0%	0.70%	-0.002%	
6-Sep-16	578.6	0.1%	0.1%	84.85	0.5%	0.21%	0.000%	
7-Sep-16	580.75	0.4%	0.3%	83.7	-1.4%	-1.61%	-0.006%	
8-Sep-16	595.15	2.5%	2.5%	84.5	1.0%	0.70%	0.017%	
9-Sep-16	580.5	-2.5%	-2.5%	83.6	-1.1%	-1.32%	0.033%	
12-Sep-16	570.1	-1.8%	-1.8%	82.8	-1.0%	-1.22%	0.022%	
14-Sep-16	577.5	1.3%	1.3%	83.75	1.1%	0.89%	0.011%	
15-Sep-16	585.4	1.4%	1.3%	84.5	0.9%	0.64%	0.009%	
16-Sep-16	593.55	1.4%	1.4%	85.15	0.8%	0.51%	0.007%	
19-Sep-16	597.8	0.7%	0.7%	84.85	-0.4%	-0.61%	-0.004%	

Starting Date	1st Sept 2016
Ending Date	7th Mar 2017
Cipla Avg Rt	0.02%
Idea Avg Rt	0.26%
Sum	0.006642
Count (n)	127
Count -1	126
Covariance	=L9/L11

You can [download](#) the excel sheet.

As you can see, the covariance number is quite small. However, that's not the point here. We only look at whether the two stocks share a positive or negative covariance. Clearly, since the two stocks share a positive covariance, it means that the returns of the two stocks move in similar directions. It means that for a given situation in the market, both the stocks are likely

to move in the same direction. Note – covariance does not tell us the degree to which the two stocks move. The degree or magnitude is captured by correlation. The correlation between Idea and Cipla is 0.106, which indicates that the two stocks are not tightly correlated.

By the way, here is something very interesting fact. The mathematical equation for correlation between two stocks is as follows –

$$\text{Correlation} = \frac{\text{Cov}(x, y)}{\sigma_x * \sigma_y}$$

Where,

$\text{Cov}(x, y)$ is the covariance between the two stocks

σ_x = Standard deviation of stock x

σ_y = Standard deviation of stock y

Note, the standard deviation of a stock is simply the square root of the variance of the stock. Here is a task for you – we have calculated the correlation between Idea and Cipla using the direct excel function. Can you confirm the accuracy by implementing the formula?

Anyway, in the case of building a stock portfolio, do you think a positive covariance is good or bad? Or rather do portfolio managers desire stocks (in their portfolio) which share a positive covariance or they don't? Well, portfolio managers strive to select stocks which share a negative covariance. The reason is quite simple – they want stocks in the portfolio which can hold up. Meaning if one stock goes down, they want, at least the other to hold up. This kind of counter balances the portfolio and reduces the overall risk.

Now, think about a regular portfolio – it will certainly contain more than 2 stocks. In fact, a good portfolio will contain at least 12-15 stocks. How would one measure covariance in this case? This is where things start getting complicated. One will have to measure covariance of each stock with all the other stocks in the portfolio. Let me illustrate this with a 4 stocks portfolio. Assume the portfolio is like this –

1. ABB
2. Cipla
3. Idea
4. Wipro

In this case, we need to calculate the covariance across –

1. ABB, Cipla
2. ABB, Idea
3. ABB, Wipro
4. Cipla, Idea
5. Cipla, Wipro
6. Idea, Wipro

Note, the covariance between stock 1 and stock 2 is the same as the covariance between stock 2 and stock 1. So as you can see, 4 stocks require us to compute 6 covariances. You can imagine the complexity when we have 15 or 20 stocks. In fact, when we have more than 2 stocks in the portfolio, the covariance between them is calculated and tabulated using a ‘Variance – Covariance Matrix’. I would love to talk about this now, but I guess, I’ll will keep it for the next chapter.

Stay tuned for more!

Key takeaways from this chapter

1. Variance measures the dispersion of returns over the expected average returns
2. Higher variance indicates higher risk, lower variance indicates lower risk
3. Square root of variance is standard deviation
4. Covariance between the returns of two stock measures how the returns of the two stocks vary
5. A positive covariance indicates that the returns move positively and a negative covariance indicates that while one stock returns moves up, the other comes down
6. Correlation measures the strength of the movement
7. Covariance between two stocks divided over their individual standard deviations results in a correlation between two stocks.
8. When we have more than 2 stocks in a portfolio, we compute the variance-covariance using a matrix

CHAPTER 4

Risk (Part 3) – Variance & Covariance Matrix

4.1 – A quick recap

Let us begin this chapter with a quick recap of our discussion so far.

We started this module with a discussion on the two kinds of risk a market participant is exposed to, when he or she purchases a stock – namely the systematic risk and the unsystematic risk. Having understood the basic difference between these two types of risk, we proceeded towards understanding **risk from a portfolio perspective**. In our discussion leading to portfolio risk or portfolio variance, we discussed two crucial concepts – variance and covariance. **Variance** is the deviation of a stock's return with its own average returns. **Covariance** on the other hand is the variance of a stock's return with respect to another stock's return. The discussion on variance and covariance was mainly with respect to a two stock portfolio; however, we concluded that a typical equity portfolio contains multiple stocks. In order to estimate the variance covariance and the correlation of a multi stock portfolio, we need the help of **matrix algebra**.

So that's where we are as of now.

In this chapter we will extent this discussion to estimate the 'variance covariance' of multiple stocks; this will introduce us to matrix multiplication and other concepts. However, the 'variance covariance' matrix alone does not convey much information. To make sense of this, we need to develop the correlation matrix. Once we are through with this part, we use the results of the correlation matrix to calculate the **portfolio variance**. Remember, our end goal is to estimate the portfolio variance. Portfolio variance tells us the amount of risk one is exposed to when he or she holds a set of stocks in the portfolio.

At this stage you should realize that we are focusing on risk from the entire portfolio perspective. While we are at it we will also discuss 'asset allocation' and how it impacts portfolio returns and risk. This will also include a quick take on the concept of 'value at risk'.

Of course, we will also take a detailed look at risk from a trader's perspective. How one can identify trading risk and ways to mitigate the same.



4.2 – Variance Covariance matrix

Before we proceed any further, I've been talking about 'Variance Covariance matrix'. Just to clear up any confusion – is it 'variance covariance matrix' or is it a variance matrix and a covariance matrix? Or is it just one matrix i.e. the 'Variance Covariance matrix'.

Well, is it just one matrix i.e. the 'Variance Covariance matrix'. Think about it, if there are 5 stocks, then this matrix should convey information on the variance of a stock and it should also convey the covariance of between stock 1 and the other 4 stock. Soon we will take up an example and I guess you will have a lot more clarity on this.

Please do note – it is advisable for you to know some basis on matrix operations. If not, here is a great video from Khan Academy which introduces matrix multiplication –

Anyway, continuing from the previous chapter, let us now try and calculate the Variance Covariance matrix followed by the correlation matrix for a portfolio with multiple stocks. A well-diversified (high conviction) portfolio typically consists of about 10-15 stocks. I'd have loved to take up a portfolio of this size to demonstrate the calculation of the variance covariance matrix, but then, it would be a very cumbersome affair on excel and there is a good chance a newbie could get intimidated with the sheer size of the matrix, hence for this reason, I just decided to have a 5 stock portfolio.

The following 5 stocks constitutes my portfolio –

1. Cipla
2. Idea
3. Wonderla
4. PVR
5. Alkem

The size of the variance covariance matrix for a 5 stock portfolio will be 5×5 . In general, if there are 'k' stocks in the portfolio, then the size of the variance covariance matrix will be **$k \times k$** (read this as k by k).

The formula to create a variance covariance matrix is as follows –

$$\Sigma_{k \times k} = \left(\frac{1}{n} \right) X^T X$$

Where,

k = number of stocks in the portfolio

n = number of observations

X = this is the $n \times k$ excess return matrix. We will understand this better shortly

X^T = transpose matrix of X

Here is a quick explanation of what is going on in that formula. You may understand this better when we deal with its implementation.

In simple terms, we first calculate the **$n \times k$ excess return matrix**; multiply this matrix by its own transpose matrix. This is a matrix multiplication and the resulting matrix will be a **$k \times k$** matrix. We then divide each element of this $k \times k$ matrix by n , where n denotes the number of observations. The resulting matrix after this division is a **$k \times k$ variance covariance matrix**.

Generating the $k \times k$ variance covariance matrix is one step away from our final objective i.e. getting the correlation matrix.

So, let us apply this formula and generate the variance covariance matrix for the 5 stocks listed above. I'm using MS excel for this. I have downloaded the daily closing prices for the 5 stocks for the last 6 months.

Step 1 – Calculated the daily returns. I guess you are quite familiar with this by now. I'm not going to explain how to calculate the daily returns. Here is the excel snapshot.

Variance Covariance & Correlation Matrix

Date	Cipla	Rt	Idea	Rt	Wonderla	Rt	PVR	Rt	Alkem	Rt
1-Sep-16	579.15		83.65		410.25		1185.45		1569.85	
2-Sep-16	577.95	-0.21%	84.45	0.96%	409.55	-0.17%	1273.45	7.42%	1636.5	=J5/J4-1
6-Sep-16	578.6	0.11%	84.85	0.47%	406.6	-0.72%	1261	-0.98%	1644.75	0.50%
7-Sep-16	580.75	0.37%	83.7	-1.36%	405.6	-0.25%	1241.65	-1.53%	1616.9	-1.69%
8-Sep-16	595.15	2.48%	84.5	0.96%	405.6	0.00%	1237.9	-0.30%	1635.9	1.18%
9-Sep-16	580.5	-2.46%	83.6	-1.07%	404.55	-0.26%	1219.75	-1.47%	1602.85	-2.02%
12-Sep-16	570.1	-1.79%	82.8	-0.96%	400.5	-1.00%	1179.25	-3.32%	1616.35	0.84%
14-Sep-16	577.5	1.30%	83.75	1.15%	400.25	-0.06%	1173.6	-0.48%	1624.3	0.49%

As you can see, I've lined up the stock's closing price and next to it I have calculated the daily returns. I have indicated the formula to calculate the daily return.

Step 2 – Calculate the average daily returns for each stock. You can do this by using the ‘average’ function in excel.

Variance Covariance & Correlation Matrix

Date	Cipla	Rt	Idea	Rt	Wonderla	Rt	PVR	Rt	Alkem	Rt
6-Mar-17	590.1	0.25%	109.75	-0.72%	380.2	0.52%	1331.9	1.67%	2110.2	-1.34%
7-Mar-17	588.05	-0.35%	108.6	-1.05%	381.2	0.26%	1344.6	0.95%	2048.6	-2.92%
Average Daily Rt	0.06%		0.57%		0.06%		0.15%		=AVERAGE(K51:K130)	

Step 3 – Set up the excess return matrix.

Excess return matrix is defined as the difference between stock's daily return over its average return. If you recall, we did this in the previous chapter while discussing covariance between two stocks.

I've set up the excess return matrix in the following way –

Variance Covariance & Correlation Matrix											X = Excess Retun matrix				
Date	Cipla	Rt	Idea	Rt	Wonderla	Rt	PVR	Rt	Alkem	Rt	Cipla	Idea	Wonderla	PVR	Alkem
21-Feb-17	593.1	0.06%	108.35	-0.09%	374.15	0.32%	1268	-0.04%	2000.05	-1.73%	0.00%	-0.66%	0.26%	-0.19%	-0.202%
22-Feb-17	589.25	-0.65%	112.6	3.92%	374.45	0.08%	1263.35	-0.37%	2022.55	1.12%	-0.71%	3.36%	0.02%	-0.52%	0.84%
23-Feb-17	592.4	0.53%	119.6	6.22%	373.4	-0.28%	1260.1	-0.26%	2076.85	2.68%	0.47%	5.65%	-0.34%	-0.41%	2.40%
27-Feb-17	585.25	-1.21%	114.55	-4.22%	373.85	0.12%	1278.1	1.43%	2154.75	3.75%	-1.27%	-4.79%	0.06%	1.27%	3.46%
28-Feb-17	583.7	-0.26%	115.85	1.13%	372.4	-0.39%	1295.55	1.37%	2141.55	-0.61%	-0.33%	0.57%	-0.45%	1.21%	-0.90%
1-Mar-17	586.3	0.45%	113.25	-2.24%	373.8	0.38%	1296.25	0.05%	2144.15	0.12%	0.38%	-2.81%	0.32%	-0.10%	-0.17%
2-Mar-17	589.25	0.50%	109.6	-3.22%	375.3	0.40%	1303.65	0.57%	2142.1	-0.10%	0.44%	-3.79%	0.34%	0.42%	-0.38%
3-Mar-17	588.6	-0.11%	110.55	0.87%	378.25	0.79%	1310.05	0.49%	2138.95	-0.15%	-0.17%	0.30%	0.73%	0.34%	=K128-\$K\$131
6-Mar-17	590.1	0.25%	109.75	-0.72%	380.2	0.52%	1331.9	1.67%	2110.2	-1.34%	0.19%	-1.29%	0.46%	1.51%	-1.63%
7-Mar-17	588.05	-0.35%	108.6	-1.05%	381.2	0.26%	1344.6	0.95%	2048.6	-2.92%	-0.41%	-1.61%	0.21%	0.80%	-3.21%
Average Daily Rt	0.06%		0.57%		0.06%		0.15%		0.29%		n =	127		k=	5

Do note, the resulting matrix is of $n \times k$ size, where n represents the number of observations (127 in this case) and k denotes the number of stocks (5 stocks). So in our example the matrix size is 127×5 . We have denoted this matrix as X.

Step 4 – Generate the $X^T X$ matrix operation to create a $k \times k$ matrix

This may sound fancy, but it is not.

X^T is a new matrix, formed by interchanging the rows and columns of the original matrix X. When you interchange the rows and columns of a matrix to form a new one, then it is referred to as a transpose matrix of X and denoted as X^T . Our objective now is to multiply the original matrix with its transpose. This is denoted as $X^T X$.

Note, the resulting matrix from this operation will result in a $k \times k$ matrix, where k denotes the number of stocks in the portfolio. In our case this will be 5×5 .

We can do this in one shot in excel. I will use the following function steps to create the $k \times k$ matrix –

List down the stocks in rows and columns –

X transpose multiplied by X

	Cipla	Idea	Wonderla	PVR	Alkem
Cipla					
Idea					
Wonderla					
PVR					
Alkem					

Apply the function = 'MMULT ((transpose X), X). Remember X is the excess return matrix.

X = Excess Return matrix						
Alkem	Rt	Cipla	Idea	Wonderla	PVR	Alkem
1569.85						
1636.5	4.25%	-0.27%	0.39%	-0.23%	7.27%	3.96%
1644.75	0.50%	0.05%	-0.09%	-0.78%	-1.13%	0.22%
1616.9	-1.69%	0.31%	-1.92%	-0.30%	-1.69%	-1.98%
1635.9	1.18%	2.42%	0.39%	-0.06%	-0.46%	
1602.85	-2.02%	-2.52%	-1.63%	-0.32%	-1.62%	-2.31%
1616.35	0.84%	-1.85%	-1.52%	-1.06%	-3.47%	0.55%
1624.3	0.49%	1.24%	0.58%	-0.12%	-0.63%	0.20%
1622.35	-0.12%	1.31%	0.33%	-0.21%	-1.43%	-0.41%

X transpose multiplied by X						
	Cipla	Idea	Wonderla	PVR	Alkem	
Cipla						
Idea						
Wonderla						
PVR						
Alkem						

Do note, while applying this formula, you need to ensure that you highlight the k x k matrix. Once you finish typing the formula, do note – you cannot hit ‘enter’ directly. You will hit **ctrl+shift+enter**. In fact, for all array functions in excel, use ctrl+shift+enter.

So once you hit ctrl+shift+enter, excel will present you with a beautiful k x k matrix, which in this case looks like this –

X transpose multiplied by X

	Cipla	Idea	Wonderla	PVR	Alkem
Cipla	0.02788	0.00679	0.00425	0.00515	0.00804
Idea	0.00679	0.14084	0.00497	0.00289	0.00475
Wonderla	0.00425	0.00497	0.03055	0.00500	0.00351
PVR	0.00515	0.00289	0.00500	0.05109	0.00338
Alkem	0.00804	0.00475	0.00351	0.00338	0.04310

Step 5 – This is the last step in creating the variance covariance matrix. We now have to divide each element of the $X^T X$ matrix by the total number of observations i.e. n. For your clarity, let me post the formula for the variance covariance matrix again –

$$\Sigma_{k \times k} = \left(\frac{1}{n} \right) X^T X$$

Again, we start by creating the layout for k x k matrix –

Variance Covariance matrix

	Cipla	Idea	Wonderla	PVR	Alkem
Cipla					
Idea					
Wonderla					
PVR					
Alkem					

Once the layout is set, without deselecting the cells, select the entire $X^T X$ matrix and divide it by n i.e. 127. Do note, this is still an array function; hence you need to hit **ctrl+shift+enter** and not just enter.

X transpose multiplied by X

	Cipla	Idea	Wonderla	PVR	Alkem
Cipla	0.02788	0.00679	0.00425	0.00515	0.00804
Idea	0.00679	0.14084	0.00497	0.00289	0.00475
Wonderla	0.00425	0.00497	0.03055	0.00500	0.00351
PVR	0.00515	0.00289	0.00500	0.05109	0.00338
Alkem	0.00804	0.00475	0.00351	0.00338	0.04310

n

127

Variance Covariance matrix

	Cipla	Idea	Wonderla	PVR	Alkem
Cipla	=S8:W12/S14				
Idea					
Wonderla					
PVR					
Alkem					

Once you hit control shift enter, you will get the ‘Variance – Covariance’ matrix. Do note, the numbers in the matrix will be very small, do not worry about this. Here is the variance covariance matrix –

X transpose multiplied by X

	Cipla	Idea	Wonderla	PVR	Alkem
Cipla	0.02788	0.00679	0.00425	0.00515	0.00804
Idea	0.00679	0.14084	0.00497	0.00289	0.00475
Wonderla	0.00425	0.00497	0.03055	0.00500	0.00351
PVR	0.00515	0.00289	0.00500	0.05109	0.00338
Alkem	0.00804	0.00475	0.00351	0.00338	0.04310

n

127



Variance Covariance matrix

	Cipla	Idea	Wonderla	PVR	Alkem
Cipla	0.0002195	0.0000535	0.0000335	0.0000405	0.0000633
Idea	0.0000535	0.0011090	0.0000391	0.0000227	0.0000374
Wonderla	0.0000335	0.0000391	0.0002405	0.0000394	0.0000277
PVR	0.0000405	0.0000227	0.0000394	0.0004022	0.0000266
Alkem	0.0000633	0.0000374	0.0000277	0.0000266	0.0003393

Let us spend some time to understand the ‘Variance – Covariance’ matrix better. Suppose I want to know the covariance between any two stocks, let’s say Wonderla and PVR, then I simply have to look for Wonderla on the left hand side and in the same row, look for the value which coincides with PVR. This would be the covariance between the two stocks. I’ve highlighted the same in yellow –

Variance Covariance matrix

	Cipla	Idea	Wonderla	PVR	Alkem
Cipla	0.0002195	0.0000535	0.0000335	0.0000405	0.0000633
Idea	0.0000535	0.0011090	0.0000391	0.0000227	0.0000374
Wonderla	0.0000335	0.0000391	0.0002405	0.0000394	0.0000277
PVR	0.0000405	0.0000227	0.0000394	0.0004022	0.0000266
Alkem	0.0000633	0.0000374	0.0000277	0.0000266	0.0003393

So the matrix suggests that the covariance between Wonderla and PVR is 0.000034. Do note, this is the same as the covariance between PVR and Wonderla.

Further, notice the number highlighted in blue. This value corresponds to Cipla and Cipla. What do you this represents? This represents the covariance between Cipla and Cipla, and if you realize, covariance of a stock with itself, is nothing but variance!

This is exactly why this matrix is called ‘**Variance – Covariance Matrix**’, because it gives us both the values.

Now, here is the bitter pill – the variance and covariance matrix on its own is quite useless. These are extremely small numbers and it is hard to derive any meaning out of it. What we really need is the ‘Correlation Matrix’.

In the next chapter, let us deal with generating the correlation matrix, and also work towards estimating the portfolio variance, which is our end objective. However, before we close this chapter, here are few tasks for you –

1. Download the last 1-year data for 5 or more stocks.
2. Calculate the Variance – Covariance matrix for the same
3. For a given stock, identify the variance value. Apply the = ‘Var()’ function on excel on the returns of the same stock and evaluate if both are matching.

You can **download** the excel sheet used in this chapter.

Key Takeaways from this chapter

1. X is defined as an excess return matrix
2. Excess return matrix is simply the time series difference daily return versus the average daily return
3. X^T is defined as the transpose of X
4. Variable n is defined as the number of observations in the data set. For example, if you have 6 months' data, n is 127, for 1-year data n would be 252
5. Excess return matrix is of the size $n \times k$, where k is the number of stocks
6. When you divide the matrix product of $X^T X$ by n , we get the variance covariance matrix
7. The variance covariance matrix is of the size $k \times k$
8. The covariance of stock 1 with itself is the variance of stock 1
9. The variance covariance matrix will lead us to the correlation matrix.

CHAPTER 5

Risk (Part 4) – Correlation Matrix & Portfolio Variance



5.1 – Correlation Matrix

In the previous chapter, we successfully calculated the variance covariance matrix. As we discussed, these numbers are too small for us to make any sense. Hence, as a practice, it always makes sense to calculate the correlation matrix when we calculate the variance covariance matrix.

So let us go ahead and do this.

How is the correlation between two stocks calculated? Well, hopefully from the previous chapter, you will recall the formula for correlation –

$$\text{Correlation} = \frac{\text{Cov}(x, y)}{\sigma_x * \sigma_y}$$

Where,

$\text{Cov}(x, y)$ is the covariance between the two stocks

σ_x = Standard deviation of stock x

σ_y = Standard deviation of stock y

This works fine if we have 2 stocks in the portfolio, but since we have 5 stocks in the portfolio, we need to resort to matrix operation to find correlations. So, when we have multiple stocks in the portfolio, the correlations between stocks are all stacked up in a $n \times n$ (read it as n by n) matrix. For example, if it is a 5 stock portfolio (5 being the n here), then we need to create a 5×5 matrix.

The formula for calculating the correlation remains the same. Recall, from the previous chapter, we have the variance-covariance matrix. For the sake of convenience, I'll paste the image again here –

Variance Covariance matrix

	Cipla	Idea	Wonderla	PVR	Alkem
Cipla	0.0002195	0.0000535	0.0000335	0.0000405	0.0000633
Idea	0.0000535	0.0011090	0.0000391	0.0000227	0.0000374
Wonderla	0.0000335	0.0000391	0.0002405	0.0000394	0.0000277
PVR	0.0000405	0.0000227	0.0000394	0.0004022	0.0000266
Alkem	0.0000633	0.0000374	0.0000277	0.0000266	0.0003393

This takes care of the numerator part of the formula. We need to now calculate the denominator, which is simply the product of the standard deviation of stock A with the standard deviation of stock B. If the portfolio has 5 stock, then we need the product of the standard deviation of all possible combination between the stocks in the portfolio.

Let's go ahead and set this up.

We first need to calculate the standard deviations of each of the stocks in the portfolio. I'm assuming you are familiar how to do this. You just need to use the '=Stdev()' function on the daily returns array to get the standard deviations.

I've calculated the same on excel used in the previous chapter. Here is the image –

Standard Deviations

Cipla	=STDEV(C5:C130)
Idea	3.34%
Wonderla	1.56%
PVR	2.02%
Alkem	1.86%

Given that we have the stock specific standard deviations; we now need to get the product of the standard deviation of all possible portfolio combination. We resort to matrix multiplication for this. This can be easily achieved by multiplying the standard deviation array with the transpose of itself.

We first create the matrix skeleton and keep all the cells highlighted –

Product of SDs

	Cipla	Idea	Wonderla	PVR	Alkem
Cipla					
Idea					
Wonderla					
PVR					
Alkem					

Now, without deselecting the cells, we apply the matrix multiplication function. Note, we are multiplying the standard deviation array with the transpose of itself. The image below should give you an idea, do look at the formula used –

Standard Deviations

Cipla	1.49%
Idea	3.34%
Wonderla	1.56%
PVR	2.02%
Alkem	1.86%

Product of SDs

	Cipla	Idea	Wonderla	PVR	Alkem
Cipla	=MMULT(\$25:\$29,TRANSPOSE(\$25:\$29))			0.000301746	0.000277040
Idea	0.000498988	0.001117270	0.000521368	0.000675631	0.000620312
Wonderla	0.000232850	0.000521368	0.000243293	0.000315280	0.000289465
PVR	0.000301746	0.000675631	0.000315280	0.000408565	0.000375112
Alkem	0.000277040	0.000620312	0.000289465	0.000375112	0.000344399

As I mentioned in the previous chapter, whenever you use matrix or array function in excel, always hold the ‘ctrl+shift+enter’ combo. The resulting matrix looks like this –

Product of SDs

	Cipla	Idea	Wonderla	PVR	Alkem
Cipla	0.0002229	0.0004990	0.0002328	0.0003017	0.0002770
Idea	0.0004990	0.0011173	0.0005214	0.0006756	0.0006203
Wonderla	0.0002328	0.0005214	0.0002433	0.0003153	0.0002895
PVR	0.0003017	0.0006756	0.0003153	0.0004086	0.0003751
Alkem	0.0002770	0.0006203	0.0002895	0.0003751	0.0003444

At this point let me paste the formula for the correlation again –

$$\text{Correlation} = \frac{\text{Cov}(x, y)}{\sigma x * \sigma y}$$

The numerator is the variance covariance matrix as seen below, and the denominator is the product of the standard deviations which we have just calculated above –

Variance Covariance matrix

	Cipla	Idea	Wonderla	PVR	Alkem
Cipla	0.0002195	0.0000535	0.0000335	0.0000405	0.0000633
Idea	0.0000535	0.0011090	0.0000391	0.0000227	0.0000374
Wonderla	0.0000335	0.0000391	0.0002405	0.0000394	0.0000277
PVR	0.0000405	0.0000227	0.0000394	0.0004022	0.0000266
Alkem	0.0000633	0.0000374	0.0000277	0.0000266	0.0003393

Dividing the variance co-variance matrix by the product of the standard deviations should result in the correlation matrix. Do note, this is an element by element division, which is still an array function, so the use of ‘ctrl+shift+enter’ is necessary.

Product of SDs

	Cipla	Idea	Wonderla	PVR	Alkem
Cipla	0.0002229	0.0004990	0.0002328	0.0003017	0.0002770
Idea	0.0004990	0.0011173	0.0005214	0.0006756	0.0006203
Wonderla	0.0002328	0.0005214	0.0002433	0.0003153	0.0002895
PVR	0.0003017	0.0006756	0.0003153	0.0004086	0.0003751
Alkem	0.0002770	0.0006203	0.0002895	0.0003751	0.0003444

Correlation Matrix

	Cipla	Idea	Wonderla	PVR	Alkem
Cipla	=S18:W22/S33:W37				
Idea					
Wonderla					
PVR					
Alkem					

The resulting correlation matrix looks like this –

Correlation Matrix

	Cipla	Idea	Wonderla	PVR	Alkem
Cipla	1.0	0.10715052	0.14368425	0.13434778	0.22858556
Idea	0.10715052	1.0	0.07499042	0.03363225	0.06024903
Wonderla	0.14368425	0.07499042	1.0	0.12484625	0.09557120
PVR	0.13434778	0.03363225	0.12484625	1.0	0.07085759
Alkem	0.22858556	0.06024903	0.09557120	0.07085759	1.0

The correlation matrix gives us the correlation between any two stocks. For example, if I have to know the correlation between Cipla and Alkem, I simply have to look under the intersecting cell between Cipla and Alkem. There are two ways you can do this –

1. Look at the row belonging to Cipla and scroll till the Alkem column
2. Look at the row belonging to Alkem and scroll till the Cipla column

Both these should reflect the same result i.e. 0.2285. This is quite obvious since correlation between stock A with Stock B is similar to the correlation of Stock B with Stock A. For this reason, the matrix displays symmetrically similar values above and below the diagonal. Check this image below, I have highlighted the correlation between Cipla and Alkem and Alkem and Cipla –

Correlation Matrix

	Cipla	Idea	Wonderla	PVR	Alkem
Cipla	1.0	0.10715052	0.14368425	0.13434778	0.22858556
Idea	0.10715052	1.0	0.07499042	0.03363225	0.06024903
Wonderla	0.14368425	0.07499042	1.0	0.12484625	0.09557120
PVR	0.13434778	0.03363225	0.12484625	1.0	0.07085759
Alkem	0.22858556	0.06024903	0.09557120	0.07085759	1.0

The correlations along the diagonal represents the correlation of certain stock with itself. Do note, the correlation numbers above the diagonal is symmetrically similar to the correlation numbers below the diagonal.

Needless to say, correlation of Stock A with Stock A is always 1, which is what we have got in the diagonal and the same is highlighted in yellow boxes.

5.2 – Portfolio Variance

We are just few steps away from calculating the Portfolio Variance. As I have discussed earlier, we need the portfolio variance to identify the extent of risk my portfolio is exposed to. With this information, I'm no longer driving blind. In fact, one can develop many other insights based on this. Of course, we will talk about this going forward.

The first step in calculating portfolio variance is to assign weights to the stocks. Weights are simply the amount of cash we decide to invest in each stock. For example, if I have Rs.100, and I decide to invest all of that money in Stock A, then the weight in stock A is 100%. Likewise, if I decide to invest Rs.50 in A, Rs.20 in B, and Rs.30 in C, the weights in A, B, and C would be 50%, 20%, and 30% respectively.

I have arbitrarily assigned weights to the 5 stocks in the portfolio –

- Cipla @ 7%
- Idea @ 16%
- Wonderla @ 25%
- PVR @ 30%
- Alkem @ 22%

Clearly, there is no science to assigning weights at this stage. However, at a later point in the module I will discuss more about this part.

The next step is to calculate the weighted standard deviation. The Weighted standard deviation is simply the weight of a stock multiplied by its respective standard deviation. For example, Cipla's standard deviation is 1.49%, hence its weighted standard deviation would be **7% * 1.49% = 0.10%**

Here are the weights and the weighted standard deviation of 5 stocks in the portfolio –

Weights & weight SD

Stock	Weight	Wt.SD
Cipla	7.00%	0.104%
Idea	16.00%	0.535%
Wonderla	25.00%	0.390%
PVR	30.00%	0.606%
Alkem	22.00%	0.408%
Total Weight	100.00%	

Do note, the total weight should add up to 100% i.e. the sum of the individual weights in stocks should add up to 100%.

At this stage, we have all the individual components needed to calculate the ‘Portfolio Variance’. The formula to calculate the Portfolio Variance is as shown below –

$$\text{Portfolio Variance} = \text{Sqrt} (\text{Transpose} (\text{Wt.SD}) * \text{Correlation Matrix} * \text{Wt. SD})$$

Where,

Wt.SD is the weights standard deviation array.

We will implement the above formula in 3 steps –

1. Calculate the product of Transpose of Wt.SD with correlation matrix. This will result in a row matrix with 5 elements
2. Multiply the result obtained above (row matrix) with the weighted standard deviation array. This will result in a single number
3. Take the square root of the result obtained above to get the portfolio variance

So, let's jump straight ahead and solve for portfolio variance in the same order –

I will create row matrix called ‘M1’ with 5 elements. This will contain the product of the Transpose of Wt.SD with correlation matrix.

Correlation Matrix

	Cipla	Idea	Wonderla	PVR	Alkem
Cipla	1.0	0.10715052	0.14368425	0.13434778	0.22858556
Idea	0.10715052	1.0	0.07499042	0.03363225	0.06024903
Wonderla	0.14368425	0.07499042	1.0	0.12484625	0.09557120
PVR	0.13434778	0.03363225	0.12484625	1.0	0.07085759
Alkem	0.22858556	0.06024903	0.09557120	0.07085759	1.0

Weights & weight SD

Stock	Weight	Wt.SD
Cipla	7.00%	0.104%
Idea	16.00%	0.535%
Wonderla	25.00%	0.390%
PVR	30.00%	0.606%
Alkem	22.00%	0.408%
Total Weight	100.00%	

M1

Cipla	Idea	Wonderla	PVR	Alkem
=MMULT(TRANSPOSE(T49:T53),S41:W45)			0.007066495	0.005386129

Do note, you will have to select the empty array space and hold down the ctrl+shift+enter keys simultaneously.

We now create another value called 'M2', which contains the product of M1 and weighted standard deviation –

Weights & weight SD

Stock	Weight	Wt.SD
Cipla	7.00%	0.104%
Idea	16.00%	0.535%
Wonderla	25.00%	0.390%
PVR	30.00%	0.606%
Alkem	22.00%	0.408%
Total Weight	100.00%	

5R x 1C

M1

Cipla	Idea	Wonderla	PVR	Alkem
0.003910484	0.006162738	0.00555355	0.007066495	0.005386129

M2

=MMULT(R59:V59,T49:T53)

We obtain the value of M2 as 0.000123542, the square root of this value is the portfolio variance.

M2

0.000123542

Portfolio Variance

=SQRT(R62)

M2

0.000123542

Portfolio Variance

=SQRT(R62)

The result for the above operation yields a value of **1.11%**, which is the portfolio variance of the 5 stocks portfolio.

Phew!!

I need a break at this. Let's figure out the next steps in the next chapter J

Download the excel sheet used in this chapter.

Key takeaways from this chapter –

1. Correlation matrix gives out the correlation between any two stocks in a portfolio
2. Correlation between stock A with stock B is the same as the correlation between stock B with stock A
3. Correlation of a stock with itself is always 1
4. The diagonals of a correlation matrix should represent the correlation of stock A with itself
5. The correlation matrix contains symmetrical values above and below the diagonals

CHAPTER 6

Equity Curve

6.1 – Overview

This is off topic – but a little digression hurts no one, I guess. Of all the chapters I have written in Varsity, I guess this one will be a very special one for me. Not because of the topic that I will be discussing. It is because of the place where I’m sitting right now and writing this for you all. Its 6:15 AM – surrounding me 360 degrees are misty mountains; the landscape I guess cannot get any better. There is only one shack here with a little music player, playing Bob Marley’s Redemption Song. Can it get any better? At least not for me I guess



Anyway, back to school

We discussed Portfolio Variance in the previous chapter. It would be pointless to crunch all the numbers to extract the variance of the portfolio, unless we put that to good use. This is exactly what we will achieve over the next 2 chapters.

Over the next 2 chapters, we will try and do the following –

1. Discuss Equity curve and an alternate method to calculate portfolio variance
2. Estimate the portfolio's expected returns over 1 year
3. Optimize the portfolio for maximum returns and minimum variance

Note, this chapter is a continuation of the discussion panned out in the previous chapters. You need to know the context here. If you are reading this chapter without knowing what happened over the last few chapters, then I'd suggest you go back and read those chapters first.

6.2 – Equity Curve

We will use this opportunity to develop an equity curve for the 5 stock portfolio that we have. In a very lose sense, a typical equity curve helps you visualize the performance of the portfolio on a normalized scale of 100. In other words, it will help you understand how Rs.100/- invested in this portfolio would have performed over the given period. You can further use this to benchmark the portfolio's performance against its benchmark – say Nifty 50 or BSE Sensex.

There are certain attributes which can be extracted out of the equity curve to develop deeper insights on the portfolio. More on that later.

Let us proceed to build an equity curve for the 5 stock portfolio. Remember, we had the following stocks and we also assigned random weights to these stock to form our portfolio. Here are the stock names along with the weightages –

Stock Name	Investment weight
Cipla	7%
Idea Cellular Ltd	16%
Wonderla	25%
PVR	30%
Alkem	22%

So what does 'Investment weight' means? – It represents the percentage of your corpus invested in the stock. For example, out of Rs.100,000/-, Rs.7,000/- has been invested in Cipla and Rs.22,000/- has been invested in Alkem Lab. So on and so forth.

While developing an equity curve, the usual practice is to normalize the portfolio for Rs.100. This helps us understand how an investment of Rs.100/- in this portfolio behaved during the period of investment. I have incorporated this in the excel sheet (please note, the excel used here is a continuation of the excel used in the previous chapter)

Have a look at the image below –

Eq Curve & Optimization												Starting Value	Total Wt				
Date	Cipla	Rt	Wt	Idea	Rt	Wt	Wonderla	Rt	Wt	PVR	Rt	Wt	Alkem	Rt	Wt	100	100%
1-Sep-16	579.15		7%	83.65		16%	410.25		25%	1185.45		30%	1569.85		22%		
2-Sep-16	577.95	-0.21%	6.9855	84.45	0.96%		409.55	-0.17%		1273.45	7.42%		1636.5	4.25%			

I have introduced a new column next to the daily return column and included the weight of the respective stock. At the end, you will find two new column being introduced – starting value pegged at 100 and total weight at 100%.

Starting value – this is basically the amount of money we are starting with. I have set this to Rs.100/-. This means, out of the 100 Rupees in total corpus, Rupees 7 is being invested in Cipla, Rupees 16 in Idea, Rupee 25 in Wonderla so on and so forth.

Now, if I add up the individual weights, then they should all add up to 100%, indicating that 100% of Rs.100 is being invested.

We now have to see how the investment in each stock has performed. To help you understand this better, let's take up the case of Cipla for now. The weight assigned to Cipla is 7%, which means out of Rs.100, Rs.7 is invested in Cipla. Based on the daily price movement of Cipla, our money i.e. Rs.7/- either increases or decreases. It is important to note that, if on day 1, if Rs.7 becomes, Rs.7.5/- then the following day, our starting price is Rs.7.5 and not Rs.7/-. I've done this on excel for Cipla, and this is how the calculation looks.

Eq Curve & Optimization

Date	Cipla	Rt	Wt
1-Sep-16	579.15		7%
2-Sep-16	577.95	-0.21%	6.99
6-Sep-16	578.6	0.11%	=D5*(1+C6)
7-Sep-16	580.75	0.37%	7.02
8-Sep-16	595.15	2.48%	7.19

On 1st Sept, Cipla was trading at 579.15, this is the day we decided to invest Rs.7 in the stock. I understand that this is technically not possible, but for the sake of this example, let us just assume this is possible and proceed. So on day one i.e. 1st Sept, 7 is invested, on 2nd Sept

Cipla closed at 577.95, down -0.21% from the previous day. This also means we lose -0.21% on our investment of Rs.7/- making it Rs.6.985. On 6th Sept Cipla shot up by 0.11% to 578.6, hence we gain 0.11% on 6.985 to make it 6.993. So on and so forth the rest of the data points.

I've done this math for all the stocks in portfolio and here is how the table looks –

Eq Curve & Optimization

Date	Cipla	Rt	Wt	Idea	Rt	Wt	Wonderla	Rt	Wt	PVR	Rt	Wt	Alkem	Rt	Wt
1-Sep-16	579.15		7%	83.65		16%	410.25		25%	1185.45		30%	1569.85		22%
2-Sep-16	577.95	-0.21%	6.985	84.45	0.96%	16.153	409.55	-0.17%	24.957	1273.45	7.42%	32.227	1636.5	4.25%	22.934
6-Sep-16	578.6	0.11%	6.993	84.85	0.47%	16.230	406.6	-0.72%	24.778	1261	-0.98%	31.912	1644.75	0.50%	23.050
7-Sep-16	580.75	0.37%	7.019	83.7	-1.36%	16.010	405.6	-0.25%	24.717	1241.65	-1.53%	31.422	1616.9	-1.69%	22.659
8-Sep-16	595.15	2.48%	7.193	84.5	0.96%	16.163	405.6	0.00%	24.717	1237.9	-0.30%	31.327	1635.9	1.18%	22.926
9-Sep-16	580.5	-2.46%	7.016	83.6	-1.07%	15.990	404.55	-0.26%	24.653	1219.75	-1.47%	30.868	1602.85	-2.02%	22.462
12-Sep-16	570.1	-1.79%	6.891	82.8	-0.96%	15.837	400.5	-1.00%	24.406	1179.25	-3.32%	29.843	1616.35	0.84%	22.652
14-Sep-16	577.5	1.30%	6.980	83.75	1.15%	16.019	400.25	-0.06%	24.391	1173.6	-0.48%	29.700	1624.3	0.49%	22.763
15-Sep-16	585.4	1.37%	7.076	84.5	0.90%	16.163	399.65	-0.15%	24.354	1158.65	-1.27%	29.322	1622.35	-0.12%	22.736
16-Sep-16	593.55	1.39%	7.174	85.15	0.77%	16.287	394.75	-1.23%	24.055	1185	2.27%	29.989	1682.1	3.68%	23.573

I've calculated the daily fluctuation in the invested price across all stocks and I've highlighted the same in blue.

Now, think about what is happening here – I've basically split Rs.100/- across 5 stocks and invested in different proportions. If I sum up the daily variation in each stock, I should be able to get the overall daily fluctuation of Rs.100, right? Doing this gives me the overall perspective on how my portfolio is moving. Let me add these up and see how Rs.100 invested across 5 stocks moves on a daily basis –

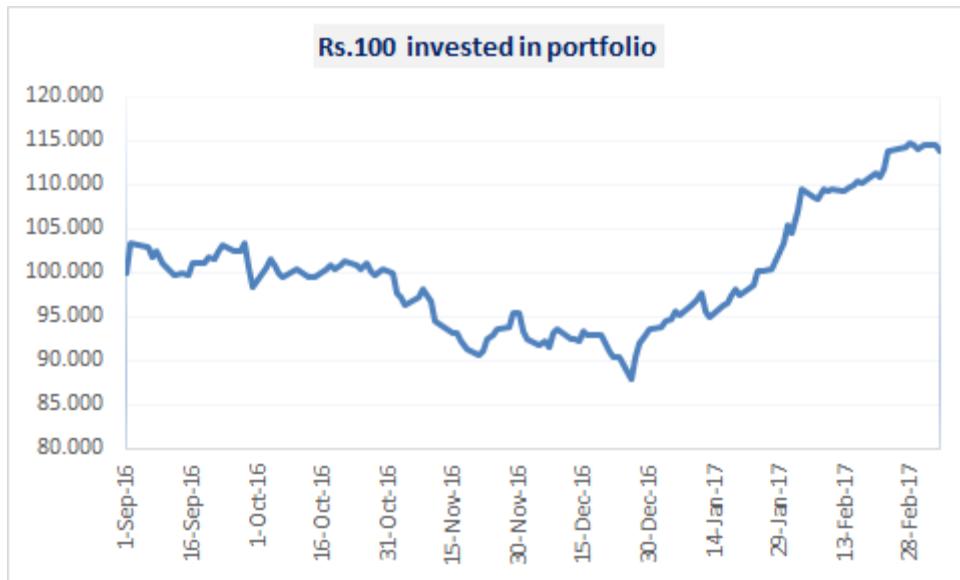
Eq Curve & Optimization															Starting Value	
Date	Cipla	Rt	Wt	Idea	Rt	Wt	Wonderla	Rt	Wt	PVR	Rt	Wt	Alkem	Rt	Wt	100
1-Sep-16	579.15		7%	83.65		16%	410.25		25%	1185.45		30%	1569.85		22%	
2-Sep-16	577.95	-0.21%	6.985	84.45	0.96%	16.153	409.55	-0.17%	24.957	1273.45	7.42%	32.227	1636.5	4.25%	22.934	=D5+G5+J5+M5+P5
6-Sep-16	578.6	0.11%	6.993	84.85	0.47%	16.230	406.6	-0.72%	24.778	1261	-0.98%	31.912	1644.75	0.50%	23.050	
7-Sep-16	580.75	0.37%	7.019	83.7	-1.36%	16.010	405.6	-0.25%	24.717	1241.65	-1.53%	31.422	1616.9	-1.69%	22.659	
8-Sep-16	595.15	2.48%	7.193	84.5	0.96%	16.163	405.6	0.00%	24.717	1237.9	-0.30%	31.327	1635.9	1.18%	22.926	
9-Sep-16	580.5	-2.46%	7.016	83.6	-1.07%	15.990	404.55	-0.26%	24.653	1219.75	-1.47%	30.868	1602.85	-2.02%	22.462	
12-Sep-16	570.1	-1.79%	6.891	82.8	-0.96%	15.837	400.5	-1.00%	24.406	1179.25	-3.32%	29.843	1616.35	0.84%	22.652	
14-Sep-16	577.5	1.30%	6.980	83.75	1.15%	16.019	400.25	-0.06%	24.391	1173.6	-0.48%	29.700	1624.3	0.49%	22.763	

Adding up the values on a daily basis gives me the time series of the daily fluctuation of the portfolio.

Eq Curve & Optimization															Starting Value	
Date	Cipla	Rt	Wt	Idea	Rt	Wt	Wonderla	Rt	Wt	PVR	Rt	Wt	Alkem	Rt	Wt	100
1-Sep-16	579.15		7%	83.65		16%	410.25		25%	1185.45		30%	1569.85		22%	
2-Sep-16	577.95	-0.21%	6.985	84.45	0.96%	16.153	409.55	-0.17%	24.957	1273.45	7.42%	32.227	1636.5	4.25%	22.934	103.257
6-Sep-16	578.6	0.11%	6.993	84.85	0.47%	16.230	406.6	-0.72%	24.778	1261	-0.98%	31.912	1644.75	0.50%	23.050	102.962
7-Sep-16	580.75	0.37%	7.019	83.7	-1.36%	16.010	405.6	-0.25%	24.717	1241.65	-1.53%	31.422	1616.9	-1.69%	22.659	101.827
8-Sep-16	595.15	2.48%	7.193	84.5	0.96%	16.163	405.6	0.00%	24.717	1237.9	-0.30%	31.327	1635.9	1.18%	22.926	102.326
9-Sep-16	580.5	-2.46%	7.016	83.6	-1.07%	15.990	404.55	-0.26%	24.653	1219.75	-1.47%	30.868	1602.85	-2.02%	22.462	100.990
12-Sep-16	570.1	-1.79%	6.891	82.8	-0.96%	15.837	400.5	-1.00%	24.406	1179.25	-3.32%	29.843	1616.35	0.84%	22.652	99.629

An 'Equity Curve' (EQ curve) can be developed if you plot the chart of this – i.e. the time series data of the daily normalized portfolio value. I say normalized because I've scaled down the investment to Rs.100/-.

So, here is the EQ curve for the portfolio that we have –



As easy as that. Eq curve is a very popular way of visualizing the portfolio performance. It gives a quick estimate of the returns generated by the portfolio. In this case, we started with an investment of Rs.100/- and at the end of 6 months the portfolio was valued at 113.84. Have a look at the image below –

Date	Cipla	Rt	Wt	Idea	Rt	Wt	Wonderla	Rt	Wt	PVR	Rt	Wt	Alkem	Rt	Wt	100
2-Mar-17	589.25	0.50%	7.122	109.6	-3.22%	20.964	375.3	0.40%	22.870	1303.65	0.57%	32.991	2142.1	-0.10%	30.020	113.967
3-Mar-17	588.6	-0.11%	7.114	110.55	0.87%	21.145	378.25	0.79%	23.050	1310.05	0.49%	33.153	2138.95	-0.15%	29.975	114.438
6-Mar-17	590.1	0.25%	7.132	109.75	-0.72%	20.992	380.2	0.52%	23.169	1331.9	1.67%	33.706	2110.2	-1.34%	29.573	114.572
7-Mar-17	588.05	-0.35%	7.108	108.6	-1.05%	20.772	381.2	0.26%	23.230	1344.6	0.95%	34.028	2048.6	-2.92%	28.709	113.846

So without much thinking, I know the portfolio has done close to 13.8% during the given period.

6.3 – Portfolio as a whole

Now, here is something I'd like you to think about. In the previous chapter, we calculated the portfolio variance. While doing so, one of the key things we had to calculate was the standard deviation of each stock. Standard deviation as you may know, represents the volatility of the stock which is nothing but the risk associated with the stock.

To calculate the standard deviation, we used the inbuilt excel function '=STDEV()' applied on the daily return of the stock. Now, think about this – we anyway have the daily value of the portfolio (although normalized to Rs.100).

Now imagine the portfolio itself in its entirety, as a whole, as a single stock, and calculate its daily returns. Just like how we calculated the daily returns of the stocks in the previous

chapter. Further, what if I apply the '=STDEV()' function on the portfolio's daily return? The resulting value should be the standard deviation of the portfolio which in other words should represent risk also called as Variance of the portfolio.

Are you able to sense where we are heading? Yes, we are talking about calculating portfolio variance using a different approach all together

To help you comprehend this better, let me paste the portfolio variance value we calculated in the previous chapter-

Portfolio Variance
1.11%

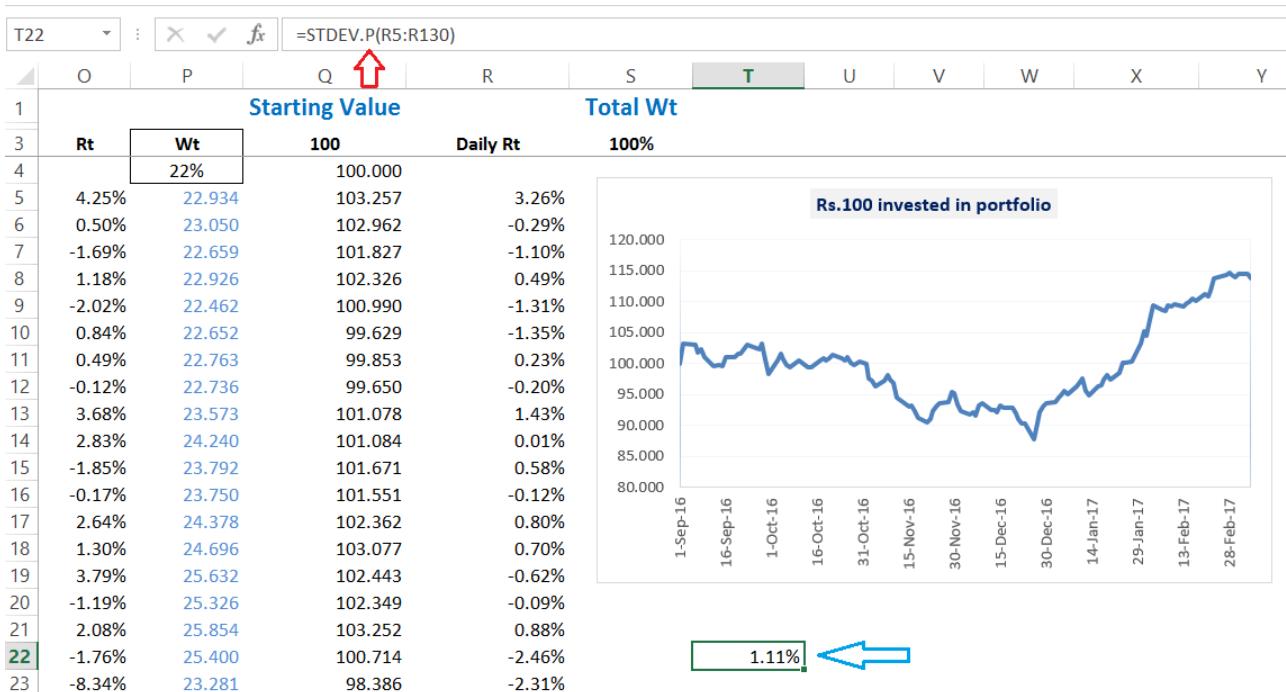
We calculated the above value using the matrix multiplication and the correlation matrix technique.

We will now look at the portfolio as a whole and calculate the daily returns of the normalized portfolio value. The standard deviation of the portfolio's daily returns should yield us a value equal to or somewhere near the portfolio variance calculated previously.

I've included a new column next to the daily normalized portfolio value and calculated the Portfolio's daily returns –

O	P	Q	R
Starting Value			
Rt	Wt	100	Daily Rt
	22%	100	
4.25%	22.934	100.000	
0.50%	23.050	103.257	=Q5/Q4-1
-1.69%	22.659	102.962	-0.29%
		101.827	-1.10%

Once I have the returns in place, I will apply the standard deviation function on the time series data, this should yield a value close to the portfolio variance value we previously calculated.



So there you go, the STDEV function gives us the exact same value!

You can **download** the excel sheet used in this chapter. In the next chapter, we will use the portfolio variance to estimate the expected returns along with optimization.

Quick Task – I'd like to leave you with a quick task here. We have assigned random weights to the stocks. Go ahead and change the weights of the stocks and see the impact on the overall returns. Do share your observation in the comment box below.

Key takeaways from this chapter

1. An equity curve is a standard way to visualize the performance of a portfolio
2. A standard industry wide practice is to normalize the portfolio to a starting investment value of Rs.100/-
3. We assign weights and the respective investment to each stock
4. We need to calculate the daily change in investment value in each stock
5. The sum total of all the variation in each stock adds up to the variation of the entire portfolio
6. The graph of the change in daily prices of the portfolio yields the equity curve
7. We can look at the portfolio as a whole, as a single stock and calculate its SD
8. The SD of portfolio also yields the portfolio variance

Expected Returns

7.1 – Expected returns



The next two chapters will be very insightful, especially for people who have never been familiar with portfolio techniques. We will venture into the realms of expected return framework and portfolio optimization. Portfolio optimization in particular (which we will discuss in the next chapter) is like a magic wand, it helps you decide how much to invest in a particular stock (within a portfolio) so that you achieve the best possible results in terms of risk and return. These are topics which the high priests of finance prefer to keep for themselves, but today we will discuss them here and truly work towards democratizing quality financial knowledge.

But please note, to best understand the discussion here, you need to have a sense of all the things we have discussed over the previous couple of chapters. If you have not read them yet, please, I'd urge you to read them first. This is good quality information and you would be a better market participant if you simply spent few hours reading them. The excel sheet used here is a continuation of the one used in the previous chapters.

So assuming you are all set, let us get started.

It is time we put the portfolio variance to good use. To begin with let us take a good look at the portfolio variance number calculated in the previous chapters –

Portfolio Variance

1.11%

What does this number tell you?

The number gives you a sense of the degree of the risk associated with the portfolio. Remember, we worked on the daily data, hence the Portfolio Variance of 1.11% represents risk on a daily basis.

Risk or variance or volatility is like a coin with two faces. Any price movement below our entry price is called risk while at the same time, the same price movement above our entry price is called return. We will soon use the variance data to establish the expected range within which the portfolio is likely to move over the year. If you've read the Options module you will probably know where we are headed.

However, before doing that, we need to figure out the expected return of the portfolio. The expected return of the portfolio is simply, the grand sum of the average return of each stock, multiplied by its weight and further multiplied by 252 (number of trading days). In simple terms, we are scaling the daily returns to its annual return, and then scaling it according to the investment we have made.

Let us calculate the expected return for the portfolio that we have, I'm sure you will understand this better. To begin with, I've lined up the data as follows –

Expected Stock Returns

Stock	Weight	Daily Avg	Expected yr rt
Cipla	7.00%	0.06%	15.49%
Idea	16.00%	0.57%	142.42%
Wonderla	25.00%	0.06%	14.45%
PVR	30.00%	0.15%	38.86%
Alkem	22.00%	0.29%	72.73%

The first 3 columns are fairly easy to understand I suppose. The last column is simply the multiplication of the daily average return by 252 – this is a step to annualize the return of the stock.

For example, (Cipla) – $0.06\% * 252 = 15.49\%$.

What does this mean? For a moment assume, I have invested all the money in just Cipla and no other stocks, then the weight of Cipla would be 100% and I can expect a return of 15.49%. However, since I've invested only 7% of my capital in Cipla, the expected return from Cipla would be –

Weight * Expected Return

$$= 7\% * 15.49\%$$

$$= 1.08\%$$

We can generalize this at the portfolio level to get the expected return of the portfolio –

Expected Stock Returns

Stock	Weight	Daily Avg	Expected yr rt
Cipla	7.00%	0.06%	15.49%
Idea	16.00%	0.57%	142.42%
Wonderla	25.00%	0.06%	14.45%
PVR	30.00%	0.15%	38.86%
Alkem	22.00%	0.29%	72.73%

Where,

Wt = Weight of each stock

Rt = Expected annual return of the stock

I've applied the same formula for the 5 stock portfolio that we've got, and here is what we have –

	I	J	K	L	M	N	O	P	Q	R	S	T	U
t	Rt	Alkem	Rt	Cipla	Idea	Wonderla	PVR	Alkem					
10.5	-0.99%	1692.15	0.03%	0.91%	2.35%	-0.29%	-1.14%	-0.26%		M2			
11.1	0.94%	1712.1	1.18%	-0.31%	3.99%	1.98%	0.78%	0.89%		0.000124			
12.5	0.71%	1699.85	-0.72%	-0.51%	-2.84%	1.41%	0.56%	-1.00%					
15.5	-1.45%	1679.1	-1.22%	0.22%	-6.57%	-1.63%	-1.61%	-1.51%					
19.8	-2.89%	1679.7	0.04%	0.47%	0.33%	-1.67%	-3.05%	-0.25%					
19.1	-2.79%	1702.95	1.38%	0.25%	-1.65%	0.16%	-2.95%	1.10%					
15.2	1.51%	1690.8	-0.71%	0.26%	1.84%	-1.48%	1.35%	-1.00%					
16.5	-0.42%	1675.25	-0.92%	-0.76%	0.85%	-1.98%	-0.57%	-1.21%					
11.5	1.93%	1680.45	0.31%	2.02%	1.03%	3.08%	1.78%	0.02%					
17.3	0.53%	1675.35	-0.30%	-0.72%	-0.37%	1.40%	0.37%	-0.59%					
18.9	-0.76%	1623.95	-3.07%	-0.77%	-2.13%	0.51%	-0.91%	-3.36%					
17.5	-0.13%	1639.75	0.97%	0.64%	1.35%	-2.65%	-0.28%	0.68%					
17.5	-0.43%	1609.35	-1.85%	-1.94%	-0.44%	1.82%	-0.59%	-2.14%					
12.4	-0.03%	1632.6	1.44%	-0.92%	-0.82%	4.61%	-0.19%	1.16%					
1.85	-1.15%	1601.95	-1.88%	0.48%	-1.54%	1.88%	-1.30%	-2.17%					
1.65	0.07%	1632.8	1.93%	0.46%	-0.30%	-2.55%	-0.08%	1.64%					
16.6	-0.37%	1632	-0.05%	-1.12%	-4.69%	-0.46%	-0.53%	-0.34%					
11.9	-2.29%	1639.85	0.48%	-0.11%	-1.25%	-1.51%	-2.45%	0.19%					
1.45	-0.33%	1607.6	-1.97%	-0.31%	-2.28%	0.60%	-0.48%	-2.26%					

Portfolio Variance
1.11%

Expected Stock Returns

Stock	Weight	Daily Avg	Expected yr rt
Cipla	7.00%	0.06%	15.49%
Idea	16.00%	0.57%	142.42%
Wonderla	25.00%	0.06%	14.45%
PVR	30.00%	0.15%	38.86%
Alkem	22.00%	0.29%	72.73%

Expected Portfolio Return

=S69*U69
55.14% ←

At this stage, we have arrived at two extremely important portfolio parameters. They are the expected portfolio return which is **55.14%** and the portfolio variance which is 1.11%.

In fact, we can scale the portfolio variance to represent the annual variance, to do this we simply have to multiply the daily variance by Square root of 252.

Annual variance =

$$= 1.11\% * \text{Sqrt} (252)$$

$$= \mathbf{17.64\%}.$$

We will keep both these important numbers aside.

It is now time to recall our discussion on normal distribution from the **options module**.

I'd suggest you quickly read through the 'Dalton board experiment' and understand normal distribution and how one can use this to develop an opinion on future outcome. Understanding normal distribution and its characteristics is quite crucial at this point. I'd encourage you to read through it before proceeding.

Portfolio returns are normally distributed, I'll skip plotting the distribution here, but maybe you can do this as an exercise. Anyway, if you do plot the distribution of a portfolio, you are likely to get a normally distributed portfolio. If the portfolio is normally distributed, then **we can estimate the likely return of this portfolio over the next 1 year with certain degree of confidence**.

To estimate the return with certain degree of confidence we simply have to add and subtract the portfolio variance from the expected annualized return. By doing so we will know how much the portfolio will generate or lose for the given year.

In other words, based on normal distribution, we can predict (although I hate using the word predict in markets) the range within which the portfolio is likely to fluctuate. The accuracy of this predication varies across three levels.

- Level 1 – one standard deviation away, 68% confidence
- Level 2 – Two standard deviation away, 95% confidence
- Level 3 – Three standard deviation away, 99% confidence

Remember, variance is measured in terms of standard deviation. So it is important to note that the annualized portfolio variance of 17.64% is also the 1 standard deviation.

So, 17.64% represents 1 standard deviation. Therefore, two standard deviations are $17.64\% * 2 = 35.28\%$ and 3 standard deviation would be $17.64\% * 3 = 52.92\%$.

If you are reading this for the first time, then yes, I'd agree it would not be making any sense. Hence it is important to understand normal distribution and its characteristics. I've explained the same in the options chapter (link provided earlier).

7.2 – Estimating the portfolio range

Given the annualized variance (17.64%) and expected annual return (55.14%), we can now go ahead and estimate the likely range within which the portfolio returns are likely to vary over the next year. Remember when we are talking about a range, we are taking about a lower and upper bound number.

To calculate the upper bound number, we simply had to add the annualized portfolio variance to the expected annual return i.e. $17.64\% + 55.15\% = 72.79\%$. To calculate the lower bound range we simply have to deduct the annualized portfolio variance from the expected annual return i.e. $55.15\% - 17.64\% = 37.51\%$.

So, if you were to ask me – how are the returns likely to be if I decide to hold the 5 stock portfolio over the next year, then my answer would be that the returns are likely to fluctuate between **+37.51% and +72.79%**.

Three quick question may crop up at this stage –

- The range suggests that the portfolio does not lose money at all, how is this even possible? In fact, the worst case scenario is still a whopping +37.51%, which in reality is fantastic.
 - True, I agree it sounds weird. But the fact is, the range calculation is statistics based. Remember we are in a bull market (April – May 2017, as I write this), and the stocks that we have selected have trended well. So quite obviously, the numbers we have got here is positively biased. To get a true sense of the range, we should have taken at least last 1 year or more data points. However, this is beside the point here – remember our end objective is to learn the craft and not debate over stock selection.
- Alright, I may have convinced you on the range calculation, but what is the guarantee that the portfolio returns would vary between 37.15% and 72.79%?
 - As I mentioned earlier, since we are dealing with level 1 (1 standard deviation), the confidence is just about 68%.
 - What if I want a higher degree of confidence?
 - Well, in this case you will have to shift gears to higher standard deviations.

Let us do that now.

To calculate the range with 95% confidence, we have to shift gears and move to the 2nd standard deviation. Which means we have to multiply the 1 standard deviation number by 2. We have done this math before, so we know the 2nd SD is 35.28%.

Given this, the range of the portfolio's return over the next 1 year, with 95% confidence would be –

$$\text{Lower bound} = 55.15\% - 35.28\% = \mathbf{19.87\%}$$

$$\text{Upper bound} = 55.15\% + 35.28\% = \mathbf{90.43\%}$$

We can further increase the confidence level to 99% and check the return's range for 3 standard deviation, recall at 3 SD, the variance is 52.92% –

$$\text{Lower bound} = 55.15\% - 52.92\% = \mathbf{2.23\%}$$

$$\text{Upper bound} = 55.15\% + 52.92\% = \mathbf{108.07\%}$$

As you may notice, the higher the confidence level, the larger the range. I'll end this chapter here with a set of tasks for you –

1. Plot the frequency distribution for this 5 stock portfolio – observe the distribution, check if you see a bell curve
2. We are dealing with the range for a year, what if you were to estimate the range for 3 months, or maybe 3 weeks? How would you do it?

It will be great if you can attempt these tasks, please do leave your thoughts in the comment box below.

You can **download** the excel sheet used in this chapter.

Key takeaways from this chapter

1. The returns of the portfolio are dependent on the weights of the individual stocks in the portfolio
2. To calculate the effect of an individual stock on the overall portfolio's return, one has to multiply the average return of the stock by its weight
3. The overall expected return of the portfolio is grand sum of the individual stock's returns (which is scaled by its weight)
4. The daily variance can be converted to annualized variance by multiplying it by square root of 252
5. The variance of the portfolio which we calculate is by default the 1st standard deviation value
6. To get the 2nd and 3rd SD, we simply have to multiply it by 2 and 3
7. The expected return of the portfolio can be calculated as a range
8. To get the range, we simply have to add and subtract the variance from the portfolio's expected return
9. Each standard deviation comes with a certain confidence level. For higher confidence level, one has to look at moving higher standard deviation

CHAPTER 8

Portfolio Optimization (Part 1)



8.1 – A tale of 2 stocks

We have spent a great deal of time and efforts towards understanding risk associated with a portfolio. Our discussion has brought us to a very important stage – it's time we discuss portfolio optimization. Perhaps, a good start to this discussion would be to understand what portfolio optimization is all about and why it makes sense to optimize a given portfolio.

Before we proceed, let me ask you a question – what do you think is the overall portfolio return, considering a portfolio consists investment in Infosys and Biocon (equally weighted). Assume the expected return of Infosys is 22% and Biocon is 15%.

I know it sounds like a typical MBA class question, but this is an important question and you should know how to answer this question at this stage J

Since the portfolio is equally weighted across two stocks, it implies we invest 50% in Infosys and 50% in Biocon. Given this, the expected portfolio return would be –

= Weight of investment in Infosys * Expected return of Infosys + Weight of investment in Biocon * Expected return of Biocon

Do recall, in the previous chapter we did discuss “Expected Return of a stock” in detail. Anyway, let us work out the answer –

$$50\% * 22\% + 50\% * 15\%$$

$$= 11\% + 7.5\%$$

$$= \mathbf{18.5\%}$$

So, the portfolio is expected to yield a return of 18.5% annually.

Great, now what if we change the weights? What if invest 30% in Infosys and 70% in Biocon? Or let us say 70% in Infosys and 30% in Biocon?

Let's figure this out, Case 1 –

$$30\% * 22\% + 70\% * 15\%$$

$$= 6.6\% + 10.5\%$$

$$\mathbf{17.1\%}$$

Case 2 –

$$70\% * 22\% + 30\% * 15\%$$

$$= 15.4\% + 4.5\%$$

$$\mathbf{19.9\%}$$

Needless to say, we can do this for multiple combinations of weights. In fact, here is the table with few of the other combinations possible –

Infosys @ 22%	Biocon @ 18%	Portfolio Return
10.0%	90.0%	15.7%
20.0%	80.0%	16.4%
30.0%	70.0%	17.1%
40.0%	60.0%	17.8%
50.0%	50.0%	18.5%
60.0%	40.0%	19.2%
70.0%	30.0%	19.9%
80.0%	20.0%	20.6%
90.0%	10.0%	21.3%

As you can notice, as the investment weight varies, the returns also vary. For example, if I had decided to invest just 40% in Infy and 60% in Biocon, I'd have enjoyed a return of 17.8%. However, if I had reversed it by investing 60% in Infy and 40% in Biocon, I'd have enjoyed a return of 19.2%, which is an additional 2% return.

This leads us to a super important conclusion – **as the investment weights vary, the returns vary**. In fact, each return has an associated risk profile, so it is prudent to state – as the weights vary, both the risk and return characteristics vary.

Now imagine this – for a given portfolio with ‘n’ number of stocks, wouldn’t it be awesome if you were to look at the past data and intelligently identify how much to invest in each stock, so that the portfolio yields the best possible returns?

This is exactly what happens when you optimize your portfolio. Generally speaking, you can adjust the weights (or optimize your portfolio) such that, for the given set of stocks –

- You identify the investment weights to achieve the best possible return or
- You identify the investment weights to achieve the least possible risk

Sounds confusing? Fear not, just read ahead!

8.2 – Caution! Jargons ahead

Hopefully by now, you fully appreciate the reason why one should optimize the portfolio. So, I won’t spend more time convincing you

Let us go ahead and optimize the portfolio we have been working with. However, there are few important terms I want you to be familiar with at this stage –

Minimum variance portfolio – Assume you have a portfolio of 10 stocks. It must be quite obvious by now that you can play around with the weights of each stock to achieve different results. When I say results, I’m talking about the risk and return characteristics. Each unique set of weights represents a unique portfolio. For example, an equally weighted portfolio (10 stocks, 10% weight in each) is a unique portfolio. A portfolio where you invest 30% in stock 1 and 7.8% each across the remaining 9 stocks is another unique portfolio. The number of combination possible are many and each combination of weights results in a unique risk and return characteristics.

Given this, there should be that one set of combination of stock weights possible, such that the risk for the portfolio is the least possible. More technically, there should be combination of weights possible such that the variance of the portfolio is minimum. This particular portfolio is also referred to as the “Minimum Variance Portfolio”. The minimum variance portfolio represents the least amount of risk you can take. So if you are a highly risk averse investor, you should aim to create a minimum variance portfolio.

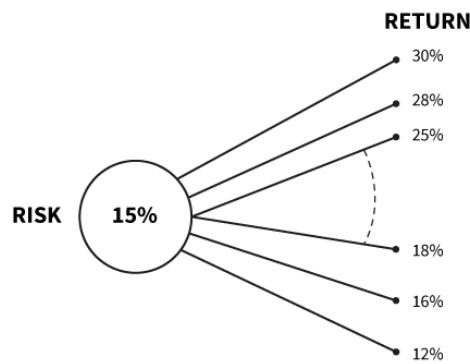
Maximum Return portfolio – This is somewhat the opposite of a minimum variance portfolio. Just like a minimum variance portfolio, there should be a combination of weights such that we can achieve a portfolio with maximum return possible. This also means that for a maximum return portfolio, the risk too will be on the higher side.

Fixed variance, multiple portfolios – This is not really a jargon, but a concept that you need to be aware of at this stage. It may come across as a little confusing at this point, but I’m certain, later on in this chapter (or maybe next) you will understand this much better, especially when we perform portfolio optimization.

For a given level of risk or variance of a portfolio, you can create **at least two** unique portfolios. One of such portfolio will yield the highest possible return and the other portfolio will yield the lowest return for the same given level of risk.

Here is an example on a completely arbitrary basis – let us say the risk or variance of a portfolio is 15%, given this, there will be a portfolio which can yield 30% return (highest possible return) and another portfolio which can yield 12% return (lowest possible return). Do note, for both these portfolios, the risk is fixed to 15% but the returns vary.

Between these two portfolios there could be multiple other (unique) portfolios with varying return profile. In super simple terms – for a fixed amount of risk, there could be multiple portfolio combinations, and within these possible combinations, there will be a portfolio with maximum return and another with minimum return.



We will revisit this concept a little later in the chapter, but for now, just keep this thought at the back of your mind.

8.3 – Portfolio optimization (steps)

Let us recall the portfolio that we have – the stock names and the associated weights are as follows. Do note, this is a continuation of the portfolio we have been working with over the previous few chapters.

Stock	Weight
Cipla	7.00%
Idea	16.00%
Wonderla	25.00%
PVR	30.00%
Alkem	22.00%
Total Weight	100.00%

Do remember, the weights assigned are all random, there was no thought process to it. For this portfolio with these combination of weights, the annual portfolio variance was estimated at **17.64%** and expected return as **55.14%**.

Our objective now is to optimize this portfolio to achieve a desired outcome. To optimize a portfolio in excel, we need the ‘Solver Tool’ in excel. You will find the solver tool under the

'Data

ribbon'.

Chapter 7_Port Opt_self learn - Excel

J K L M N O P Q R S T U V W

X = Excess Retun matrix

Alkem	Rt	Cipla	Idea	Wonderla	PVR	Alkem	Cipla	Idea	Wonderla	PVR	Alkem
17%	1702.15	1.46%	0.36%	2.18%	0.13%	1.71%	1.17%				
13%	1722.1	1.17%	0.09%	-2.55%	-0.13%	1.88%	0.88%				
10%	1691.65	-1.77%	2.00%	2.51%	1.33%	0.54%	-2.06%				
19%	1692.15	0.03%	0.91%	2.35%	-0.29%	-1.14%	-0.26%				

M2

Many of you may not find the 'solver' tool under the data ribbon. This is because you've not added it from the excel add ins. To add solver, follow these simple steps –

1. Click on Files on the opened excel sheet
2. Select Options
3. Select Add-ins (last but one option)
4. Click on 'Solver Add Ins'
5. Click on "Go"
6. Check on "Solved Add ins" once again
7. Click Ok and close
8. Close the excel sheet, if required restart your system
9. Check under data ribbon – you should be able to find the solver tool

To begin with, let us optimize the portfolio to get the "Minimum Variance portfolio". Here are few simple steps that you can follow to achieve this.

Step 1 – Organize your data. This is the key to using solver. Your cells should be linked; data should be neatly organized. No hard coding of data. Here is how the data on excel sheet looks at this stage.

Weights & weight SD

Stock	Weight	Wt.SD
Cipla	7.00%	0.104%
Idea	16.00%	0.535%
Wonderla	25.00%	0.390%
PVR	30.00%	0.606%
Alkem	22.00%	0.408%
Total Weight	100.00%	



M1

Cipla	Idea	Wonderla	PVR	Alkem
0.003910484	0.00616274	0.00555355	0.007066495	0.005386129

M2

0.000123542

Portfolio Variance

1.11%

Expected Stock Returns

Stock	Weight	Daily Avg	Expected yr rt
Cipla	7.00%	0.06%	15.49%
Idea	16.00%	0.57%	142.42%
Wonderla	25.00%	0.06%	14.45%
PVR	30.00%	0.15%	38.86%
Alkem	22.00%	0.29%	72.73%

Expected Port Return	55.14%
Annual Port Varience	17.64%



I've highlighted two important parts, which we will use for optimizing. The top most part has the weights assigned to each stock. Needless to say, this will change once the portfolio is optimized. The 2nd part has the expected return and annual portfolio variance calculation, which will also change when we optimize the portfolio.

Step 2 – Use the solver tool in excel to optimize the weights. I'm assuming you may be new to solver, hence will give you a quick overview of this tool. You can use solver to work with something called as an 'objective'. An objective, according to solver is essentially a data point, derived by set of formulas. You can minimize the objective's value or maximize the objective's value or set the value of an objective to a certain desired value. You can do this while changing certain variables. The variables, according to solver are the elements of the formulas used in deriving the objective. For example, I can choose to minimize the variance

of the portfolio by changing the weights of each stock. Here, the variance is the objective and the weights are the variable.

When we command the solver to minimize the objective (variance in this case), then in the background, excel's solver will quickly check the formulas used and works around it in such a way that the objective's value is least minimum.

Look at the image below, I'm invoking the solver tool and will soon ask it to minimize the variance.

The screenshot shows the 'Solver Parameters' dialog box and its associated results. The dialog box is titled 'Solver Parameters' and contains the following fields:

- Set Objective:** A dropdown menu where the user has selected 'Min'.
- To:** A dropdown menu showing 'Max' and 'Min'.
- Value Of:** A text input field containing '0'.
- By Changing Variable Cells:** A dropdown menu.
- Subject to the Constraints:** An empty list area with 'Add', 'Change', 'Delete', 'Reset All', and 'Load/Save' buttons.
- Make Unconstrained Variables Non-Negative:** A checked checkbox.
- Select a Solving Method:** A dropdown menu set to 'GRG Nonlinear'.
- Solving Method:** A descriptive text area explaining the GRG Nonlinear engine.
- Help**, **Solve**, and **Close** buttons at the bottom.

On the right side, there are two tables:

	Cipla	Idea	Wonderla	PVR	Alkem
M2	0.003910484	0.00616274	0.00555355	0.007066495	0.005386129

Portfolio Variance	
1.11%	

Expected Stock Returns				
Stock	Weight	Daily Avg	Expected yr rt	
Cipla	7.00%	0.06%	15.49%	
Idea	16.00%	0.57%	142.42%	
Wonderla	25.00%	0.06%	14.45%	
PVR	30.00%	0.15%	38.86%	
Alkem	22.00%	0.29%	72.73%	

Expected Port Return	55.14%
Annual Port Varience	17.64%

When you click on the data ribbon and click on solver, you will see the solver tool open up, as seen above. We need to set the objective here. Objective as I mentioned earlier, is the annual portfolio variance. Remember, we are working towards finding the minimum variance portfolio here.

Check the image below –

The screenshot shows the Solver Parameters dialog and a summary table for a portfolio of stocks.

Solver Parameters Dialog:

- Set Objective:** \$S\$77 (highlighted with a red arrow)
- To:** Min (radio button selected)
- By Changing Variable Cells:** \$S\$49:\$S\$53 (highlighted with a green arrow)
- Subject to the Constraints:** (empty list)
- Select a Solving Method:** GRG Nonlinear
- Solving Method:** Select the GRG Nonlinear engine for Solver Problems that are smooth nonlinear. Select the LP Simplex engine for linear Solver Problems, and select the Evolutionary engine for Solver problems that are non-smooth.

Summary Table:

	Cipla	Idea	Wonderla	PVR	Alkem
M2	0.003910484	0.00616274	0.00555355	0.007066495	0.005386129
Portfolio Variance	1.11%				
Expected Stock Returns					
Stock	Weight	Daily Avg	Expected yr rt		
Cipla	7.00%	0.06%	15.49%		
Idea	16.00%	0.57%	142.42%		
Wonderla	25.00%	0.06%	14.45%		
PVR	30.00%	0.15%	38.86%		
Alkem	22.00%	0.29%	72.73%		

Expected Port Return 55.14%
Annual Port Varience 17.64% (highlighted with a red arrow)

Objective is set to ‘Annual portfolio variance’ – you can notice the cell address is highlighted in the ‘set objective’ field. The cell containing the annual portfolio variance itself is highlighted below, you will find another red arrow here. We are minimizing the objective here, the same is highlighted by the green arrow.

Once this is set, the next step is to inform the solver tool that we need minimize the objective by changing the variables. In this case, the variable happens to be the weights assigned to each stock.

The screenshot shows the Solver Parameters dialog and a summary table for a portfolio of stocks, with the results of the optimization process.

Solver Parameters Dialog:

- Set Objective:** \$S\$77
- To:** Min
- By Changing Variable Cells:** \$S\$49:\$S\$53 (highlighted with a red arrow)
- Subject to the Constraints:** (empty list)
- Select a Solving Method:** GRG Nonlinear
- Solving Method:** Select the GRG Nonlinear engine for Solver Problems that are smooth nonlinear. Select the LP Simplex engine for linear Solver Problems, and select the Evolutionary engine for Solver problems that are non-smooth.

Summary Table:

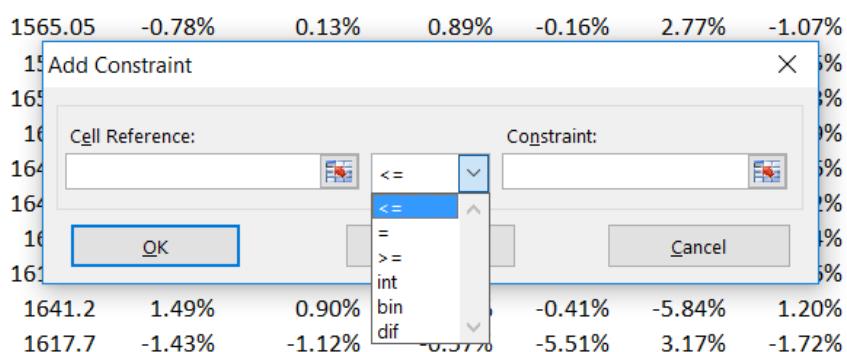
	Cipla	Idea	Wonderla	PVR	Alkem
M1	0.003910484	0.00616274	0.00555355	0.007066495	0.005386129
M2	0.000123542				
Portfolio Variance	1.11%				
Weights & weight SD					
Stock	Weight	Wt.SD			
Cipla	7.00%	0.104%			
Idea	16.00%	0.535%			
Wonderla	25.00%	0.390%			
PVR	30.00%	0.606%			
Alkem	22.00%	0.408%			
Total Weight	100.00%				

As you can see, in the “By changing variable cells” field, I’ve highlighted the weights assigned to each stocks.

You can also find “subject to constraints”, field. This essentially means, that solver will minimize the variance, by change the weights of each stock, and at this stage, it is also asking us if there are any constraints it needs to keep in mind while solving to minimize the variance.

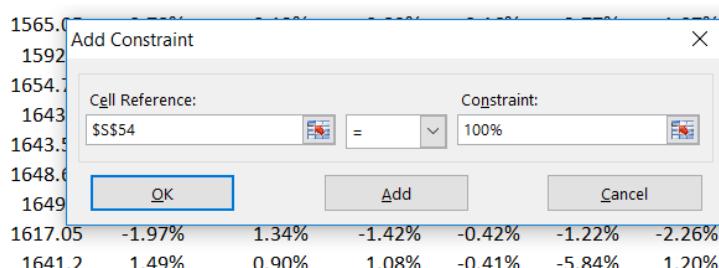
One constraint that I can think of at this stage is that the total weight of all stocks put together should be 100%. This essentially means that my capital is 100% deployed across all the 5 stocks. If I do not specific this, then there is a chance that solver may suggest to skip investments across few stock altogether. Remember, solver is an excel tool, and it does not appreciate stock picking

To add a constraint, click on ‘add’. When you do so the following window opens up –



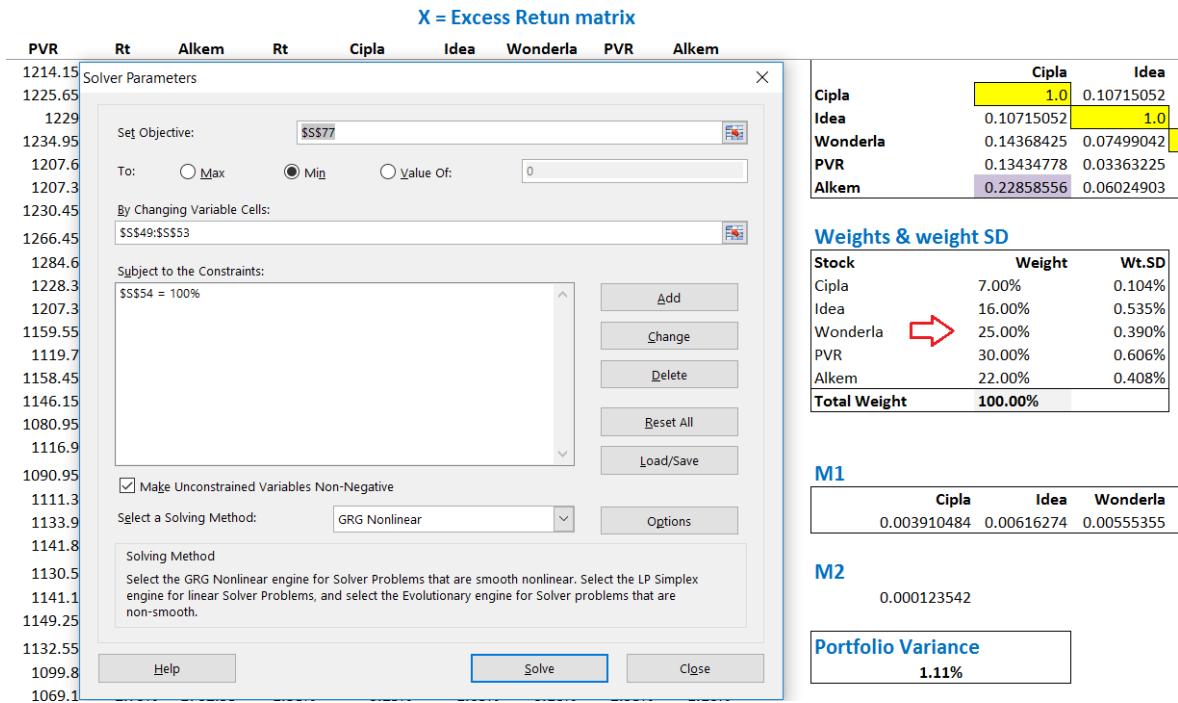
Under Cell reference, I will give the sum of weights of stocks – which needs to be equal to 100%. Next to this, you can see a drop down menu with multiple options, I'd pick '=' here. Finally, the constraint itself will be 100%. Note, I've typed out 100% here.

In simple words, I'm asking solver to optimize for minimum variance, keeping the weight of all stock to 100%. The window now looks like this –



Weights & weight SD		
Stock	Weight	Wt.SD
Cipla	7.00%	0.104%
Idea	16.00%	0.535%
Wonderla	25.00%	0.390%
PVR	30.00%	0.606%
Alkem	22.00%	0.408%
Total Weight	100.00%	

The solver is completely set up now. The final screen before pressing “Solve” looks like this –



I've highlighted the weights of each stock for reference. Remember, these are pre optimized weights that we randomly assigned at the beginning of this discussion. Post optimizing, the weights will be changed such that the variance is least possible for these set of stocks. Let us go ahead and press 'solve' and check what solver has for us.

And here you go –

Expected Stock Returns

Stock	Weight	Daily Avg	Expected yr rt
Cipla	29.58%	0.06%	15.49%
Idea	5.22%	0.57%	142.42%
Wonderla	30.22%	0.06%	14.45%
PVR	16.47%	0.15%	38.86%
Alkem	18.51%	0.29%	72.73%

Expected Port Return	36.25%
Annual Port Varience	15.57%

Solver has solved for the 'minimum variance' portfolio and accordingly it has worked out the weights for each stock.

For example, it wants us to increase the weight in Cipla from current 7% to 29.58%, while it wants us to reduce the weight in Idea to 5.22% from 16%. So on and so forth. Further, it is also telling us that the least possible variance with this portfolio is **15.57%** (remember, the

variance was earlier at 17.64%). Along with this, the portfolio's expected return too seem to have dropped to **36.25%** from the earlier 55.14%.

So, no matter what you do, the variance cannot be lowered below 15.57%. In other words, if these are the 5 stocks that you want to invest in, then the least amount of risk you will be exposed to is 15.57% and absolutely nothing below that!

I'll leave you at this. In the next chapter, we will optimize the same portfolio for few more scenarios and work towards building something called as an 'Efficient Frontier'.

You can **download** the excel sheet used in this chapter. Do note, the excel contains the optimized weights for the minimum variance portfolio.

Key takeaways from this chapter

1. The returns of the portfolio are dependent on the weights assigned to each stock
2. Minimum variance portfolio is that portfolio where the variance or risk is least possible for the given set of stocks
3. Maximum return portfolio is that portfolio where the expected portfolio returns are maximized for the given set of stocks
4. When we fix the variance of a portfolio we can achieve at least two portfolios where the expected portfolio returns can be maximum or least
5. One can optimize a given portfolio with 'n' number of stocks on excel, by using the solver tool
6. One of the most important points to remember while using solver is to ensure the data is well organized. One can do this by linking all the relevant cells and avoiding hard coding of values
7. You can optimize the portfolio by subjecting the variable to constraints

Portfolio Optimization (Part 2)



9.1 – Working with the weights

In the previous chapter we introduced the concept of portfolio optimization using excel's solver tool. We will build on the same concept in this chapter and proceed to understand an important portfolio concept, often referred to as the 'Efficient Frontier'.

Recall in the previous chapter, we discussed how a portfolio can produce multiple return series for a fixed portfolio variance. We will now go ahead and see how this works. This concept will eventually lead us to understanding portfolio optimization better.

In the previous chapter, we optimized the portfolio to produce the minimum variance portfolio. The results, in terms of weights of individual stocks were as follows –

SI No	Stock name	Pre optimized weight	Optimized for minimum variance
01	Cipla	7%	29.58%
02	Idea	16%	5.22%
03	Wonderla	25%	30.22%
04	PVR	30%	16.47%
05	Alkem	22%	18.51%

And the expected portfolio returns and the portfolio variance is as follows –

	Pre optimized	Optimized for minimum variance
Expected Portfolio return	55.14%	36.35%
Portfolio Variance	17.64%	15.57%

Here is where things start to get a little interesting. So far what we have achieved in terms of portfolio optimization is merely a minimum variance portfolio. Like we discussed in the previous chapter, for every fixed risk level, there could be multiple unique portfolio with varying return characteristics. We will now go ahead and explore this in greater detail.

We know at 15.57% portfolio variance, the return expected is 36.35%. We will now go ahead and increase the risk maybe to 17%, and calculate the highest and lowest possible returns for this. In other words, we are essentially trying to identify the highest and lowest possible return for a fixed portfolio variance of 17%. Also, do pay attention here – when I say increase the risk, we are essentially fixing the risk to certain desired level. 17% for now.

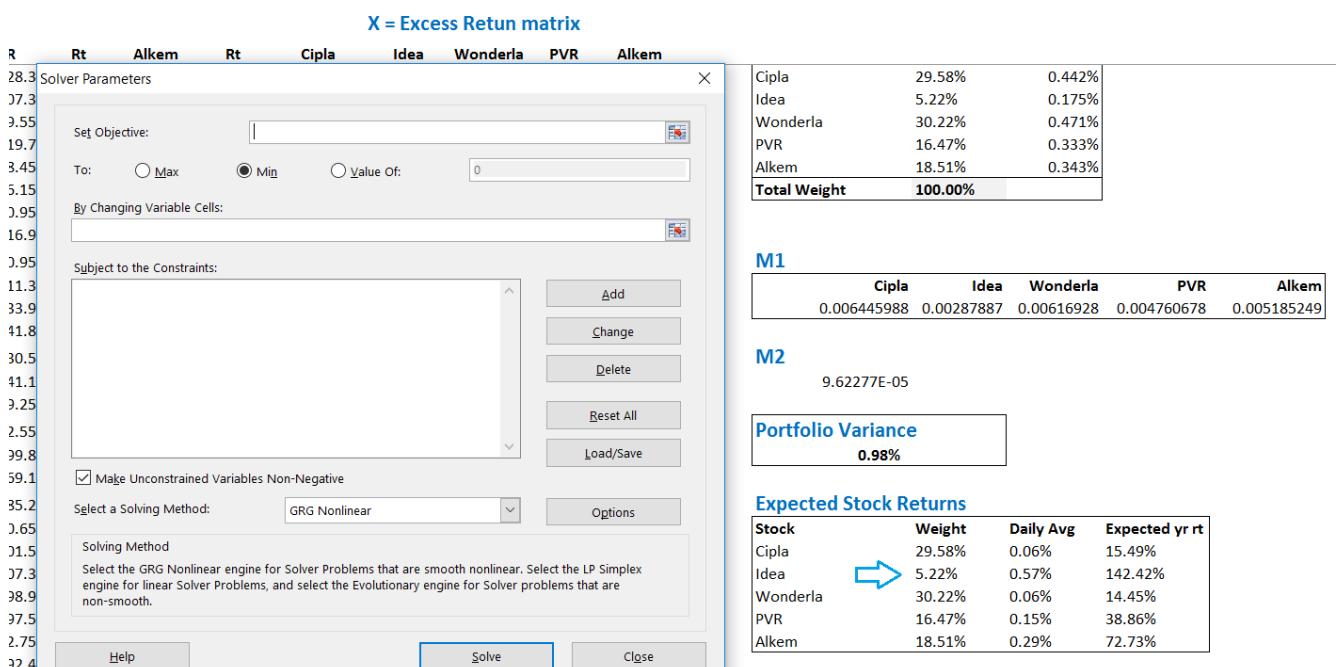
9.2 – More optimization

The general direction we are headed is this – we know the minimum risk possible for this portfolio is 15.57%. We have also noted the return achievable at this level of risk i.e – 36.35%. Like I mentioned earlier, we will now increase the risk a notch higher and note down the maximum and minimum return for this risk. Along with the return, we will also note the investment weights. We will then increase the risk another notch higher and again note the max and min return along with the weights. We will do few such iterations and note down all the observations.

Eventually, I would like to plot a scatter plot of fixed risk along with its respective max return and min return data points and study this scatter plot in greater detail. This scatter plot will help us understand portfolio optimization.

So let us get started by fixing the risk at 17%. Please note, I've opted 17% just like that, it could very well have been 16% or 18%.

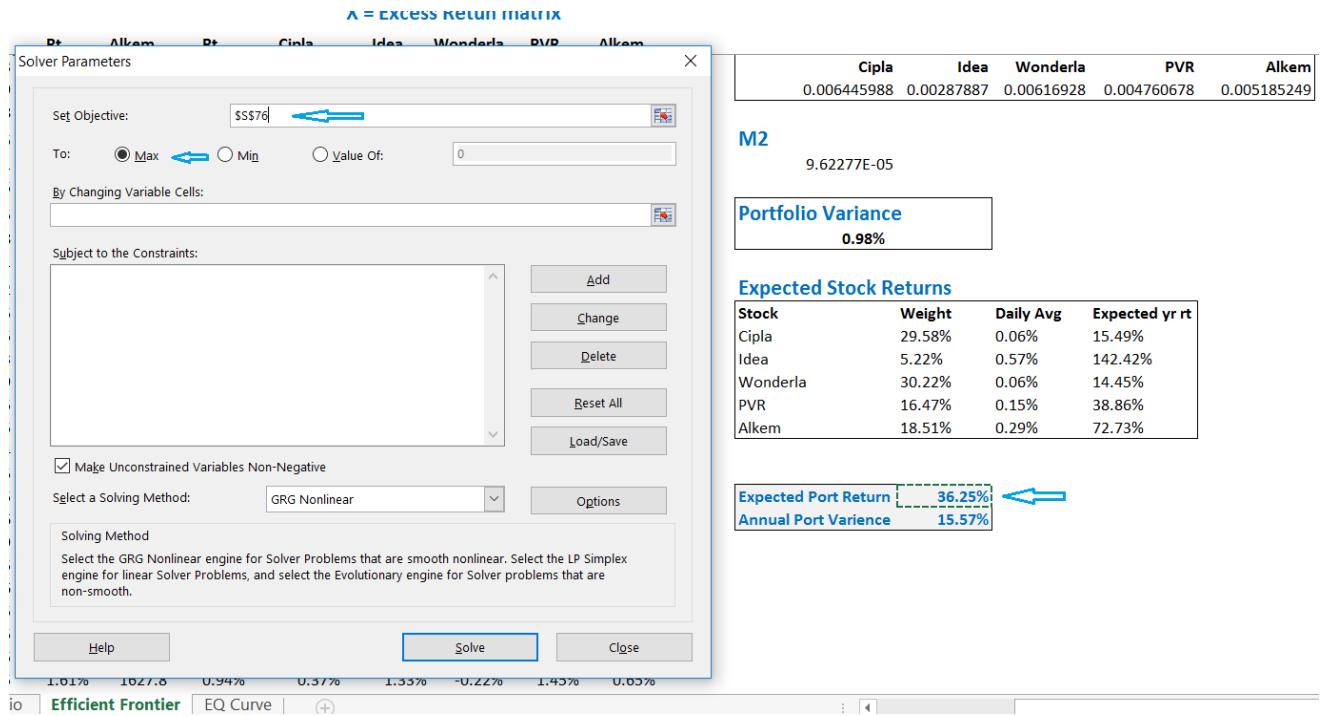
Step 1 – Invoke the solver



As I explained in the previous chapter, I've invoked the solver calculator by clicking on the data ribbon. I've highlighted the optimized weights for the minimum variance portfolio, this is just for your reference.

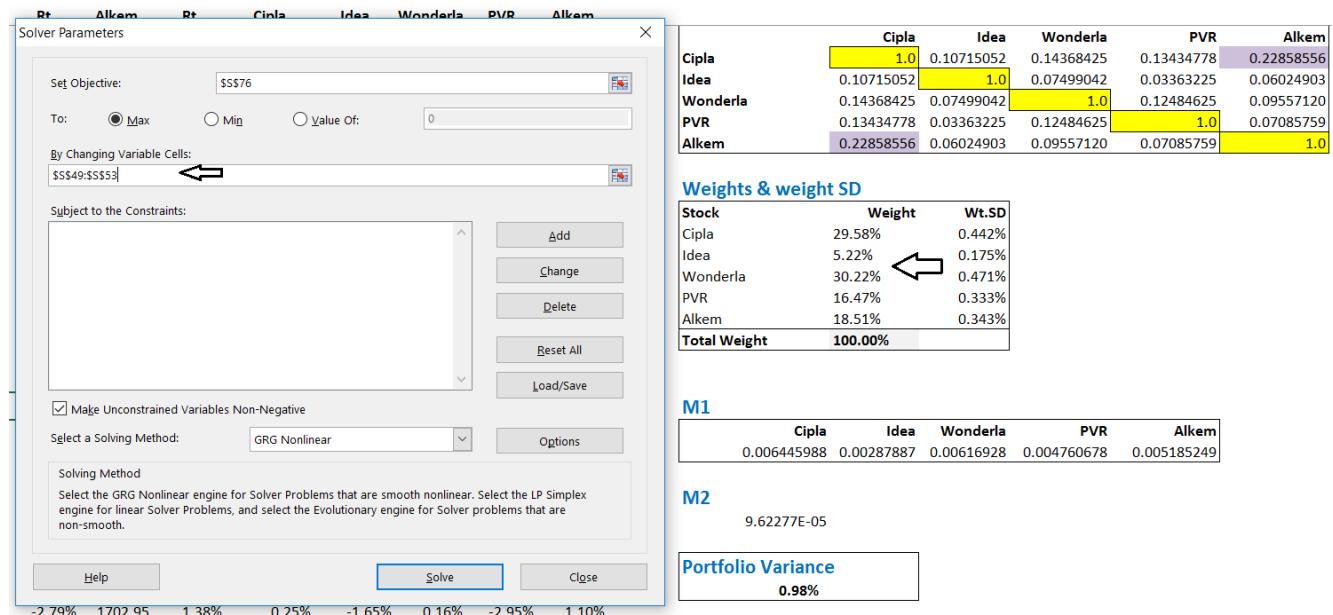
Step 2 – Set the parameters

To begin with let us find out the maximum return one can achieve for a fixed 17% risk. For this, we need to set the objective to **maximize** the ‘expected portfolio return’. The same is highlighted as shown below –



Step 3 – Select the weights

The next step is to ensure that we tell the solver tool that we want to optimize the portfolio for maximum return by varying the weights. This is very similar to what we did in the previous chapter.



Do note, the weights here are the variable cells.

Step 4 – Set the constraints

Now, here is the important part of the optimization where we set the constraints. We now tell solver that we need to maximize the returns @ 17% risk, by varying the investment weights. We do these while keeping the following two constraints –

1. The total weights add up to 100%
2. The Portfolio risk is fixed to 17%

The constraints section now looks like this –

The screenshot shows the 'Solver Parameters' dialog box from Microsoft Excel. The 'Set Objective' cell is \$S\$76, and the 'To:' option is set to 'Max'. The 'By Changing Variable Cells' range is \$S\$49:\$S\$53. In the 'Subject to the Constraints:' section, there are two entries: '\$S\$54 = 100%' and '\$S\$77 = 17%'. A red arrow points to the '\$S\$77 = 17%' constraint. To the right of the constraints list are buttons for 'Add', 'Change', 'Delete', 'Reset All', and 'Load/Save'. Below the constraints list, there is a checked checkbox for 'Make Unconstrained Variables Non-Negative'. Under 'Select a Solving Method:', 'GRG Nonlinear' is selected. A detailed description of the 'Solving Method' is provided: 'Select the GRG Nonlinear engine for Solver Problems that are smooth nonlinear. Select the LP Simplex engine for linear Solver Problems, and select the Evolutionary engine for Solver problems that are non-smooth.' At the bottom of the dialog are 'Help', 'Solve' (which is highlighted with a blue border), and 'Close' buttons.

With these constraints loaded and rest of the parameters specified, we can go ahead and click on ‘solve’ to figure out the maximum return possible @ 17%, along with the respective weights.

The result upon optimization is as follows –

Expected Stock Returns

Stock	Weight	Daily Avg	Expected yr rt
Cipla	16.04%	0.06%	15.49%
Idea	14.78%	0.57%	142.42%
Wonderla	20.35%	0.06%	14.45%
PVR	18.05%	0.15%	38.86%
Alkem	30.77%	0.29%	72.73%

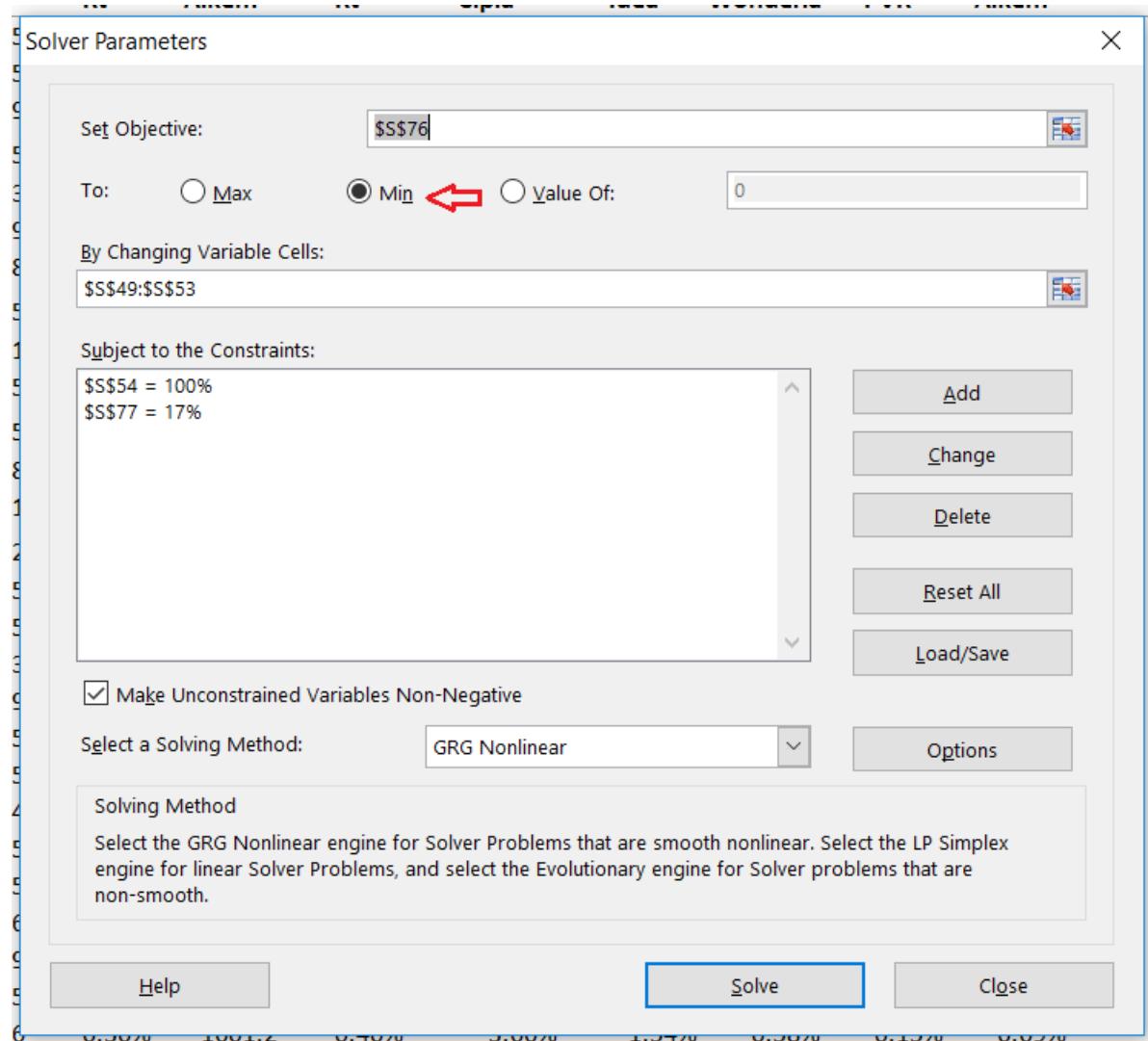
Expected Port Return	55.87%
Annual Port Varience	17.00%

The maximum possible returns @17% portfolio variance happens to be 55.87%. However, to achieve this, the weights are as shown above. Notice how the weights for this portfolio have changed when compared to the minimum variance portfolio.

We will now proceed to figure out the minimum return possible for the same fixed amount of risk, which is 17% in our case. Before we proceed, here is a table that I'm compiling of all the various portfolios that we are building, along with its respective weights and risk return characteristics.

Portfolio	Risk	Return	Cipla	Idea	Wonderl	PVR	Alkem
P1 - Min Var	15.57%	36.25%	29.58%	5.22%	30.22%	16.47%	18.51%
P2 - max risk @ 17%	17%	55.87%	16.04%	14.78%	20.35%	18.05%	30.77%
P3 - Min risk @ 17%	17.00%						

We are now working on portfolio 3 (P3), which is the minimum risk possible for a fixed risk of 17%. Here is the solver tool, fully loaded and ready to be optimized.



Notice, while other variables remain the same, the objective is shifted to minimize from maximize. Upon optimization, the return is now minimized to 18.35%. Clearly, for the same given risk, we have now established two unique portfolios with different possible return characteristics, all these while just changing the investment weights in the stocks.

Here are the three unique portfolios that we have generated so far –

Portfolio	Risk	Return	Cipla	Idea	Wonderla	PVR	Alkem
P1 - Min Var	16%	36%	30%	5%	30%	16%	19%
P2 - max risk @ 17%	17%	56%	16%	15%	20%	18%	31%
P3 - Min risk @ 17%	17%	18%	45%	0%	41%	13%	0%

Just to recall – P1 is the minimum variance portfolio, P2 max risk @17%, and P3 is min risk at 17%.

9.3 – Efficient Frontier

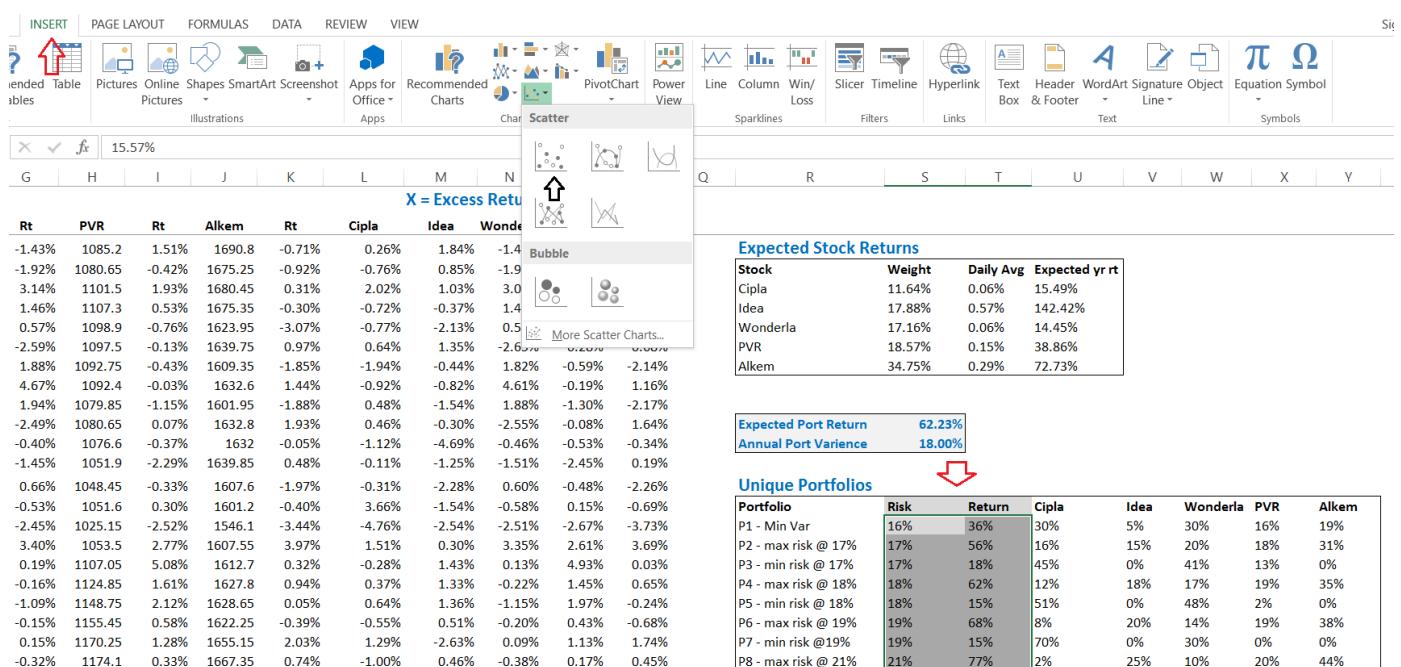
As discussed earlier, we can now increase the risk a notch higher to maybe 18%, 19%, and 21% and identify the maximum and minimum risk at both these risk levels. Remember, our end objective is attain a scatter plot of the risk and return profile and study its characteristics. I've gone ahead and optimized the portfolios for all the risk points, and at each point, I've identified the maximum and minimum return possible. Please note, I've rounded off the decimal values here, just so that the table looks pretty

Unique Portfolios

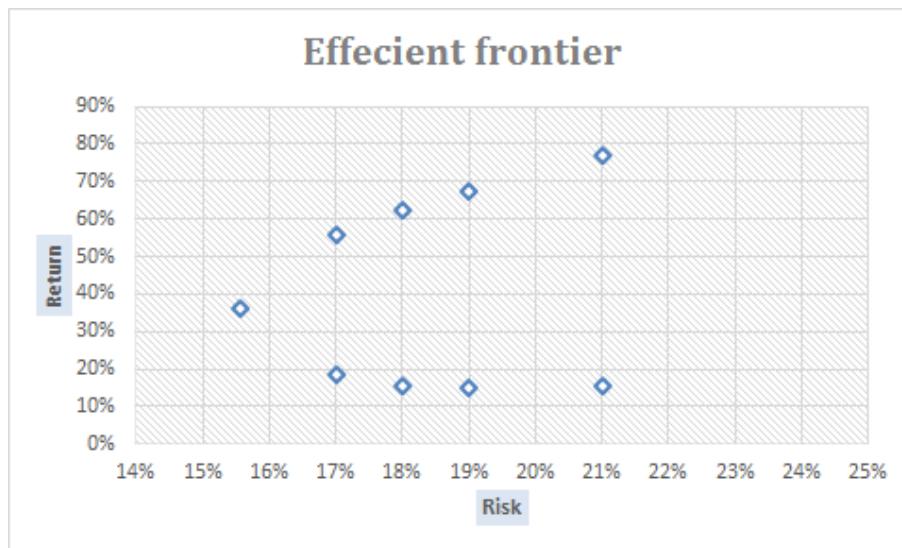
Portfolio	Risk	Return	Cipla	Idea	Wonderla	PVR	Alkem
P1 - Min Var	16%	36%	30%	5%	30%	16%	19%
P2 - max risk @ 17%	17%	56%	16%	15%	20%	18%	31%
P3 - min risk @ 17%	17%	18%	45%	0%	41%	13%	0%
P4 - max risk @ 18%	18%	62%	12%	18%	17%	19%	35%
P5 - min risk @ 18%	18%	15%	51%	0%	48%	2%	0%
P6 - max risk @ 19%	19%	68%	8%	20%	14%	19%	38%
P7 - min risk @ 19%	19%	15%	70%	0%	30%	0%	0%
P8 - max risk @ 21%	21%	77%	2%	25%	10%	20%	44%
P9 - min risk @ 21%	21%	15%	86%	0%	14%	0%	0%

If you notice, I've highlighted the risk and return values of each portfolios. I'll now go ahead and plot a scatter plot of these data points and see, what I can see.

To plot a scatter plot, simply select the data points and opt for the scatter plot under the insert ribbon. This is how it looks –



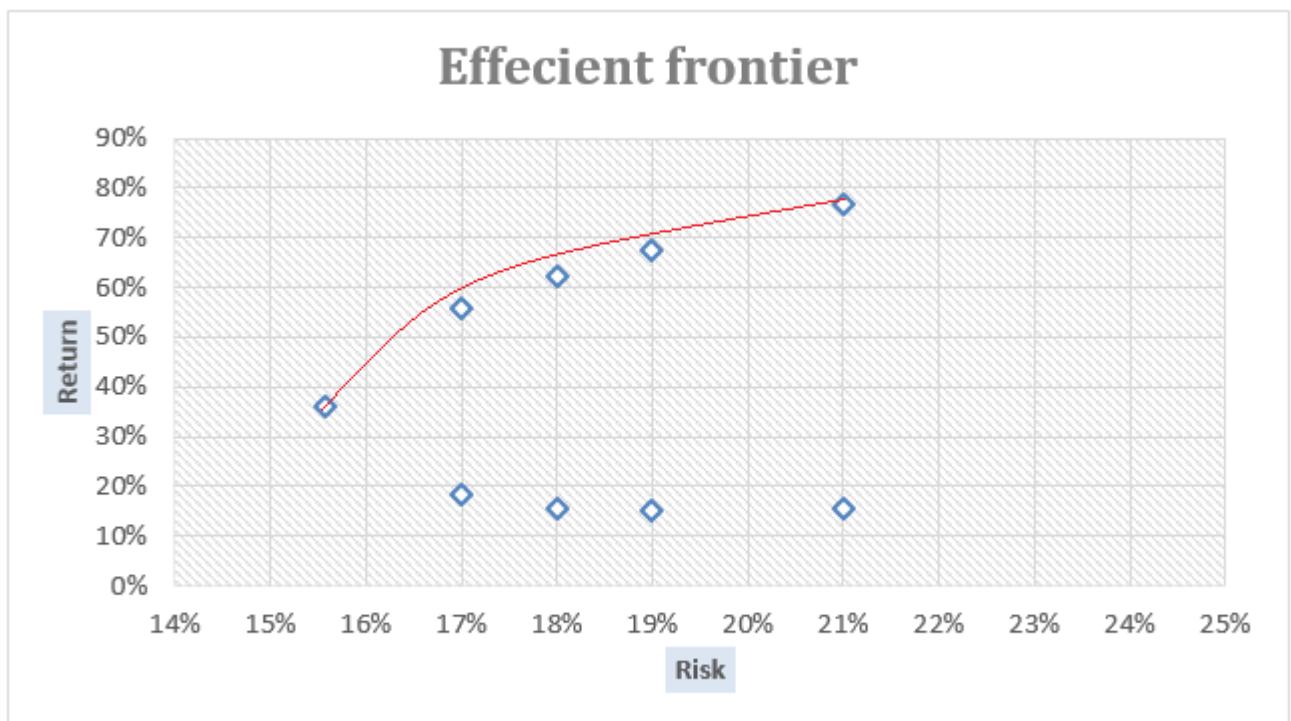
Once you click on the scatter plot, you will be able to see the how the plot appears. Here is how it looks, of course, I've tried to format the graph to make it look more presentable.



This curve that you see above my friend, is called the 'efficient frontier' of this portfolio. So what do we understand from this curve and why is it so important? Well, quite a few things, lets deal with it one by one –

1. As you can see, the X-axis represents risk and the Y-axis represents returns
2. Starting from the left most point, the one which seems to be a little isolated from the rest, represents the minimum variance portfolio. We know this portfolio has a risk of 15.57% with a return of 36.25%.
3. We now move focus to 17% risk (notice the x axis), you can find two plots, one at 18.35% and another at 55.87% – what does this tell you?
 1. It tells us that at 17% risk (or when we are particular about fixing the risk at 17%), the best possible portfolio can achieve a return of 55.87%
 2. The worst possible portfolio (in terms of return) is 18.35%
 3. In simple terms, when you fix a level of risk you are comfortable, you should aim to maximize the return
 4. There are multiple other portfolios that are possible between 18.35% and 55.87% (when we fix risk at 17%) these would be represented as plots between the minimum and maximum return. All these portfolios are considered inefficient, the minimum return portfolio being the worst amongst the rest
 5. So as an investor, your aim should be to maximum the return, especially when you have some clarity on how much risk you are willing to bear
4. You can notice the same behavior for risks at 18%, 19% and 21%

5. The best possible portfolios, or in other words, the efficient portfolio will always lie on the line above the minimum variance portfolio. This line is highlighted below



So, you as an investor, should always aim to create a portfolio, which lies on the efficient frontier, and as you may realize, creating this portfolio is merely a function of rearranging weights as per the results obtained in portfolio optimization.

Think about it – when you risk your money, you obviously want the best possible return, right? This is exactly what the curve above is trying to convey to us. Its prompting us to create portfolios more efficiently.

In the next chapter, we will take a quick look at a concept called “Value at risk” and then proceed to understanding risk from a trader’s perspective.

You can **download** the excel sheet used in this chapter.

Key takeaways from this chapter

1. A portfolio with certain weights to each stock is considered unique
2. When we fix the desired level of risk, we can optimize the portfolio to yield the minimum return and maximum return portfolios
3. Between the min and max return portfolio (for a given fixed level of risk), we can have multiple unique portfolios
4. The scatter plot of risk and return gives us the efficient frontier
5. For a given level of risk, the best possible portfolio one can construct would lie on the efficient frontier, all other portfolios are deemed inefficient

Value at Risk

10.1 – Black Monday

Let's start this chapter with a flashback. For many of us, when we think of the 70's, we can mostly relate to all the great rock and roll music being produced from across the globe. However, the economists and bankers saw the 70's very differently.

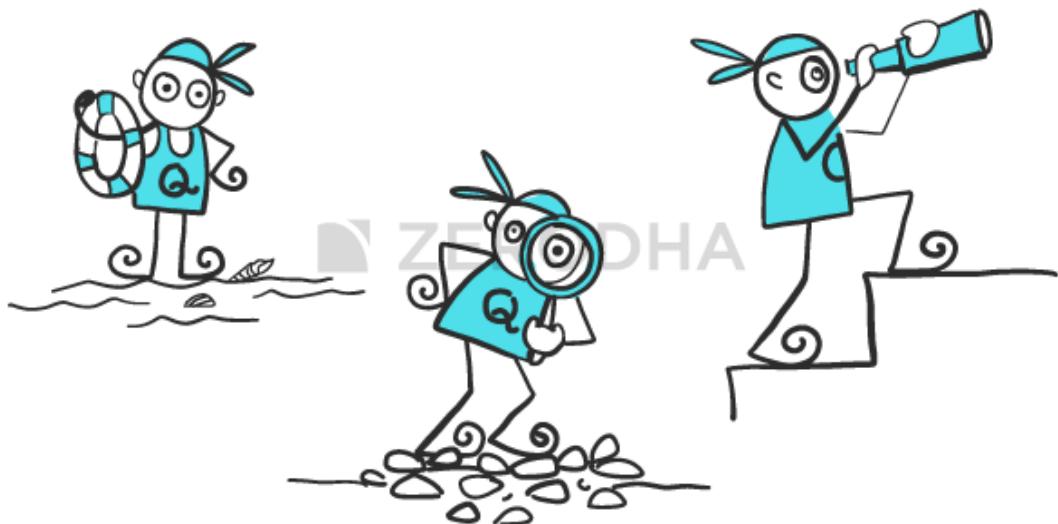
The global energy crisis of 70's had drawn the United States of America into an economic depression of sorts. This lead to a high inflationary environment in the United States followed by elevated levels of unemployment (perhaps why many took to music and produced great music). It was only towards the late 70's that things started to improve again and the economy started to look up. The United States did the right things and took the right steps to ease the economy, and as a result starting late seventies / early eighties the economy of United States was back on track. Naturally, as the economy flourished, so did the stock markets.

Markets rallied continuously starting from the early 1980s all the way to mid-1987. Traders describe this as one of the dream bull runs in the United States. Dow made an all-time high of 2,722 during August 1987. This was roughly a 44% return over 1986. However, around the same time, there were again signs of a stagnating economy. In economic parlance, this is referred to as 'soft landing' of the economy, where the economy kind of takes a breather. Post-August 1987's peak, the market started to take a breather. The months of Aug, Sept, Oct 1987, saw an unprecedented amount of mixed emotions. At every small correction, new leveraged long positions were taken. At the same time, there was a great deal of unwinding of positions as well. Naturally, the markets neither rallied nor corrected.

While this was panning on the domestic front, trouble was brewing offshore with Iran bombing American super tankers stationed near Kuwait's oil port. The month of October 1987, was one of its kind in the history of financial markets. I find the sequence of events which occurred during the 2nd week of October 1987 extremely intriguing, there were way too much drama and horror panning out across the globe –

- 14th Oct 1987 (Wednesday) – Dow dropped nearly 4%, this was a record drop during that period
- 15th Oct 1987 (Thursday) – Dow dropped another 2.5%. Dow was nearly 12% down from the August 1987's high. On the other side of the globe, Iran attacked an American super tanker stationed outside Kuwait's oil port, with a Silkworm missile
- With these two events, there were enough fear and panic spread across the global financial markets
- 16th Oct 1987 (Friday) – London was engulfed by an unexpected giant storm, winds blowing at 175 KMPH caused blackouts in London (especially the southern part, which is the financial hub). London markets were officially closed. Dow opened weak, and crashed nearly 5%, creating a global concern. Treasury Secretary was recorded stating economic concerns. Naturally, this would add more panic
- 19th Oct 1987 (**Black Monday**) – Starting from the Hong Kong, markets shaved off points like melting cheese. Panic spread to London, and then finally to the US. Dow recorded the highest ever fall with close 508 or 22.61% getting knocked off on a single day, quite naturally attracting the Black Monday title.

The financial world had not witnessed such dramatic turn of events. This was perhaps the very first few ‘Black Swan’ events to hit word hard. When the dust settled, a new breed of traders occupied Wall Street, they called themselves, “The Quants”.



10.2 – The rise of quants

The dramatic chain of events of October 1987 had multiple repercussion across the financial markets. Financial regulators were even more concerned about system wide shocks and firm's capability to assess risk. Financial firms were evaluating the probability of a 'firm-wide survival' if things of such catastrophic magnitude were to shake up the financial system once again. After all, the theory suggested that 'October 1987' had a very slim chance to occur, but it did.

It is very typical for financial firms to take up speculative trading positions across geographies, across varied counterparties, across varied assets and structured assets. Naturally, assessing risk at such level gets nothing short of a nightmarish task. However, this was exactly what the business required. They needed to know how much they would stand to lose, if October 1987 were to repeat. The new breed of traders and risk mangers calling themselves 'Quants', developed highly sophisticated mathematical models to monitor positions and evaluate risk level on a real-time basis. These folks came in with doctorates from different backgrounds – statisticians, physicist, mathematicians, and of course traditional finance. Firms officially recognized 'Risk management' as an important layer in the system, and risk management teams were inducted in the 'middle office' segment, across the banks and trading firms on Wall Street. They were all working towards the common cause of assessing risk.

Then CEO of JP Morgan Mr. Dennis Weatherstone, commissioned the famous '4:15 PM' report. A one-page report which gave him a good sense of the combined risk at the firm-wide level. This report was expected at his desk every day 4:15 PM, just 15 minutes past market close. The report became so popular (and essential) that JP Morgan published the methodology and started providing the necessary underlying parameters to other banks. Eventually, JP Morgan, spun off this team and created an independent company, which goes by the name 'The Risk Metrics Group', which was later acquired by the MSCI group.

The report essentially contained what is called as the 'Value at Risk' (VaR), a metric which gives you a sense of the worst case loss, if the most unimaginable were to occur tomorrow morning.

The focus of this chapter is just that. We will discuss Value at Risk, for your portfolio.

10.3 – Normal Distribution

At the core of Value at Risk (VaR) approach, lies the concept of normal distribution. We have touched upon this topic several times across multiple modules in Varsity. For this reason, I will not get into explaining normal distribution at this stage. I'll just assume you know what we are talking about. The Value at Risk concept that we are about to discuss is a ‘quick and dirty’ approach to estimating the portfolio VaR. I’ve been using this for a few years now, and trust me it just works fine for a simple ‘buy and hold’ equity portfolio.

In simple words, Portfolio VaR helps us answer the following questions –

1. If a black swan event were to occur tomorrow morning, then what is the worst case portfolio loss?
2. What is the probability associated with the worst case loss?

Portfolio VaR helps us identify this. The steps involved in calculating portfolio VaR are very simple, and is as stated below –

1. Identify the distribution of the portfolio returns
2. Map the distribution – idea here to check if the portfolio returns are ‘Normally distributed’
3. Arrange portfolio returns from ascending to descending order
4. Observe out the last 95% observation
5. The least value within the last 95% is the portfolio VaR
6. Average of the last 5% is the cumulative VaR or CVar

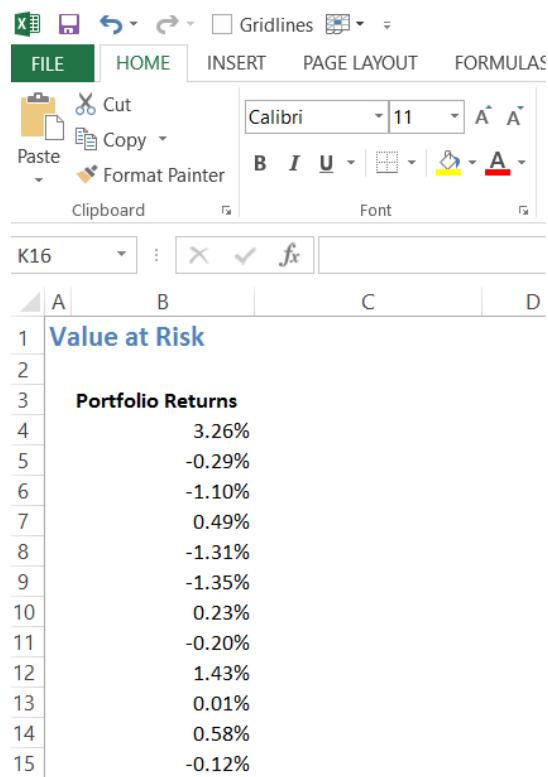
Of course, for better understanding, let us apply this to the portfolio we have been dealing with so far and calculate its Value at Risk.

10.4 – Distribution of portfolio returns

In this section, we will concentrate on the first two steps (as listed above) involved in calculating the portfolio VaR. The first two steps involve us to identify the distribution of the portfolio returns. For this, we need to deal with either the normalized returns or the direct portfolio returns. Do recall, we have already calculated the normalized returns when we discussed the ‘equity curve’. I’m just using the same here –

Starting Value	R
100	Daily Rt
100.000	
103.257	3.26%
102.962	-0.29%
101.827	-1.10%
102.326	0.49%
100.990	-1.31%
99.629	-1.35%
99.853	0.23%
99.650	-0.20%
101.078	1.43%
101.084	0.01%
101.671	0.58%

You can find these returns in the sheet titled ‘EQ Curve’. I’ve copied these portfolio returns onto a separate sheet to calculate the Value at Risk for the portfolio. At this stage, the new sheet looks like this –



Remember, our agenda at this stage is to find out what kind of distribution the portfolio returns fall under. To do this, we do the following –

Step 1 – From the given time series (of portfolio returns) calculate the maximum and minimum return. To do this, we can use the ‘=Max()’ and ‘=Min()’ function on excel.

Value at Risk

Portfolio Returns			
3.26%			
-0.29%	Max		3.26%
-1.10%	Min		-2.82%
0.49%			
-1.31%			
-1.35%			
0.23%			
-0.20%			
1.43%			

Step 2 – Estimate the number of data points. The number of data points is quite straight forward. We can use the ‘=count ()’ function for this.

Value at Risk

Portfolio Returns			
3.26%			
-0.29%	Max		3.26%
-1.10%	Min		-2.82%
0.49%	Count		126
-1.31%			
-1.35%			

There are 126 data points, please do remember we are dealing with just last six months data for now. Ideally speaking, you should be running this exercise on at least 1 year of data. But as of now, the idea is just to push the concept across.

Step 3 – Bin width

We now have to create ‘bin array’ under which we can place the frequency of returns. The frequency of returns helps us understand the number of occurrence of a particular return. In simple terms, it helps us answer ‘how many times a return of say 0.5% has occurred over the last 126 days?’. To do this, we first calculate the bin width as follows –

$$\text{Bin width} = (\text{Difference between max and min return}) / 25$$

I’ve selected 25 based on the number of observations we have.

$$= (3.26\% - (-2.82\%)) / 25$$

$$= 0.002431$$

Step 4 – Build the bin array

This is quite simple – we start from the lowest return and increment this with the bin width. For example, lowest return is -2.82, so the next cell would contain

$$= -2.82 + 0.002431$$

$$= -2.58$$

We keep incrementing this until we hit the maximum return of 3.26%. Here is how the table looks at this stage –

	A	B	C	D	E	F	G
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							

The table contains the following data:

Row	Column	Value
1	A	Value at Risk
3	A	Portfolio Returns
4	B	3.26%
5	B	-0.29%
6	B	-1.10%
7	B	0.49%
8	B	-1.31%
9	B	-1.35%
10	B	0.23%
11	B	-0.20%
12	B	1.43%
13	B	0.01%
14	B	0.58%
3	C	Max
4	C	3.26%
5	C	Min
6	C	-2.82%
7	C	Count
8	C	126
8	D	Bin Width
8	D	0.00243078
3	E	Bin Array
4	E	-2.82%
5	E	-2.58%
6	E	-2.33%
7	E	-2.09%

And here is the full list –

Bin Array
-2.82%
-2.58%
-2.33%
-2.09%
-1.85%
-1.60%
-1.36%
-1.12%
-0.88%
-0.63%
-0.39%
-0.15%
0.10%
0.34%
0.58%
0.83%
1.07%
1.31%
1.56%
1.80%
2.04%
2.28%
2.53%
2.77%
3.01%
3.26%

We now have to calculate the frequency of these return occurring within the bin array. Let me just present the data first and then explain what is going on –

Bin Array	Frequency
-2.82%	1
-2.58%	0
-2.33%	2
-2.09%	2
-1.85%	2
-1.60%	0
-1.36%	1
-1.12%	4
-0.88%	8
-0.63%	10
-0.39%	11
-0.15%	12
0.10%	9
0.34%	11
0.58%	13
0.83%	10
1.07%	11
1.31%	4
1.56%	2
1.80%	5
2.04%	2
2.28%	1
2.53%	2
2.77%	0
3.01%	2
3.26%	0

I've used the '=frequency ()' function on excel to calculate the frequency. The first row, suggests that out of the 126 return observation, there was only 1 observation where the return was -2.82%. There were 0 observations between -2.82% and 2.58%. Similarly, there were 13 observations 0.34% and 0.58%. So on and so forth.

To calculate the frequency, we simply have to select all the cells next to Bin array, without deselecting, type =frequency in the formula bar and give the necessary inputs. Here is the image of how this part appears –

The screenshot shows a Microsoft Excel spreadsheet. The formula bar at the top has the formula `=FREQUENCY(B4:B129,D11:D36)`. Two red arrows point from the text in the formula bar to the corresponding parts of the formula: one arrow points to the range `B4:B129` and another points to the range `D11:D36`.

The spreadsheet contains the following data:

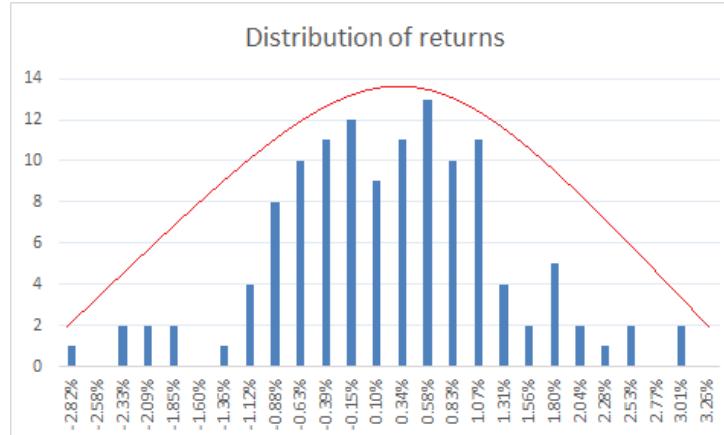
	Value at Risk	Portfolio Returns	Bin Array	Frequency
1	Value at Risk			
2				
3	Portfolio Returns			
4		3.26%		
5		-0.29%		
6		-1.10%		
7		0.49%		
8		-1.31%		
9		-1.35%		
10		0.23%		
11		-0.20%	-2.82%	1
12		1.43%	-2.58%	0
13		0.01%	-2.33%	0
14		0.58%	-2.09%	0
15		-0.12%	-1.85%	0
16		0.80%	-1.60%	0
17		0.70%	-1.36%	0
18		-0.62%	-1.12%	0
19		-0.09%	-0.88%	0
20		0.88%	-0.63%	0
21		-2.46%	-0.39%	0

Do remember to hit 'Ctrl + shift + enter' simultaneously and not just enter. Upon doing this, you will generate the frequency of the returns.

Step 5 – Plot the distribution

This is fairly simple. We have the bin array which is where all our returns lie and next to that we have the frequency, which is the number of times a certain return has occurred. We just need to plot the graph of the frequency, and we get the frequency distribution. Our job now is to visually estimate if the distribution looks like a bell curve (normal distribution) or not.

To plot the distribution, I simply have to select the all the frequency data and opt for a bar chart. Here is how it looks –



Clearly what we see above is a bell-shaped curve, hence it is quite reasonable to assume that the portfolio returns are normally distributed.

10.5 – Value at Risk

Now that we have established that the returns are normally distributed, we proceed to calculate the Value at Risk. From here on, the process is quite straightforward. To do this, we have to reorganize the portfolio returns from the ascending to descending order.

	A	B	C	D
1	Value at Risk			
2				
3	Portfolio Returns	Port Rt - Reordered		
4		3.26%	3.26%	
5		-0.29%	2.92%	
6		-1.10%	2.83%	
7		0.49%	2.37%	
8		-1.31%	2.35%	
9		-1.35%	2.18%	
10		0.23%	1.94%	
11		-0.20%	1.90%	
12		1.43%	1.78%	
13		0.01%	1.73%	←
14		0.58%	1.71%	
15		-0.12%	1.63%	
16		0.80%	1.63%	
17		0.70%	1.43%	
18		-0.62%	1.42%	

I've used excel's sort function to do this. At this stage, I will go ahead and calculate Portfolio VaR and Portfolio CVaR. I will shortly explain, the logic behind this calculation.

Portfolio VaR – is defined as the least value within 95% of the observation. We have 126 observations, so 95% of this is 120 observations. Portfolio VaR is essential, the least most value within the 120 observations. This works out to be **-1.48%**.

I take the average of the remaining 5% of the observation, i.e the average of the last 6 observations, and that is the Cumulative VaR of CVaR.

The CVaR works out to **-2.39%**.

You may have many questions at this stage, let me list them down here along with the answers –

1. Why did we plot the frequency distribution of the portfolio?
 1. To establish the fact that the portfolio returns are normally distributed
2. Why should we check for normal distribution?
 1. If the data we are studying is normally distributed, then we can characteristics of normal distribution is applicable to the data set
3. What are the characteristics of normally distributed data?
 1. There are quite a few, but you should specifically know that 68% of the data lies within 1 SD, 95% of the data within 2nd, and 99.7% of the data lies within the 3rd I'd suggest you read [this chapter](#) to know more about the normal distribution.
4. Why did we sort the data?
 1. We have established that the data set is normally distributed. Do remember, we are only interested in the worst case scenario. Given this, when we sort it from highest to lowest, we are essentially in a position to look at the returns in a more systematic way.
5. Why did bother to take only 95% observation?
 1. Remember, according to the normal distribution theory, 95% of the data lies within the 2nd standard deviation. This means on any random day, the return on the portfolio is likely to be any value within the 95% of the observations. Therefore, quite naturally the least most value within the 95% observation should represent the worst case loss or the Value at Risk.
6. What does the VaR of -1.48% indicate?
 1. It tells that the worst case loss for the given portfolio is -1.49% and we can conclude this with a confidence of 95%
7. Can't the loss not exceed -1.48%?
 1. Yes, it certainly can and this is where CVaR comes into play. In the case of an extreme event, there is a 5% chance that the portfolio could experience a loss of -2.39%.
8. Can't the loss exceed beyond -2.89%?

1. Yes, it can but the probability of this occurring is quite very low.

I hope the above discussion makes sense, do apply this on your equity portfolio and I'm sure you will gain a greater insight into how your portfolio is positioned.

We have discussed quite a few things with respect to the portfolio and the risk associated with it. We will now proceed to understand risk with respect to trading positions.

Download the Excel workbook used in this chapter.

Key takeaways from this chapter

1. Events which have a very low probability of occurrence is called 'Black Swan' events
2. When a black swan event occurs, a portfolio can experience higher levels of losses
3. Value at Risk is one approach to estimate the worst case loss if a black swan event were to occur
4. We can estimate the portfolio VaR by studying the distribution of the portfolio returns
5. The average of the last 5% of the observation gives us the Value at Risk of the portfolio.

Position Sizing for active trader



11.1 – Poker face

Last month I got an opportunity to play poker with a few good friends. I was playing poker after a gap of 6 years and I was quite excited about it. The buy in for this friendly game was Rs.1000/. For those who are not familiar with poker – it's a card game where skill and luck are tested in equal measure.

So, the game started, cards were dealt, and in the very first round I bet Rs.200/- and I saw it go away, just like that. In the next round, I bet another 200, and again saw it go away. At this stage I convinced myself that I could make up my losses in the 3rd round, and with this thought I increased the bet size to 600, only to watch it go away! So for all practical purposes, I lost Rs.1000/- in a matter of 10 minutes! In the trading world, this is equivalent to blowing up your entire trading account.

I didn't give up, after all, I'm supposed to know trading and poker draws many similarities to trading. I decided to 'recover' my initial loss and stay in the game longer. I bought in for another 1000 and started fresh. This time, I stayed on the table a bit longer – for a total of 15 minutes!

Clearly, it was not working for me. I had a better memory of me playing poker 6 years ago. Though not the best, at least, I would stay on the table till the game lasted and even win few hands. So what was happening this time around? I was confused and I kind of didn't believe that this was happening to me? How could I wipe my account twice in a matter of 25 minutes?

With these confusing thoughts on my past poker skills and my current game play, I decided to buy in again for another 1000 Rupees. This was my 3rd buy in. In the trading world, this is equivalent to funding your account 3rd time over after successfully blowing it up twice.

What advice would you give someone who has blown up his account twice in the markets? – ‘get out of the markets immediately’, would perhaps be the best-suited advice right? Well, I dint pay any heed to my inner voice, gambler’s fallacy had taken over my rational thinking abilities and I bought in again for 1000 Rupees more.

For those of you who don’t know gambler’s fallacy – if you are betting on an outcome and you tend to make a long streak of losses, then at the time of quitting, your mind tells you or rather tricks you to believe that your losing streak is over and your next bet will be a winner. This is when you increase your betting size and lose a bigger chunk of money. Gamblers fallacy is one of the biggest culprits in wiping out many trading accounts clean.

Anyway, back to my poker game. This was my 3rd buying, I had already lost 2K and was betting with another 1K. I was confident I’d recover plus make some money and save myself some shame, but the boys on the table had other plans for me. They knew I was the sucker on the table and it was easy to allure me to make irrational bets. So they did and wiped me out clean over the next 7 minutes.

That was it, I called it quits and I got back more after losing 3k.

After the game, I thought through on what went wrong. The answer was very clear –

1. I had forgotten to recognize the odds of winning with the cards that were dealt
2. I was not ‘position sizing’ my bets – my bets were way too irrational and random

After a couple of weeks, I had another invite to the game. I had set a bad precedence of giving away easy money. This time around I had decided to position size my bets well.

I bought in for 1000 and started the game. Each time the cards were dealt – I accessed my odds fairly well and if I thought my odds were fair, I bet accordingly. In the trading world, this

was equivalent to following a ‘trading system’ backed by position sizing techniques. The result of this simple systematic approach had a great impact on my game –

1. I won few hands
2. At the peak, I must have had about 4K of winnings
3. I lasted throughout the game and had a lot of fun along the way
4. Towards the end I gave up some gains but was extremely happy with the fact that few simple techniques helped me manage my game much better

Position sizing made all the difference in this game. It always does and this is the exact reason for me to narrate this story. I do not want you to speculate in the markets without understanding your odds or without position sizing your bets. If you do, you will end up making a fool out of yourself.

Poker is played for fun but when you trade, you are essentially deploying your capital for a more serious and meaningful outcome. So please do pay attention to some of the things we will discuss over the next few chapters. I’m certain it will have a positive impact in your trading career.

At this point I have to mention this – I myself learned position sizing many years ago by reading Van Tharp’s books. Van Tharp is one of the most prominent people to bring in the concept of position sizing to traders. I’d even recommend you buy some of his books to expand your knowledge on this subject.

11.2 – Gambler’s fallacy

We briefly discussed the gambler’s fallacy early on. I guess it makes sense to discuss a little more on this at the very beginning especially in the context of markets.

Take a look at this chart –



This is the chart of Nifty – Nifty hit the magical number of 10,000 on 25th July 2017. As a trader, how would you trade this?

1. Nifty is at an all-time high – 10K
2. Many market participants may book profits at this point – considering it is a psychological level
3. All time high implies no resistance points
4. Nifty has been in a great up wards trend over the past few weeks
5. Maybe Nifty would consolidate around these levels?
6. Maybe a correction of 2-3% before the rally continues?

Let us just assume that these are some valid points for now. This means a short position is justified or for that matter buying of puts. Your analysis could be as simple as this or as sophisticated as studying the time series data and modeling the same using advanced statistical or machine learning models.

Irrespective of what you do – there is no certainty in the markets. No one technique will tell you the outcome in advance. This implies that we are dealing with fairly random draws here. Of course, based on how meaningful your analysis is, your odds of winning can improve, but at the end of the day, there is no certainty and you have to acknowledge the fact that markets are indeed random.

Now imagine this – you have done a state of the art analysis and you place your bet on Nifty only to see the stop loss trigger. You do not give up, you place another trade and to your misfortune, you are stopped out again. This cycle repeats for say the next 4 trades.

You know your analysis is bang on – but then your stop loss is continuously getting triggered. You still have money in your account to take on bets, you are still convinced that your analysis is rock solid and the markets will turn around, you still have an appetite for risk – given all these, what do you do?

1. Would you stop trading?
2. Would you risk the same amount of money again?
3. Now that you have lost 6 consecutive bets, would you consider that your odds of making money on the 7th trade is higher and therefore increase your bet size to recover your previous losses plus reap in some profits?

Which option are you likely to take? Take a minute and answer this question honestly to yourself.

Having been through this situation myself and having interacted with many traders let me tell you – most traders would take the 3rd option, the question however is – why?

Traders tend to believe that long streaks will cease when they take the ‘next’ trade. For instance, in this case, the trader has faced 6 consecutive losses, but at this point his conviction that the 7 trade will be a winner is very high. This is called ‘Gambler’s fallacy’.

In reality, when you are dealing with random draws, the odds of making a loss on the 7th trade is as high (or low) as it was when you placed your first bet. Just because you have made a series of losses, the odds of making money on the next trade does not improve.

Traders fall prey to ‘Gamblers fallacy’ and often end up increasing their bet sizes without understanding how the odds stack up. In fact, gamblers fallacy ruins your position sizing philosophy and therefore is the biggest culprit in wiping out trading accounts.

This works on the other side as well. Imagine, that you are fortunate enough to witness a 6 or let us say 10 consecutive wins. Whatever you bet on, the trade works out in your favor. You are on your 11th trade now, which of the following are you likely to do?

1. Considering that you made enough money, would you stop trading?
2. Would you risk the same amount again?

3. Would you increase your bet size?
4. Will you take a conservative approach, maybe protect your profits, and therefore reduce your bet size?

Chances are that you will take the 4th option. You clearly want to protect your profits and do not want to give back whatever you have earned in the markets and at the same time you would want to take a trade considering you have had a great winning streak.

This is again ‘gamblers fallacy’ at play. Being completely influenced by the outcome of the previous 10 trades, you are essentially reducing your position size for the 11th trade. In reality, this new trade has a same odds of winning or losing as the previous 10 bets.

Perhaps, this explains why some of the traders, even though get into profitable trading cycle end up making very little money.

The antidote for ‘Gambler’s Fallacy’, is position sizing.

11.3 – Recovery trauma

In the trading world, the capital we bring on the table is the raw material. If you do not have enough money to trade with, then how will you make a profit? Hence we need to not just protect the profits that we make, but also protect the capital.

Extending this thought – if you risk too much capital on any one trade, then you stand a chance to risk your capital to an extent that you may burn your capital leaving you with very little money. Now if you are trading with very little money, then every trade that you take will appear to be too risky. The climb back to where you started will (in terms of capital) will be a Herculean task.

I have prepared a table to help you understand this fact. Assume you have a trading capital of Rs.100,000/- . Let us see how the numbers stack up with –

Starting Capital **100,000**

Drawdown	Starting Capital	Efforts
5%	95,000	5.3%
10%	90,000	11.1%
15%	85,000	17.6%
20%	80,000	25%
25%	75,000	33%
30%	70,000	43%
35%	65,000	54%
40%	60,000	67%
45%	55,000	82%
50%	50,000	100%
55%	45,000	122%
60%	40,000	150%
65%	35,000	186%
70%	30,000	233%
75%	25,000	300%
80%	20,000	400%
85%	15,000	567%
90%	10,000	900%
95%	5,000	1900%

You can download the excel sheet [here.](#)

Assume you lose 5% of your capital or Rs.5000/- . Your new starting capital is Rs.95,000/- . Now, in order to recover to Rs.5000 with a capital of 95000, you need to generate a return of 5.3%, which is 0.3% more than what you lost.

Now, instead of 5%, assume you lost 10% and your capital becomes 90000, now in order to recover 10000 or 10% of your original capital, you have to earn back 11.1%. As you can see, as the loss deepens, you will have to work really hard to bounce back to original starting capital. For example at 60% loss or original capital, you are staring at a 150% bounce back.

Unfortunately, the ‘recovery trauma’ affects traders with smaller account size. Assume you come to the market with Rs.50,000/- capital. Now you would have heard of stories on how Rakesh Jhunjhunwala, grew his money from 10,000 to 15K Crores. You would want to replicate at least a small portion of this success. Honestly speaking, if you can manage to grow Rs.50,000/- to say Rs.60,000 by the end of the year, you would have done a great job. This translates to a 20% return. But this is not exciting, right? I mean earning Rs.10,000/- over 1 year when you are actively trading somehow does not seem right.

So what do you do? You tend to take bigger risks and hope to make bigger gains, and if the trade goes against you, then you are essentially falling prey to the ‘recovery trauma’ phenomena.

This is exactly the reason why you should never risk too much on any one trade, especially if you have a small capital. Remember, your odds of making good money in the markets is high if you can manage to stay in game for long, and to stay for a longer period, you need to have enough capital, and to have enough capital, you need to risk the right amount of money on each trade. This really boils down to working towards longer term ‘consistency’ in markets, and to be consistent you need to position size your trades really well.

I’m going to close this chapter with a quote from Larry Hite.



I have two basic rules
about winning in trading
as well as in life. 1. If you don't bet,
you can't win. 2. If you lose all
your chips, you can't bet

Larry Hite

Over the next few chapters, we will dig deeper into position sizing techniques.

Key takeaways from this chapter

1. Position sizing forms the corner stone of a trading system
2. Gamblers fallacy is a bias highly applicable to the trading world. It makes the trader believe that a long streak of a certain outcome can break
3. When there are infinite draws, the odds of making a profit or loss on the N^{th} trade is similar to the odds of making the same profit or loss on the 1st trade
4. The recovery of capital is much more difficult task than one can imagine
5. Traders with small accounts have a tendency to take larger bets, which they need to avoid

CHAPTER 12

Position Sizing for active traders (Part 2)

12.1 –Defining Equity Capital

The last chapter we laid down few key thoughts on position sizing and with that, I guess it is amply clear as to why one has to incorporate position sizing at the core of every trading strategy. Position sizing technique helps you identify how much of your equity capital has to be exposed for a given trade. In this chapter, we will take that discussion forward and explore ways to position size.

A quick recap of sorts before we proceed. What is position sizing?

Position sizing is all about answering how much capital you will expose to a particular trade given that you have ‘x’ amount of trading capital. One classic position sizing strategy which most people employ is the standard 5% rule. The 5% rule does not permit you to risk more than 5% of the capital on a given trade. For example, if the capital is Rs.100,000/-, then they will not risk more Rs.5000/- on any single trade.

Here 5000 is the exposure to a trade and 10000 is the equity capital. You have decided to invest 5000 a trade based on a position sizing rule or a strategy.

Needless to say, there are many different ways to position size, which by the way, also means (unfortunately) that there is no single guided technique to position size. You as a trader need to experiment and figure out what works for you. Of course, I will discuss few position sizing techniques soon.

Now, irrespective of which position sizing technique you will follow, at some point the technique will require you to estimate your equity capital. For this reason, we will address the technique of estimating equity capital first and then proceed to learn position sizing techniques.

What do I mean by equity capital?

Equity capital is basically the amount of money you have in your trading account based on which you decide how much capital to deploy in a trade. This may seem very trivial to you at this point. But allow me to illustrate why this is a tricky task.

Assume you have Rs.500,000 capital and you work with a simple position sizing principle of exposing not more than 10% capital to a single trade. Given this, assume you take a position worth Rs.50,000/-.

Now for the next trade, how much is your equity capital?

1. Is it Rs.450,000?
2. Is it still Rs.500,000 considering the fact 50K is deployed in a trade?
3. Should it be 450,000 plus $50K \pm \text{the P\&L from the trade}$ that exists in the market?

Given that there are numerous outcomes and possibilities, estimating equity for the trade is not really a straightforward task. Hence, getting our act right in estimating the equity capital is very important before we proceed to learn position sizing concepts.



12.2 – Estimating Equity Capital

At this point, I'd like to go back to good old Van Tharp and talk to you some of the techniques he uses to estimate equity capital. These are some of the better techniques compared to the many out there. Essentially there are three techniques or models as he calls them –

1. Core Equity model

2. Total Equity model
3. Reduced total equity model

The **core equity model** requires you to deduct the capital allocated to a trade from the existing capital. This way, the exposure to a trade goes on reducing as you ladder up more and more positions. Let me give you an example – assume your equity capital is Rs.50,000/- and you follow a simple 10% position sizing formula. The 10% rule implies that you do not expose or risk more than 10% of your capital to a trade. So the first trade gets an exposure of Rs.5000. The core equity is now reduced to Rs.45000. Have a look at the following table –

Trade	Available Equity	Trade Exposure	Core Equity
1	50,000	5,000	45,000
2	45,000	4,500	40,500
3	40,500	4,050	36,450
4	36,450	3,645	32,805
5	32,805	3,281	29,525
6	29,525	2,952	26,572
7	26,572	2,657	23,915
8	23,915	2,391	21,523
9	21,523	2,152	19,371
10	19,371	1,937	17,434

Download the excel sheet [here](#).

So, the first trade assumes the equity available is Rs.50,000, hence 10% of the available equity is exposed first trade i.e Rs.5000/-. The core equity model requires you to deduct the capital deployed to a trade and re work on the core equity model. So, the core equity is now Rs.45000/-, which is also the available equity for the 2nd trade.

For the 2nd trade, we again deploy 10% of the equity available i.e $10\% * 45000 = \text{Rs.}4500/-$. We deduct this amount to calculate the new core equity, which is now Rs.40,500/-. This also is now the newly available equity for the 3rd trade.

So for the 3rd trade, the capital exposure for the trade is Rs.4050 and the new core equity is Rs.36,450/-. So on and so forth, I'm assuming you get the drift.

I consider this as a slightly conservative equity estimation model as you tend to reduce the capital allocation as the number of opportunities increases. For all you know, your 5th trade (for which the equity exposure is far lesser) may be a great winner. The other side of the argument is that the 5th trade could be the worst loser compared to the rest.

Having said that, I like this model for the sake of its simplicity. Once you commit the capital to a trade, you kind of forget about that and move on with what is available.

The **Total equity model** aggregates all the positions in the market along with its respective P&L and cash balance to estimate the equity. Let me straight away take an example to explain this –

Free cash available – Rs.50,000

Margin blocked for Trade 1 = Rs.75,000

P&L on Trade 1 = + Rs.2,000

Margin blocked for Trade 2 = Rs.115,000

P&L on Trade 2 = + Rs.7000

Margin blocked for Trade 3 = Rs.55,000

P&L on Trade 1 = - Rs.4,000

Total Equity = $50000 + 7000 + 2000 + 115000 + 7500 + 55000 - 4000$

= **Rs.300,000/-**

So, as you can see, in the total equity model, free cash along with margins blocked and the P&L per position is taken into consideration. Now, if my position sizing strategy suggests a 10% exposure to a new position, then I'd expose Rs.30,000/- on a new trade. If the free balance in my account does not permit me to take this position, then I'd not really initiate a new position. I'd wait to close one of the existing positions to take a new position.

The fact that this model considers a live position along with its P&L into account for estimating equity makes it a little risky. I'm personally not a big fan of this equity estimation model. This is somewhat like counting the chicken before they hatch.

I do like the 3rd model to estimate the equity, this one is called the '**Reduced Total Equity Model**'.

This model kind of combines the best of both the core equity model and the total equity model. It basically reduces the capital allocation to a particular trade (similar to core equity

model) and at the same time includes the P&L of the trade which is already in place (similar to total equity model). However, the P&L is only on the locked in profits.

Let me work with an example to help you understand this better. Assume I have a capital of Rs.500,000/- . Further, assume my position sizing strategy allows me to invest not more than 20% on a single trade, which is Rs.100,000/- per trade.

I'm looking at the chart of ACC and I decide to go long on ACC futures at 1800 by blocking a margin of approximately Rs.90,000/-, which is well within my position sizing limit of Rs.100,000/-.

I've now entered a position and waiting for the market to move. Meanwhile, as per the reduced total equity model, my the capital available for the 2nd trade is –

$$20\% * (500,000 - 90,000)$$

$$= \text{Or about } 20\% \text{ of Rs.} 410,000/-$$

$$= \text{Rs. } 82,000/-$$

Note, because of the existing position, the exposure capital has reduced from Rs.100,000 to Rs.82,000/- . Up to this point, it works exactly like the core equity capital model.

Now, assume the stock moves, and ACC jumps by 25 points to 1850. Considering the lot size of 400, I'm now sitting on a paper profit of –

$$400 * 50$$

$$= \text{Rs.} 20,000/-$$

I would now put in a trailing stop loss and lock in at least about 25 points out of 50 point move or in Rupee terms, I want to lock in Rs.10,000 as profits.

This means, for the long ACC position at 1800, I have to now place a stop loss at 1825 and locked in Rs.10,000/- as profits.

I will now add this locked in profits back to the total equity. Hence my total equity now stands at –

$$410,000 + 10,000$$

$$= 420,000/-$$

This means, my new exposure capital will be 20% of the total equity –

$$=20\% * 420000$$

= Rs.84,000/-

As you notice, the exposure capital has now increased by an additional 2000/-.

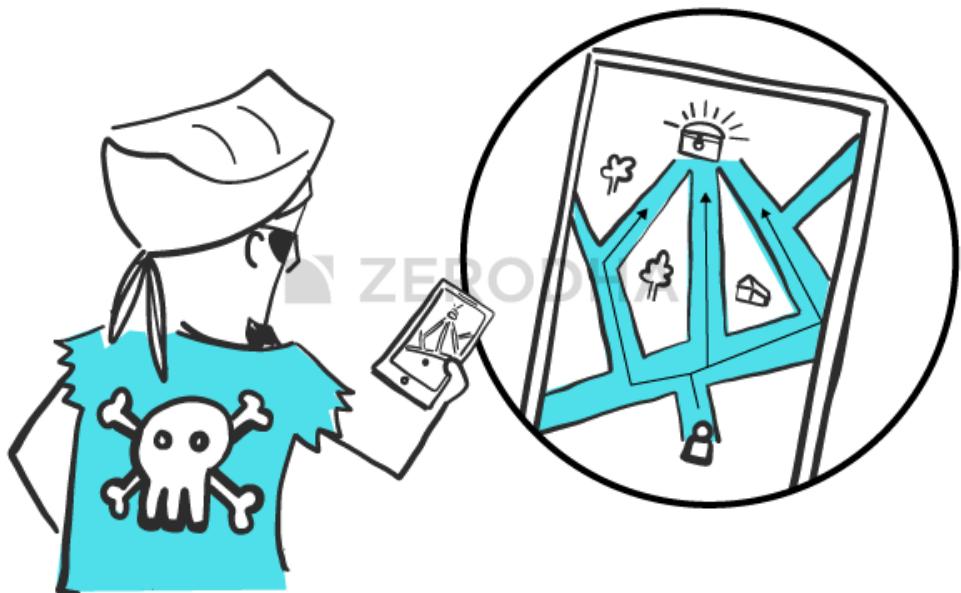
I kind of like the reduced total equity model to estimate the total capital available to position size. If one follows tends to follow this technique, then it kind of forces you to practice basic stop loss principles, which according to me is very good.

Anyway, I'd like to close this chapter at this point. In the next chapter, we will consider one of the above-stated methods to estimate equity and look into few position sizing techniques.

Key takeaways from this chapter

1. Estimating equity capital is crucial for position sizing
2. Core equity model deducts the capital allocated to a trade and recalculate the capital available
3. Total Equity model requires you to add the free cash, margins blocked, and the P&L of the positions to estimate the equity capital
4. Reduced Total Equity model requires you to add the free cash to the locked in profits of an existing position

Position Sizing for active traders (Part 3)



13.1 – Choose your path

We addressed a very crucial concept in the previous chapter. We looked at how one can determine equity based on 3 different models. Each of these three models on its own merit imposes some sort of position sizing discipline, but clearly that's not enough. We still need a standalone method to position size. Given this, we will move forward to discuss some of Van Tharp's techniques on position sizing.

I'd like to talk about three core position sizing techniques at this point, they are –

1. Unit per fixed amount
2. Percentage margin
3. Percentage of volatility

Do note, these models are asset independent and time frame independent. What do I mean by this? This means that you can apply these position sizing techniques to any asset you want. It could be stocks, stock futures, commodity futures, or currency futures. Further you

can apply them across any time frame – intraday, few trading session, or even trades extending for over few months.

To understand this really well, I'd suggest you pick a trading system, it could be as basic as a moving average crossover system. Identify entry and exit rules and evaluate the returns you would generate for the given time period. Now for the same set of data, apply one of the position sizing technique (which we will shortly discuss) and evaluate the performance. I'm sure, you will observe a huge improvement not just in terms of P&L but also the stability of the system.

Just to throw some light into how complex this can get –

- Assume you have a trading system – a simple moving average cross over system
- You intend to deploy cash on this and start trading every signal that the system generates
- There are 3 models to define equity and there are at least 3 basic models to define position sizing techniques
- This means you can position size in $3 \times 3 = 6$ different ways to deploy cash for the same opportunity (signal)
- The P&L for each will be different

However, from my experience, I would suggest you stick one method to estimate equity and maybe 1 or at the most 2 (meaningful) techniques to position size. Anything more may not be a great, in the sense, it would induce complexity, and complex does not necessarily mean better.

So you as a trader need to assess which path to follow based on your temperament. Anyway, let's get started on the core position sizing techniques.

13.2 – Unit per fixed amount

Let's discuss the '**Unit per fixed amount**' model first. This is a fairly simple model. Any trader who has a slight inkling towards position sizing would have explored this model in the initial days. I like and dislike this model for the same reason – its simplicity.

The model requires you to simply state how many shares or lots (in case of futures) you will trade for a given amount. For example, assume you have Rs.200,000 in your trading account and you have the following 5 assets (futures) as your opportunity universe –

1. Nifty

2. SBI
3. HDFC
4. Tata Motors
5. Infosys

You could simply state that you would not want to trade more than 1 lot of futures per 100,000 of any asset at any given point. Given this, assume you get a signal to buy Nifty, now since there is 2L in the account, you can choose to buy one or 2 lots.

The best part about this model is that it does not complicate the decision-making process. However, there are few problems with this model.

Consider this – the trading system that you follow generates a signal to buy Nifty Futures and at the same time the system signals you to buy Tata Motors. Since you have 2L in your account, you decide to buy 1 lot each. Do note at the point of writing this article, Nifty Futures requires a margin of about 60K and Tata Motors around 72K.

Irrespective of the margin, the rule simply states, 1 lot per 1L. This means, position sizing rule is assigning an equal weight to both the contracts, ignoring the implicit ‘riskiness’ of the asset. To give you a perspective, Nifty Futures has an annualized volatility of around 14% and Tata Motors has an annualized volatility of over 40%. So essentially, you are exposing yourself to a higher risk at the portfolio level.

This in fact, is both good and bad at the same time. Good in the sense that it does not reject a trade based on the riskiness and bad in the sense it does not really factor in risk.

There is another angle here – think about this, consider you are following a trading system to which you apply the 1 lot per 100,000 position size rule. Assume you have a 2 lac capital. Now, further assume that the system performs really well and you are bestowed with multiple winning trades. Now, for each signal, the maximum number of lots you can buy is restricted to just 2. For you to increase another lot or 2, you really need to double your capital or wait for your profits to double up your capital. So in a sense this particular position sizing technique limits the scalability of a system. The only antidote to this is to bring in a much larger account size.

For these reasons, I kind of don’t prefer the ‘unit per fixed amount’ position sizing technique. However, please don’t take my word, I’d suggest you work around and figure out your comfort level with this technique before deciding to adopt or not adopt this as your core position sizing technique.

13.3 – Percentage Margin

The percentage margin is an interesting position sizing technique. I personally think this technique is far more structured than the ‘unit per fixed amount’, technique especially for intraday traders. The percentage margin technique requires you to position size based on the margins.

Here you essentially fix a ‘X’ percentage of your capital as margin amount to any particular trade. Let’s work with an example to understand this better.

Assume you have a capital of Rs.500,000/-, with this you decide that you will not expose more than 20% as margin amount to a particular trade. This translates to a capital of Rs.100,000/- per trade.

Assume you spot an opportunity to trade Nifty Futures, you can easily take this position as the margins for this is roughly around 60K. However, let’s say you spot an opportunity in ICICI, you will be forced to let go of this as the margin for this is close to Rs.105,000/- . This means, ICICI will be out of your trading universe until and unless you increase your capital. Obviously, one should not randomly increase the capital just to accommodate opportunities. Capital should increase as an outcome on profits accumulating in your account.

Anyway, after you initiate the position in Nifty, assume you spot an opportunity in ACC, the margin for this is 90K.

Will you take this position?

The answer to this really depends on the way you estimate equity.

If you consider the total equity model, then you will still consider your capital to be 5L, 20% of which is 1L, hence you can safely take the position in ACC.

However, if you consider the reduced total equity model, then this is how it would work (assuming 20% position sizing rule) –

Starting Capital = 5L

Margin blocked = 60K

New capital = 4.4L

Margin @ 20% = 88K

Given this, you'd fall short by (just) 2K for a 90K position, hence you would have to let go...and as you realize, equity estimation plays very crucial role here.

Lastly, assume, you spot an opportunity which requires a margin of 40K, since you have 88K, you can comfortably take up 2 lots of this position.

So on and so forth.

The percentage margin rule ensures you pay roughly the same margin to all positions. However, the volatility from each position could vary. You could end up with risky bets and therefore altering the entire risk profile of your account.

This exposure to risk is overcome by next position sizing model.

13.4 – Percentage Volatility

The percentage volatility rule accounts for volatility of the underlying asset. The volatility as per this technique is not really the ‘standard deviation’, but rather the daily expected movement in the underlying.

For example, if SBI's OHLC is 276, 279, 274, and 278, then the volatility for the day is simply the difference between low and high i.e

$$279 - 274$$

$$= 5$$

To get a sense of the generic volatility measured this way, I can look at the difference between low and high for last ‘n’ days and take an average. However, the only problem here would be that I would be ignoring the gap up and gap down openings. For this reason, Van Tharp suggest the use of ‘Average True Range’ to measure the stock’s volatility.

The ‘Percentage Volatility’ method of position sizing requires us to define the maximum amount of volatility exposure one can assume for the given equity capital.

For example, if the equity capital is Rs.500,000/- then I could make a rule saying that I do not want to expose more than 2% of the capital to volatility.

Let's work with an example. Here is the chart of Piramal Enterprises Limited (PEL) –



The 14-day ATR is 76. This means each share of PEL contributes to a fluctuation (volatility) of Rs.76/- to my equity capital.

Now assume I spot an opportunity to trade PEL, the question is how many share should I buy considering my equity is 5L and I've capped volatility exposure as not more than 2%.

2% of 5L is 10,000/-. This means I should only so many number of shares of PEL, such that the overall volatility caused by PEL is not more than 10k.

Given this, I simply have to divide 10,000 by 76 to find out the number of shares that I can buy

-

$10,000 / 76$

= 131.57 or about 131 shares.

PEL is currently trading around 2700, which means to say, your overall exposure would be -

$131 * 2700$

=Rs.353,700/-

I'd suggest you stick to the reduced total equity model for estimating equity here. This means, the capital available for the next trade would be –

$$500,000 - 353,700$$

$$= 146,300$$

Now @ 2% volatility, the capital exposure reduced to Rs.2929/- . Clearly the capital exposure to the next trade would reduce, but the exposure to volatility would remain the same.

Here is an advice (from Van Tharp, of course) if you are inclined to follow percentage volatility technique – the do estimate the total amount of volatility you want to expose your portfolio too. If the number is say 15% then on a 5L capital this works out to Rs.75,000/-.

Think about it, if every position goes against you, then you stand to lose 75k on a capital of 5L on a single day. How does that feel? If your stomach churns, then 15% portfolio volatility maybe a bit high for you.

In the next chapter, we will explore few more concepts before we proceed to understanding ‘Trading biases’.

Key takeaways from this chapter

1. Estimating equity plays an important part in position sizing
2. Suppose you have 3 ways to estimate equity and 4 ways to position size, then essentially you have a $4 \times 3 = 12$ position sizing technique
3. Unit fixed model requires you to ascertain how many shares or lots you will trade for every ‘x’ amount of capital in your account
4. Unit fixed model does not consider risk
5. Percentage margin method requires you to define the maximum margin amount you will expose your capital to. You ideally should club this with total reduced equity model
6. Percentage volatility measures volatility in term of ATR.
7. Percentage volatility equal weights ‘volatility’ exposure to each position

Kelly's Criterion

14.1 – Percentage Risk

Last chapter we looked at three important position sizing techniques, all of them were unique in their own merit. The three techniques were –

- Unit per fixed amount
- Percentage Margin
- Percentage Volatility

All three methods work differently and when combined with a certain equity estimation technique, they produce totally different results. Given this, it is really up to you to figure out the marriage of which position sizing technique with which equity estimation technique works best for you.

Before I proceed, I thought it is important to discuss another practical position sizing technique, called the ‘Percentage Risk’, method. I do know quite a few traders who use this and I myself find this quite simple and intuitive technique to use.



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The percentage risk method, relies upon your own assessment of 'loss' that you are willing to bear for a given trade. This, as you may know is also called the 'Stop loss' for the trade. The stop loss for a trade is the price at which you decide to close the trade and take a hit. The percentage risk technique controls the position size as a function of risk defined by stop loss.

Let me take the example of a stock futures and explain how this works, in fact, I think this is a good trade setup –



Here is an intraday chart of Tata Motors, the frequency is 15 mins (14th Sept 2017, around 11:30 AM).

Let me explain why this is a trade worth considering –

Tata Motors is at 393.65, which happens to be a price action zone, considering it tested the same level, twice in the past. So this makes 393.65, a support price for Tata Motors (on an intraday basis). Both the times in the past, the price declined of Tata Motors declined when the stock tested 393.65. Given this, there is a possibility that the price could again test 393.65 and react to bounce back to the price from which it started to decline i.e 400.

Also, do notice the low volume retracement between 400 to 393.65 – I've discussed why I like trades like these in the Technical Analysis module. If you've not read that module, maybe you should

Considering these factors, a trader could be inclined to go long on Tata Motors Futures at 393.65.

What if the trade heads the other direction? What is the stop loss?

I notice some sort of support at 390/-, hence I'd be happy to set this as stop loss for the trade.

Nothing complicated, as you can see this is a very straightforward setup.

So the trade would be –

Stock: Tata Motors Limited

Trade: Long

Trade Price: 393.65

Target Price: At least 400

Target value 6.35

Stop loss Price: 390

Stop loss value: 3.65

Reward to Risk: 1.7 (which is great for an intraday trade)

Lot size: 1500

Margin Required: 73.5K

Now assume I have a capital of Rs.500,000/-, how many lots of Tata Motors can I buy considering the margin per lot is Rs.73,500/-?

Technically speaking one can buy up to 6.8 or 6 lots –

$500000/73500$

=6.8

However the question is – would you expose your entire capital to this one trade alone? Not a smart thing to do, if you were to ask me, because if the trade goes wrong, you would be losing Rs.32,850/- ($3.65 * 1500 * 6$) on this trade.

In other words, you would lose –

32850/500000

=6.57% of your capital on one trade.

However great a trade set up is, it is not a smart thing to expose so much capital to risk. As a thumb rule, professional traders do not risk more than 1 to 3% of their capital on any single trade, and this rule forms the core of the ‘Percentage risk’ position sizing technique.

Given this, let us define the **maximum risk per trade** as a percentage of overall capital – maybe 1.5% for now. This means on this trade, the maximum loss I’m willing to bear is

$1.5\% * 500000$

Rs.7,500/-

In other words, I don’t intend to lose more than Rs.7,500/- on any single trade. This is the maximum loss threshold.

We know the stop loss for this trade is 390, from an entry price of 393.65, the stop loss in absolute Rupee terms is –

$393.65 - 390$

= 3.65

The loss per lot is –

$3.65 * 1500$

= 5475

In the event the stop loss is triggered I would be taking a hit of Rs.5475 per lot.

Now to identify the number of lots I could take for the risk I’m willing to bear, I simply have to divide the maximum threshold by the loss per trade.

= $7500 / 5475$

= 1.36

Therefore, on this trade I can go ahead and buy up to 1 lot, which will cost me Rs.73,500/- as margin deposits.

For the next trade, it is prudent (or rather conservative in a positive way) to reduce the money blocked from the overall capital and re-work the maximum loss threshold. Let's do that and identify the new max loss threshold –

500000 – 73500

= 426,500

1.5% * 426500

= 6397.5

Given this, for the next trade, I will work out the stop loss, multiply that with the lot size and divide the max risk i.e 6397.5 by loss threshold to identify how many lots I can transact in.

So on and so forth!

By the way, curious to know how the trade panned out? Here you go –



I like trades like these, when the price does not even approach close to the stop loss J. As I had pointed out earlier, I did have a great amount of conviction on this trade. This leads me to the next topic – how do I position size when my conviction on a particular trade is high? What in such situations I want to expose a slightly higher capital?

Well, say hello to Kelly's Criterion!

14.2 – Kelly's Criterion

Kelly' Criterion has an interesting background. It was proposed by John Kelly in the 50's who at that point was working for AT&T's Bell Laboratories. He in fact, suggested the Kelly's Criterion to help the telecom company with long distance telephone noise issues. However, the same theory was adopted by professional gamblers to identify the optimal bet size. This soon found its way to the stock markets as well, and there are many professional traders and investors who use Kelly's Criterion for bet sizing. Perhaps, this is one of those very few tools that both traders and investors commonly use.

I still don't know how the transition from Telecom to stock markets happened – I'm a Telecom Engineer by qualification (although I know nothing about Telecommunications now) and I've been involved in Stock markets for over 13+ years....but I just can't wrap my head around how Kelly's Criterion made its transition across these two different worlds J

Anyway, the Kelly's Criterion essentially helps us estimate the optimal bet size (or the fraction of our trading capital) considering –

- We have a certain information on the bet we are about to take
- We have an edge taking that particular bet

Let's jump straight to Kelly's Criterion with an example. The Kelly's Criterion is an equation, the output of which is a percentage, also known as a the Kelly's percent. The equation is as below –

$$\text{Kelly \%} = W - [(1-W)/R]$$

Where,

W = Winning probability

R = Win/Loss ratio.

- The winning probability is defined as the total number of winning trades divided over the total number of trades
- The win/loss ratio is the average gain of winning trades divided over average loss of the negative trades.

To understand this better, let's take up an example. Assume I have a trading system which has produced the following results, for sake of simplicity, let's assume this is a trading system to trade just one stock, Tata Motors.

SI No	Signal Date	Result	P&L (in INR)
01	3 rd Sept	Win	+ 5,325
02	4 th Sept	Win	+2,312
03	5 th Sept	Win	+4,891
04	6 th Sept	Loss	- 6,897
05	11 th Sept	Win	+1,763
06	12 th Sept	Loss	-3,231
07	13 th Sept	Loss	-989
08	14 th Sept	Loss	-1,980
09	15 th Sept	Win	+8,675
10	18 th Sept	Win	+4,231

Given the above data –

$$W = \text{Total Number of winners} / \text{Total number of trades}$$

$$= 6/10$$

$$= 0.6$$

$$R = \text{Average Gain} / \text{Average Loss}$$

$$\text{Average gain} = \text{Average of } [5325, 2312, 4891, 1763, 8675, 4231]$$

$$= 4,532$$

$$\text{Average loss} = \text{Average of } [6897, 231, 989, 1980]$$

$$= 3,274$$

$$R = 4532 / 3274$$

$$= 1.384$$

Do note, a number greater than 1 is always desirable as it indicates that your average gains are higher than your average loss.

Lets plug these numbers back to the Kelly's Criterion equation –

$$\text{Kelly \%} = W - [(1-W)/R]$$

$$= 0.6 - [(1-0.6)/1.384]$$

$$= 0.6 - [0.4/1.384]$$

$$= 0.31 \text{ or } \mathbf{31\%}.$$

As per the original school of thought – Kelly's percentage is a direct representation of how much capital one should expose for a trade. For example, for the 11th trade on Tata Motors, Kelly's Criterion suggests a capital exposure of 31%.

But I think this can be a little tricky, imagine a trading system with great accuracy – the Kelly;s Percentage can turn out to be 70%, suggesting a capital exposure of 70% to the next trade. Not a very smart thing to do if you ask me. However, you may ask why not? After all a system with 70% accuracy is a great, so why not maximize the bet?

This is because, there is still a 30% chance to lose 70% of your capital!

Given this, here is a simple modification to Kelly's criterion. Let us go back to the percentage risk position sizing technique we discussed earlier in the chapter.

We defined the percentage risk as a technique wherein the exposure to a trade is defined as 1.5% (or any percentage) of the capital. Given Kelly's criterion, we can modify the exposure as 'up to 5%' (or any percentage you deem suitable).

What does this mean? This means for a given trade, I would not expose more than 5% of the capital. This also means that capital exposed could range from as low as 0.1% to all the way up to 5%. So how do I decide?

We can use Kelly's percentage here. For example, if the Kelly's percentage is 30%, then I'd expose, 30% of 5% or in other words, I'd expose 1.5%. If the Kelly's percentage is 70%, then I'd expose 70% of 5% or say 3.5% of the capital on the trade.

So higher the Kelly's percentage, higher is the capital exposed and vice versa.

For a more Mathematical explanation on Kelly's Criterion, I'd suggest you [watch this video](#), if not for anything, watch from the 10th minute onward.

With this, I'd like to close the discussion on position sizing, hopefully the last 4 chapters has given you a fair understanding of the importance of position sizing and techniques to position size your bets.

Onwards to 'Trading and Investing Biases'.

Key takeaways from this chapter

1. Percentage Risk is an easy and intuitive position sizing technique
2. One has to define the maximum amount of risk one as a percentage of capital, dividing this over the stop-loss gives us a sense of how much capital one should expose to a trade
3. Kelly's Criterion suggests how much capital one can expose for a given trade
4. One can combine Kelly's Criterion with percentage risk for optimal results

Trading Biases

15.1 – Mind games

If you are a part of any WhatsApp group related to stock markets, then chances are that you may have watched this [video](#) –

If you are in no mood to watch it, then let me give you a quick summary – This is a show where people call in during the show and ask the show host questions related to stock markets. This is a video clip of one such caller asking the host of the show, the procedure to convert 20,000 shares of MRF LTD from paper to digital form. The shares were bought by his grandfather back in the 90's and were kept in the paper form – ‘physical certificates’, as they are called.

After informing the caller the procedure to convert the shares from the physical form to DEMAT form, the show host casually informs him the value of his shares in today's terms.

The price of MRF on a per share basis was roughly Rs.64,000/- . Considering the fact that he has 20,000 shares, the overall value works out to –

$$20,000 * 64,000 = 1,280,000,000$$

Or about Rs.128 Crores.

Can you imagine that – **ONE TWENTY-EIGHT Crore!**



I was flabbergasted when I first saw this video.

The first thought that occurred to my mind was – how can someone have the vision to buy MRF 25 years ago? How is he motivating himself to still stay invested? How could he resist the temptation to not sell the stock? Especially after watching the stock grow multiple times over his initial investment?

A common investor according to me would probably sell his investment if he saw his investment return say – 50%, maybe 100%...or at most 200%. But this guy has held his stock across years, watching it grow at least 20 times or 2000%.

How did this happen?

Think about this – if we can understand what exactly is happening here, maybe it will throw out a bunch of insights which will help us create similar wealth right?

When I thought through this again (and watched the video again) – I kind of figured what was going on here. Here are my observations –

- His grandfather had bought the shares of MRF back in days, has not paid much attention to it since the purchase
- One fine day he realized that he has few shares of MRF lying in the attic
- He must have mentioned this to his grandson (the caller)
- The grandson has now decided to convert them to DEMAT
- I'm assuming that he would probably sell the shares as soon as it gets them converted

I find this situation extremely interesting, there is a lot happening here and one can draw few conclusions here –

1. It is likely that the grandfather has forgotten about his investment, and spent his time somewhere else
 - *This is a valid conclusion as otherwise; he would have taken efforts to convert shares to DEMAT long ago*
2. Because he had forgotten, he has not paid much attention to the price appreciation over the years

What can we infer from this?

One straightforward inference that you would agree I suppose – granddad had made a ton of money by simply forgetting the fact that he owns shares of MRF.

Now for a moment imagine – what if he had not forgotten about his investments? What if he had access to a broker or a friend who would call him every day to tell him the stock price of MRF?

Do you think he would have held on to his shares for these many years? Don't you think there is a high probability of him selling out his investment – at say a return of 100%, 200% or even 500%?

In other words – because he forgot and did not pay attention to his investment, he held on to his investment over the years and reaped its benefit.

Now, had he decided to track the stock price and update himself with the latest developments – what do you think would have happened? He would analyze the data – when people analyze data – they don't just analyze the facts, they try and be smart about it by adding their own imagination. These imaginations originate from our own interpretation of an ideal world. We often refer to this as 'biases'.

Biases, in the trading and investing world, is the only thing standing between you and a profitable P&L.

This objective of this chapter and the next is to discuss some of these common biases and help you overcome these biases.

15.2 – Illusion of Control

Let us start with one of the most common biases traders and investors tend to have. Have a look at the chart below, a typical chart you'd find on any technical analyst's desk. There are quite a few things happening here in this chart –

1. Candlestick chart for price action
2. Bollinger band to track volatility
3. Fibonacci retracement to identify retracements
4. Pivot points for support and resistance
5. Volume chart
6. ATR
7. Stochastic indicator

I'm certain, at least 8 out of every 10 technical traders would have a similar setup while analysing charts. Clearly, for someone not familiar with charts or technical analysis this chart would look quite intimidating. After all, there are so many things happening here.



Each element on this chart gives out a unique insight to the trader. Along with these so-called insights, the chart does something else to the trader at the subconscious level.

Because of the complexity of the chart, and the fact that not many people can relate to it – it somehow makes the trader believe that he is dealing with a complex subject – and he is in total control over the stock by virtue of all the ‘important insights’ he seems to have derived.

This is often called the ‘illusion of control’ – one of the biggest trading biases for a technical trader. Traders who are heavily influenced by the illusion of control often make statements like ‘This stock is not going to go above 500’ or sometimes they make super confident statements like ‘Go ahead and buy puts’, you question them why, and they will be quick to say ‘Boss, I’m telling you just buy Puts’.

Why do they do this?

Well, traders have this tendency to get attracted to complex things, it just feels very nice to be looking at complex charts and making sense out of it. This is like fighting fire with fire – markets are so complex, the default notion is to fight this complex beast with complex analysis. Further, the fact that only you can make sense of it and others cannot give you that additional kick.

This physiological behavior can be attributed to the ‘Illusion of control’.

Remember, no matter how many indicators you load or how many numbers you crunch, there is no way you can control all the outcomes. End of the day, there are several different outcomes possible for every possible situation in the market. You cannot control them all.

The only way to overcome this behavior is to stay focused on results and statistics. If you are dealing with a trading strategy, then you got to know the odds of the next trade being profitable. When you start looking at market opportunities this way, you will start being truthful to yourself (and others around you) and will always remain humble. If not for anything, you not get carried away by noise.

From all my market experience I can tell you one thing with conviction – the best analysis is done when things are kept simple. Complex does not necessarily mean ‘better’. Hence, you as a trader need to be completely aware of this and work towards building a data-driven approach and not get swayed by inputs that don’t really matter.

15.3 – Recency Bias

Here is another bias that plagues traders. I find this quite interesting – no matter how many years of experience you have, at some point, you will fall prey to it. Let me illustrate with a recent example.

If you have been tracking ‘Café Coffee Day Enterprises’ (CCD), then you’d know what is really happening with the company and stock price. For the uninitiated – the company has been under the radar of ‘Income Tax Department’ for tax evasion and hoarding large amounts of income. Couple of days ago, Economic Times carried out the story in great detail, here is what the headlines said –

Coffee Day Enterprises slips 10% as I-T raids on CCD find Rs 650 cr concealed income

ETMarkets.com | Sep 25, 2017, 11.45 AM IST

I’ve always maintained one stance when it comes to making long-term investments – if the company’s corporate governance is questionable, then no matter how attractive the investment appears, one has to avoid. History has taught us many times that such investments will eventually go down the drain. Given this investment stance and the recent events in CCD, I’d be hesitant in making a long-term investment in CCD.

But what if you already have an investment and this news rolls out? Well, assuming there is truth in the news, the first thing I'd do would be to get out, no matter how much money I'd be making or losing at that point.

A good family friend had made an investment in CCD, he called me **a couple of days after** the news rolled out asking me for my advice. Do note, the news by the time he called me was already 2-3 days old. Things had calmed down (but the fact that the income was concealed, still remains). When he asked me for my advice – I asked him to get out. He quickly pulled the chart of CCD and asked me to take a look –



As you can see, after the steep fall, the latest green candle suggests that there was some buying in the stock. Maybe, there were few traders/investors trying to bottom fish.

Now, if the idea is to get out because of corporate governance issue – you have to. There are no two ways about it. However, this friend of mine suggested, ‘Maybe I’ll hold for few days before selling, I could get a better price’.

I just left it at that and didn’t really try convincing him to get rid of the stock.

But why do you think this friend of mine wanted to hang on to the stock? Does the latest green candle override the fact that there was concealed income at CCD? Or does it give a clean chit to the company's corporate governance?

I don't think so.

Instead, what it does is – it induces a bias called the 'Recency bias'.

'Recency bias', gets you carried away with the latest information/event by making you turn a blind eye to the past events or facts. This is exactly what is happening to my friend – the latest green candle is making him turn bullish and he is convincing himself that there is more up move left. Well, there could be an up move – but that still does not override corporate governance and turns the stock to an investable grade stock.

Recency bias distorts your sense of judgment. It makes you weigh the recent event far higher than what you probably should.

The only way to overcome recency bias is by taking cognizance of the wider picture. You should be in a position to see things from an overall perspective and not really a microscopic view.

Key takeaways from this chapter

1. Markets are complex, but the means to analyze markets need not be complex
2. Traders often complicate their charts, subconsciously it makes them think they are invincible, gives them a sense of control
3. Illusion of control makes you spend many hours trying to derive data, which is otherwise pointless
4. More data does not necessarily mean quality of information
5. Recency bias makes you turn a blind eye to the past events (which could have more impact on markets)
6. Having a sense of the overall picture helps you prevent yourself from falling prey to recency bias

Trading Biases (Part 2)



16.1 – Anchoring Bias

I've spent close to about 13 years participating in the stock markets. I've spent these years in various capacities – as a trader, investor, broker, money manager, analyst etc. I've had my fair share of happiness and regrets in the markets and I've learned a lot (still continue to learn) during these years. I've realized that happiness and regret may not always be linked to the outcome of a trade that you've taken up – you feel happy when you make a profit and regret when the trade results in a loss. These feelings can also manifest out of trades that you've not taken up. Let me tell you one of my biggest regrets in the stock markets till date.

In the recent years, August / Sept 2013 was one of the greatest times to build a long-term portfolio from scratch. Stocks of great business were available at throwaway valuations. I was fortunate enough to be aware of this situation in the market and I was really busy structuring my equity portfolio. I had a tough time selecting stocks to include in my portfolio. Tough time in the sense that there were too many opportunities to choose from. In fact, this is what a bear market does to you – it spoils you for choices.

I included few stocks in the portfolio (which I still continue to hold) and I let go of many stocks including MRF, Bajaj Finserv, etc. The decision to let go of these stocks was based on the fact that I perceived investing in other stocks more attractive. Stocks like MRF and Bajaj Finserv have performed phenomenally well, but then I don't regret my decision.

However, the decision to not invest in Sundaram Clayton Limited pains my heart – I consider this as one of the biggest regrets.

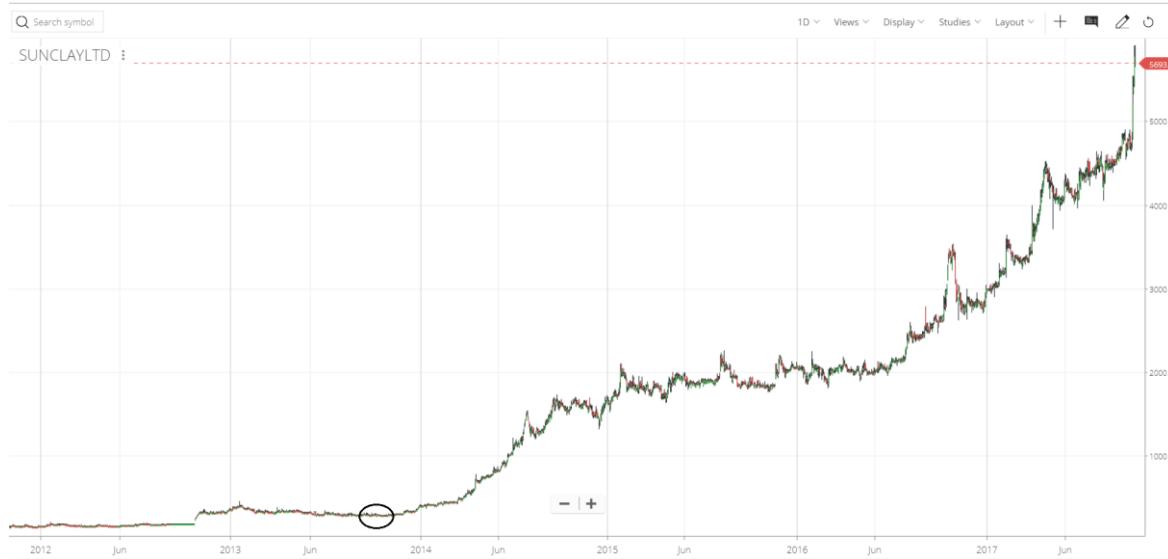
Take a look at this chart –



I did my usual stock research and was convinced that the stock was a great buy. I've circled the area around which I wanted to buy – roughly around 270 per stock. Given that it was a bear market, I was kind of rigid on the price to buy – 270 or lower.

The stock price moved slightly higher to about 280, but I did not budge. I waited. The stock price moved to 290, I waited. A couple of days later, the stock shot to 310 and I remember convincing myself – the stock will retrace back to 270 considering that it was a bear market. After all, I was in no mood to pay a 15% ‘premium’ on a price that I perceived as ‘the best price’.

As you may have guessed, 270 never occurred and I never got to buy this stock, and here is what really happened to the stock later on –



I've circled the 270 price mark again for your reference, which is where my so-called 'price conflict' occurred – all in my mind!

I probably missed out one of the greatest investment opportunity in my life, and all thanks to the games my mind played with me. More formally, what really prevented me from buying Sundaram Clayton can be attributable to a notorious trading bias called 'The Anchoring Bias'.

I was looking up on Wikipedia for 'Anchoring Bias', and I discovered a new term for the same – it is also called 'Focalism'. Anchoring bias belongs to a group of biases grouped under 'Cognitive Biases'. Cognitive bias is a systematic error in our thinking that affects the way human beings make their decisions or judgments. Anchoring Bias leads the list of cognitive biases.

Under the influence of Anchoring Bias, we tend to get fixated to the first level of information we get. For example, in my very own case, the first price I saw on the terminal was 270 (for Sundaram Clayton), and I was fixed to that price. Here 270, formed a price anchor.

Think about your own trading situations – how many times you may have missed placing that buy order or a stop loss order because the price that you perceived as 'right' never occurred, only to later see the stock perform exactly the way you thought it would. After all, in most of these situations, the price difference between what we perceived as right and the one available in the markets would be marginal – few Rupees probably, but then our minds just do not permit us to go ahead.

Like any other biases, there is no real cure for anchoring bias. The only real cure is to be aware of it and adopt critical thinking in your approach to markets.

16.2 – Functional Fixedness

This is yet another cognitive biases – although you will not read much about this particular bias in the trading world. However, I think it kind of has its impact on traders, especially the ones who trade derivatives.

Let me give you a generic explanation of ‘functional fixedness’ bias and then relate this to the trading world.

There is juice shop near my office which I frequent for a glass of fresh juice. On one of those visits, I asked for my regular orange juice, but the guy at the juice shop was busy fixing the mixer jar. The handle of the jar was loose and had to be fixed. The guy was busy trying to find a screwdriver to tighten the mixer’s handle. Unable to find one, he was kind of clueless on how to proceed.

At the same time, his colleague walked in and learned about the issue. He simply picked up a spoon which was lying around, used the other end of the spoon (which basically has a flat side) as a makeshift screwdriver and tightened the jar. Problem solved, juice was served.

This is functional fixedness at its best. Functional Fixedness is a cognitive bias that limits a person to using an object only in the way it is traditionally used. We assign tasks to objects and we live with that rigidity all our lives. For example – we have all grown up with the notion that we only need to look for a screwdriver to tighten screws, without which one cannot. However, a simple spoon can do the same job! One has to start thinking out of the box to solve problems in unconventional ways.

There are few ways in which Functional Fixedness limits our way of thinking when it comes trading. Let me start with a classic example.

Assume you have Rs.100,000/- in your trading account. You have identified a great trading opportunity in Nifty and you expect to hold onto the trade for the next 2 or 3 days. Since you intend to hold this trade overnight, you have to opt for a ‘NRML’, product type. The typical margin blocked for this trade would be about Rs.65,000/-.

So you take the trade around 3:20 PM and carry the position forward. End of the day 65K would be blocked as margin and 45K would be your available balance, which can be utilized toward another trade the next day.

The next day market opens, Nifty starts moving in the direction that you expect it to move. You are happy with the way things are going.

Now, assume that you spot a great intraday opportunity, TCS stock futures, which requires you to pay an MIS margin of 60K. What will you do? The available margin is 45K, you'd fall short of 15K right? Therefore, you cannot take the TCS intraday trade.

Now, this is where the functional fixedness is playing the culprit. We consider the NRML (margins blocked for overnight positions) as 'margins blocked', and we invariably forget about this capital until we square off the position.

With a little bit of 'out of the box', thinking (and some efforts) we can, in fact, continue to hold the overnight position plus take up the intraday opportunity.

Here is how it would work –

1. At the start of the day, you have available margin of 45K, short of 15K to take up the intraday trade
2. Convert the NRML Nifty position to MIS. When you do this, from the 65k that was blocked, nearly 39K would be freed up – as MIS for Nifty is about 26K
3. You now have 45K + 39K or 84K free cash for the day
4. With 84K, you can easily place an MIS order, blocking 60K. You will still have 14k as available margin
5. End of the day, square off the MIS stock futures trade – remember this was an intraday trade
6. Your available margin goes up to 84K
7. Convert back the MIS Nifty trade to NRML and carry forward the position

The snapshot below shows you how you can do this on Kite –

INFY	NET QTY.	AVG. PRICE	P&L X
MIS / NSE	1	932	0
LAST CLOSE	LTP	DAY'S P&L	
0	932	0	
BUY QTY.	PRICE	VALUE	SELL QTY.
1	932	932	—
			PRICE
			VALUE
			—
ADD		EXIT	CONVERT
			EQUITY

16.3 – Confirmation Bias

Have a look at the Tata Motor's below



I've marked few important points on this chart –

1. The stock is around 430 today
2. 430 seems to be a price action zone considering the past price reactions
3. Sometime in early August, the price cracked through 430 and declined to 370
4. The stock price stabilized around 370, quite evident with the double/triple bottom formation
5. Since 370, the price has consistently trended up, all the way back to 430, which is where the current stock price is

Considering the above, guess the stock is all primed up for an up move – don't you think so?

Also, keeping that analysis in the back of our mind how would you view this piece of news which made the headlines earlier today –

Tata Motors Starts Electric Bus Pilot-Runs In Guwahati

Tata Motors has completed trials for electric bus in Shimla and Chandigarh where it ran for almost 165 km and 143 km on a single charge, respectively.

Chances are that you will views this news piece as a trigger for Tata Motors to edge higher and therefore support your logic of buying the stock. However, in reality, the fundamental news may not really be a great trigger to drive the stock price higher. But then, at a subconscious level, you start looking for pieces of information that support your view. In other words, when you form a trading opinion, no matter what happens, you only look and assimilate information that supports your view. Your brain somehow does not allow you to pay attention to information that does not support your original contention.

This is called the ‘Confirmation Bias’.

Critical reasoning is the key to overcome the confirmation bias. You got to ask yourself – so what?

16.4 – Attribution Bias

This one is funny.

How many times have you had a winning trade and ended up feeling proud of your analysis? Perhaps you bought an option and it gained 100% on the premium or maybe you bought a stock and saw it appreciate multifold.

Every time you make a profit – it is somehow because of your smart trading logic, and therefore you give yourself a pat on your back. But what about the times you’ve made a loss? How do you deal with it?

Coming from a stockbroking industry, let me tell you one thing – when people make a loss, they invariably attribute this as broker’s fault and not really their own. Traders find all sorts of reasons to blame the broker – broker’s system failed, charts not loading, orders are slow, and what not.

Everything thing is attributable to someone else’s mistake (mainly the broker) and not really the subpar analysis in the first place!

This is called the ‘Attribution Bias’ and people succumb to it owing to acknowledge the fact that they are wrong. One way to overcome the attribution bias is to maintain a trading journal and make entries which reason outs why you’ve entered into a trade and why you decided to close the trade. These journal entries over time give you a great insight into your own trading behavior.

16.5 – And it's a wrap!

The list of these biases gets endless. Naturally, covering all of them would be hard. However, here is what I'll do – I'll keep this chapter open and I will continue to add more biases as and when I discover them myself

With this chapter, I'd like to close this module on Risk and Trading Psychology. As usual, I hope you enjoyed reading this module, as much as I enjoyed writing it for you all.

Keep those comments coming!

Key takeaway from this chapter

1. Anchoring Bias can be quite notorious – tricks the trader/investor to anchor them to the first piece of information
2. Anchoring Bias may lead you to miss great opportunities
3. Functional Fixedness fixes your opinion on the utility of the tools, restricts your imagination
4. One can overcome functional fixedness by practicing ‘out of the box’ thinking approach
5. Confirmation bias makes you seek information (or tricks you to assimilate information) which can support your original hypothesis
6. In a typical trading world, traders attribute losses to problems in the outside works and not really because of subpar analysis
7. Attribution Bias can be overcome by maintaining a trading journal