

Module 11 — [Personal Finance](#)

Chapter 5

The retirement problem (Part 2)

10

5.1 – Assumptions

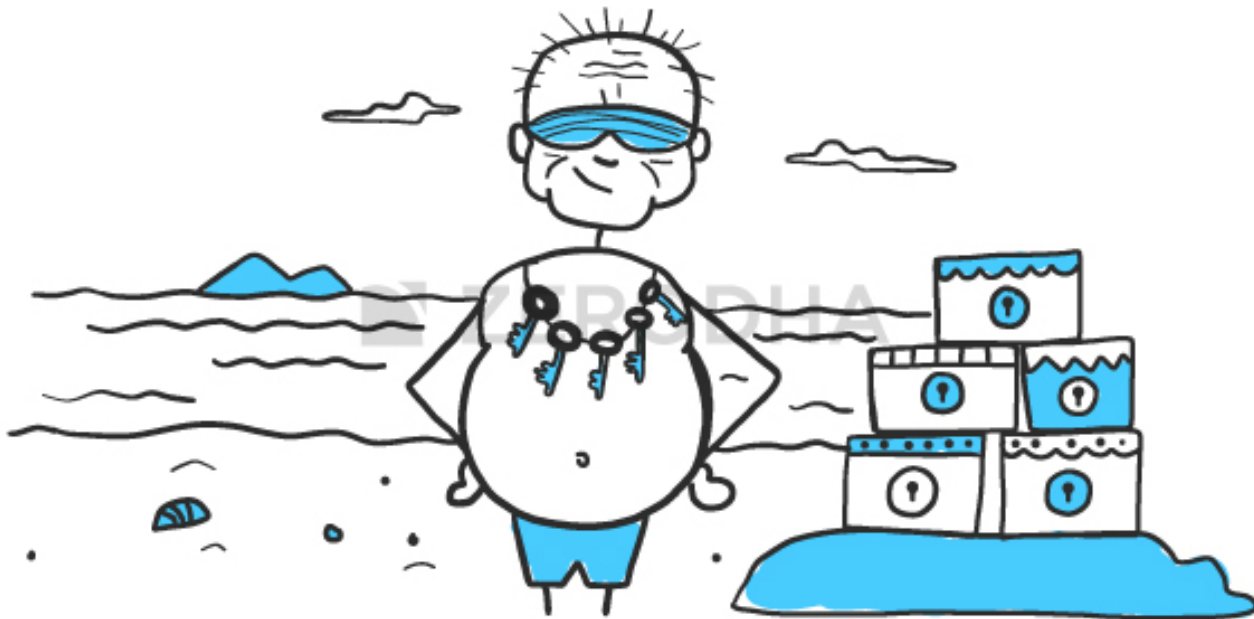
We are at an exciting point now. The previous chapter helped us estimate (roughly) the corpus required for one to retire comfortably, without drastically changing the post-retirement lifestyle.

One can argue that certain aspects were overlooked while estimating the post-retirement corpus, which is ok for now because this helps us determine the retirement corpus on a conservative basis.

The idea, of course, is to understand personal finance so well that we can plugin things as we progress and eventually get the corpus number right.

In the previous chapter, we figured that we need roughly 7Cr by retirement; in this chapter, we address the technique to generate the same. It must be quite evident to you by now that to create the retirement corpus by the target retirement year; we need to make investments starting today.

The investments that we make today should ideally spread across multiple assets. This is called the multi-asset portfolio, which includes – fixed deposits, gold, real estate, equities, cash and cash equivalents. The overall growth that you experience will then be an aggregate across all these assets.



Let me explain a bit more before we get back to the retirement problem. Assume your net worth is distributed across multiple assets –

- 30% of your net worth is invested in real estate
- 8% of your net worth is in the fixed deposit
- 8% of your net worth is from gold
- 13% of your net worth is in equities
- Cash is 4%

The numbers assigned are all arbitrary, to drive the concept, so don't sweat over it 😊

Now, each of these assets grows at a specific rate. Needless to say that the growth rates differ for each of these assets. The question is, what is the overall growth given this portfolio of assets?

To answer this, we need to have an expected growth rate for each of these assets.

My long term (10 plus years) growth expectation (CAGR) from these assets are as follows –

- Real estate – 8-10%
- Fixed Deposit – 6-7%
- Gold – 8-9%
- Equities – 10-11%
- Cash – 0% (in fact cash does grow if you consider inflation)

You can develop your own opinion on the growth rates for these assets by looking at the long-term trends and by developing an idea on their future performance. But here is an advise, when you work with predictions/projections of any sort in personal finance, always keep the number on a conservative basis.

For example, frankly I know equities, in the long run, will do much better than 11% CAGR, but I'll work with a 10-11% range. The advantage here is that you build a future based on conservative assumption, anything better is only a bonus.

Anyway, the overall portfolio growth is the sum product of the weight of each asset and the expected return. Therefore –

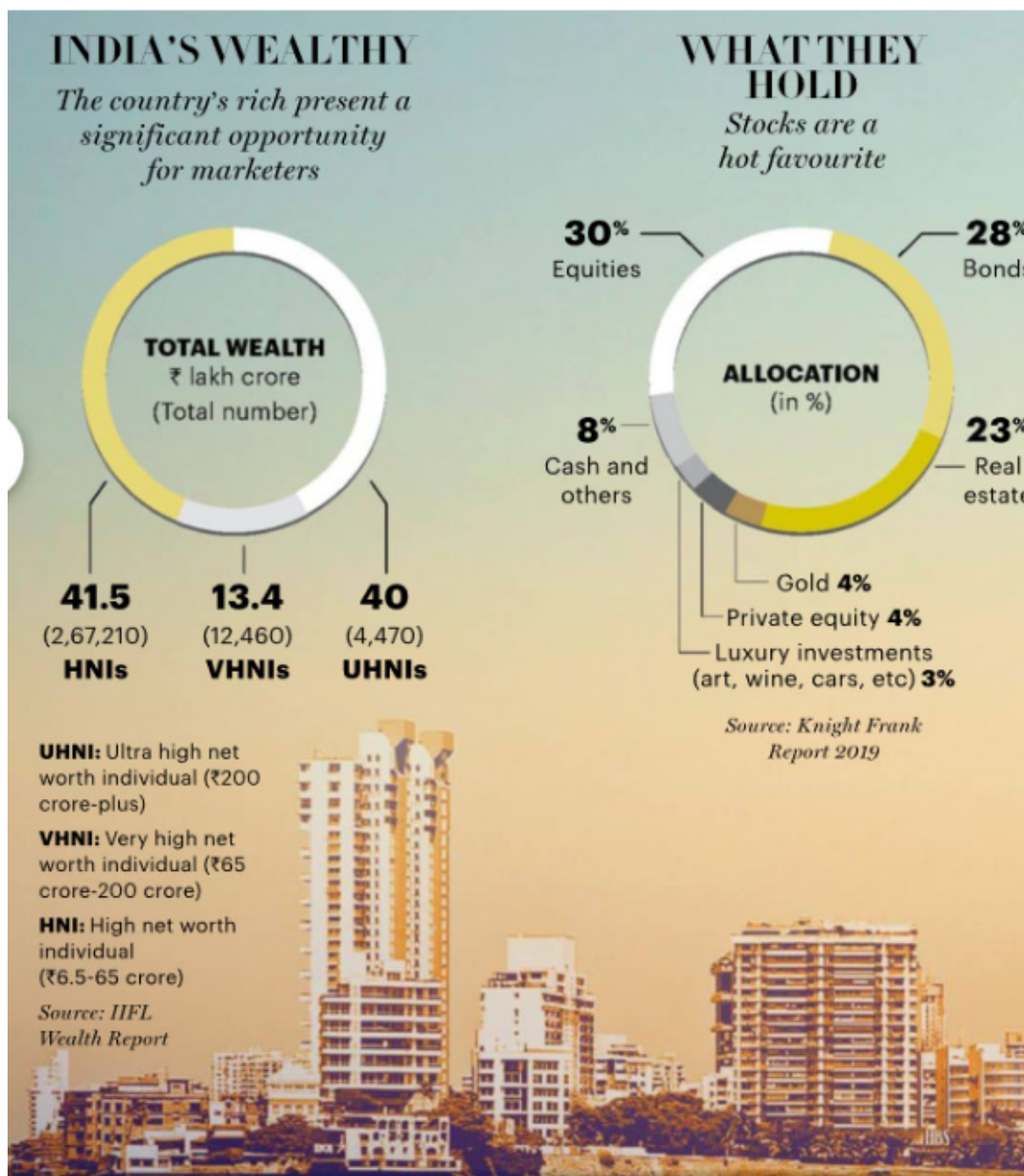
$$= 30\% * 10\% + 8\% * 7\% + 8\% * 9\% + 13\% * 11\% + 4\% * 0$$

$$= \mathbf{8.3\%}$$

So as you can see, the combined (diversified) portfolio with multi-assets, generates an overall return of 8.3%.

Of course, change in asset allocation has an impact on portfolio growth. We have discussed this multiple times, won't get into that discussion now.

By the way, check this to know how people generally divide their net worth across a diverse set of assets –



The infographic above mainly talks about the HNI and above category; however, if you walk into any financial planning firm, you are likely to get a somewhat similar diversification plan.

While a multi-asset portfolio is highly desirable, we won't get into that discussion just yet. This is slightly complex, and we are too early in this module to talk about it.

For the retirement problem, we will make one fundamental assumption. The assumption is that we will look at only equity for building the retirement corpus. The exposure to equity is in the form of making systematic investments in a growth-oriented equity mutual fund.

If you do not understand 'systematic investments in a growth-oriented equity mutual fund', then do not worry. Going forward in this module, we will discuss this in detail.

Since equity is the only asset we are dealing with in this retirement problem, we need to assign an expected growth rate to this asset. I think a 10-11% CARG is a fair expectation, especially when the holding period is

long, i.e. more than ten plus years.

So let's work with this number for now.

5.2 – The setup

A quick recap of the retirement problem, before we proceed. In the previous chapter, we figured that we need funds to the tune of 7Cr to lead a comfortable retired life. We call this as the retirement corpus. We defined 'comfortable' by ensuring we have at least Rs.50,000/- per month for the 20 years post-retirement.

The next step is to figure out how one can generate retirement corpus. Remember, we are starting our journey to save for retirement today, and we have 25 years to build this corpus. Twenty-five years is 300 months.

For now, we will rely upon investing in an equity mutual fund, in a systematic way to generate this retirement corpus. To solve this problem, we need to make a few assumptions. They are –

- We have a steady job which pays us a salary every month
- We are employed until the year of our retirement
- Our primary savings vehicle is regular investments in equity mutual funds
- We get yearly hikes in our pay
- Every year we will increase the investments in equity mutual funds by 10%
- The increase in savings happens every January

I know many of you may be concerned with these assumptions here, especially about the job and the hikes, but then, that's an underlying assumption, without which we cannot proceed 😊

So how do these assumptions translate to action? Here is how it looks –

Sl No	Months	Months	Investment
1	300	Jan	5000
2	299	Feb	5000
3	298	Mar	5000
4	297	Apr	5000
5	296	May	5000
6	295	Jun	5000
7	294	July	5000
8	293	Aug	5000
9	292	Sept	5000
10	291	Oct	5000
11	290	Nov	5000
12	289	Dec	5000

Let me explain this table. The very first row reads like this –

It is January, and I'm making my very first investment of Rs.5000/- today. I won't be touching this investment until I retire, which is 25 years away or about 300 months away.

The 2nd row reads similar – Its February, I'm making the 2nd savings instalment for the year, i.e. Rs.5000/-. Retirement is now 299 months away.

I want you to recognise the fact that the ‘months away’ can be looked at from a different perspective. If you realise, these are the number of months during which your money can grow. For example, the very first instalment you make has the luxury to build (or compound) for 300 full months. The next month’s savings can grow only for 299 months, 3rd instalment has only 298 months to grow. So on and so forth.

Now, the 5th and 6th assumptions state that we are increasing the savings rate by 10% every January. This means, if we are starting with Rs.5000/- for year 1, the 2nd year we bump this up by 10%, hence for the 2nd year we invest Rs.5,500/-.

This is how it looks –

Sl No	Months	Months	Investment
1	300	Jan	5000
2	299	Feb	5000
3	298	Mar	5000
4	297	Apr	5000
5	296	May	5000
6	295	Jun	5000
7	294	July	5000
8	293	Aug	5000
9	292	Sept	5000
10	291	Oct	5000
11	290	Nov	5000
12	289	Dec	5000
13	288	Jan	5500
14	287	Feb	5500
15	286	Mar	5500
16	285	Apr	5500
17	284	May	5500
18	283	Jun	5500
19	282	July	5500
20	281	Aug	5500
21	280	Sept	5500
22	279	Oct	5500
23	278	Nov	5500
24	277	Dec	5500
25	276	Jan	6050
26	275	Feb	6050
27	274	Mar	6050

The month counting continues the same way. For example, the Rs.5,500/- investment we make in the 2nd year January has only 288 months to grow or compound.

I hope you get this flow for now.

So what happens after you make these investments? Well, as per the assumption, each of these monthly investments we make, grows at 11% CAGR (compounded annual growth rate), for the respective months.

For example, the very first investment that we make, i.e. Rs.5000/- gets to grow at the rate of 11%, for 300 months. So what would be the value of this investment at the end of 300 months?

Well, by now, you should recognise that we can apply the concept of the future value of money and get the answer. The future value of money formula is –

$$\text{Future value} = P \times (1+R)^{(n)}$$

Where,

Principal (**P**) = Rs.5000

Growth rate (**R**) = 11% per annum

Time (**n**) = 300 months. However, this formula considers time in years. Hence we need to express 300 months in years, therefore $300/12 = 25$

$$= 5000 \times (1+11\%)^{(300/12)}$$

$$= \text{Rs.67,927/-}$$

Let us do this for the 2nd instalment as well; everything stays the same except for the time component –

$$= 5000 \times (1+11\%)^{(299/12)}$$

$$= \text{Rs.67,339/-}$$

This is how the table looks –

Sl No	Months	Months	Investment	Growth Rate	Future Value
1	300	Jan	5000	11%	67,927
2	299	Feb	5000	11%	67,339
3	298	Mar	5000	11%	66,756
4	297	Apr	5000	11%	66,178
5	296	May	5000	11%	65,605
6	295	Jun	5000	11%	65,037
7	294	July	5000	11%	64,474
8	293	Aug	5000	11%	63,915
9	292	Sept	5000	11%	63,362
10	291	Oct	5000	11%	62,813
11	290	Nov	5000	11%	62,269
12	289	Dec	5000	11%	61,730
13	288	Jan	5500	11%	67,315
14	287	Feb	5500	11%	66,732
15	286	Mar	5500	11%	66,155

Now, if you add up all the future values, you get the corpus accumulated for your retirement. Before I show you the number, what is your guess? Does Rs.5000/- as the starting amount make the cut? Do you think it gives you the target corpus of Rs.7Cr?

If you are doubtful, then you are right. It does not cut the mark. Its way off the mark –

Corpus Estimation

Sl No	Months	Months	Investment	Growth Rate	Future Value
1	300	Jan	5000	11%	67,927
2	299	Feb	5000	11%	67,339
3	298	Mar	5000	11%	66,756
4	297	Apr	5000	11%	66,178
5	296	May	5000	11%	65,605
6	295	Jun	5000	11%	65,037
7	294	July	5000	11%	64,474
8	293	Aug	5000	11%	63,915
9	292	Sept	5000	11%	63,362
10	291	Oct	5000	11%	62,813
11	290	Nov	5000	11%	62,269
12	289	Dec	5000	11%	61,730
13	288	Jan	5500	11%	67,315
14	287	Feb	5500	11%	66,732
15	286	Mar	5500	11%	66,155
16	285	Apr	5500	11%	65,582

Assumption

Starting monthly SIP (INR)	5000
Yearly increase	11%
Retirement savings (INR Crs)	1.74722668



So what should we do? How do we ensure we reach the target retirement corpus? Well, we can do three things –

- We save for a much longer period, say 30 or 35 years. However, this may not be viable as we won't have a sustainable source of income for these many years
- Increase the rate of return, maybe from 11% to 14%, but then is like robbing yourself of your future. So we won't commit this sin
- Increase savings, this means a frugal life today for a comfortable and financially independent life tomorrow. This is an option we can work with this.

So from saving Rs.5000 per month, let us bump this up to say Rs.15,000/- per month. Here is how the numbers stack up –

Corpus Estimation

Sl No	Months	Months	Investment	Growth Rate	Future Value
1	300	Jan	15000	11%	203,782
2	299	Feb	15000	11%	202,017
3	298	Mar	15000	11%	200,268
4	297	Apr	15000	11%	198,534
5	296	May	15000	11%	196,815
6	295	Jun	15000	11%	195,111
7	294	July	15000	11%	193,421
8	293	Aug	15000	11%	191,746
9	292	Sept	15000	11%	190,086
10	291	Oct	15000	11%	188,440
11	290	Nov	15000	11%	186,808
12	289	Dec	15000	11%	185,191
13	288	Jan	16500	11%	201,946
14	287	Feb	16500	11%	200,197
15	286	Mar	16500	11%	198,464
16	285	Apr	16500	11%	196,745
17	284	May	16500	11%	195,042
18	283	Jun	16500	11%	193,353

Assumption

Starting monthly SIP (INR)	15000
Yearly increase	11%
Retirement savings (INR Crs)	5.24168004



There is a significant improvement, but still not close to the 7Cr mark. We can try this with Rs.20,000/-

Corpus Estimation

Sl No	Months	Months	Investment	Growth Rate	Future Value
1	300	Jan	20000	11%	271,709
2	299	Feb	20000	11%	269,357
3	298	Mar	20000	11%	267,024
4	297	Apr	20000	11%	264,712
5	296	May	20000	11%	262,420
6	295	Jun	20000	11%	260,148
7	294	July	20000	11%	257,895
8	293	Aug	20000	11%	255,662
9	292	Sept	20000	11%	253,448
10	291	Oct	20000	11%	251,254
11	290	Nov	20000	11%	249,078
12	289	Dec	20000	11%	246,921
13	288	Jan	22000	11%	269,261
14	287	Feb	22000	11%	266,930
15	286	Mar	22000	11%	264,619
16	285	Apr	22000	11%	262,327
17	284	May	22000	11%	260,056
18	283	Jun	22000	11%	257,804
19	282	July	22000	11%	255,572
20	281	Aug	22000	11%	253,359
21	280	Sept	22000	11%	251,165

Assumption

Starting monthly SIP (INR)	20000
Yearly increase	11%
Retirement savings (INR Crs)	6.98890672



As you can see, starting at Rs.20,000/- per month, we get close to the 7 Cr mark, which upon retirement will yield us Rs.50,000/- per month for 20 years.

5.3 – Are you serious?

Saving Rs.20,000/- a month, that too as a starting amount may sound crazy to many, especially for people who are just starting their careers. After all, you've just started your career, started seeing a steady cash flow, and you are expected to park the bulk of it for retirement?

How fair is that?

Before it demotivates you any further, let me tell you. It is not all that lousy 😊

Let me make an assumption here; if you are starting your career now, then probably you are 24 or 25 years old. This means you have a long runway before you retire. Even if you retire by 60, you mostly have 35 years to retire.

Out of these 35 years of service, even if you invest for 30 years, you will be placed much better. You can choose to start with Rs.10,000/- per month. Check the snapshot –

Corpus Estimation

Sl No	Months	Months	Investment	Growth Rate	Future Value
1	360	Jan	10000	11%	228,923
2	359	Feb	10000	11%	226,941
3	358	Mar	10000	11%	224,976
4	357	Apr	10000	11%	223,028
5	356	May	10000	11%	221,096
6	355	Jun	10000	11%	219,182
7	354	July	10000	11%	217,284
8	353	Aug	10000	11%	215,403
9	352	Sept	10000	11%	213,537
10	351	Oct	10000	11%	211,688
11	350	Nov	10000	11%	209,855
12	349	Dec	10000	11%	208,038
13	348	Jan	11000	11%	226,861
14	347	Feb	11000	11%	224,896
15	346	Mar	11000	11%	222,949
16	345	Apr	11000	11%	221,018
17	344	May	11000	11%	219,105

Assumption

Starting monthly SIP (INR)	10000
Yearly increase	11%
Retirement savings (INR Crs)	6.9144364



Starting your career early, gives you two powerful levers to operate – time and money. You can start with a small amount and build on it, eventually, it will yield you a similar result.

What if you are in the middle of your career and you are looking at retirement sometime over the next 10 or 15 years? Well, unfortunately, you do not have many options expect to save large chunks of your cash flow.

But remember, this entire conversation is an oversimplification to help us get started. There are many angles to this story. For example, you may acquire property by inheritance, which earns you a rental income for the rest of your life or you can get a huge lump sum amount at retirement, thanks to PF and stuff. This retirement amount gets parked in a savings account or a fixed deposit, which gives you yearly cash flow.

The objective of this module is to help you solve this puzzle so that you can plan your financials efficiently for yourself and your family.

5.4 –Next step

Irrespective of the lump sum cash or a yielding rental property landing up in your lap by retirement, investing in equity is something that you cannot miss. I firmly believe that ‘equity’ as an asset class will outperform all other assets and shine through. Equity has to be a part of your long term portfolio.

The best way to gain exposure to equity is by investing in mutual funds via a systematic investment plan. Of course, there are many other variants and techniques for this.

Given this, over the next few chapters, we will deep dive into mutual funds and get a thorough understanding of mutual fund investing. This discussion will include things like developing a mindset for mutual fund investment, building a mutual fund portfolio, goal-based portfolio, fund analysis, direct vs regular, growth vs dividends etc.

Once we understand mutual funds, we will steer our way to learn other critical components of personal finance such as life insurance, health insurance, pension funds, EPF, ETFs etc.

So as you can imagine, we have a long learning path ahead 😊

Key takeaways from this chapter

- In a multi-asset portfolio, the aggregate portfolio return is the sum product of the asset weight and the asset's expected returns
- Equity exposure is a critical component in long term wealth creation

- Investing small amounts of money regularly leads to a massive retirement corpus

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10 comments



1. *Kunal G* says:

[October 4, 2019 at 8:14 pm](#)

I have read all of your varsity modules!

I'm eagerly waiting for the mutual fund education. There are a lot of mutual funds out there and which makes it confusing to know where to park our money into. And how much tax do we have to pay for the interest we receive every year.

[Reply](#)



o *Karthik Rangappa* says:

[October 5, 2019 at 11:17 am](#)

Glad to note that, Kunal. I will try and put up clear and non-confusing articles on MFs 😊

[Reply](#)



2. *Punith* says:

[October 5, 2019 at 12:53 pm](#)

Hi Karthik,

You have listed the importance of savings and investing your savings in a very effectively manner, The point I wanted to add was we even have PF's which will also add a significant contribution to our final corpus – Do you like to and any points on the same.

[Reply](#)




o *Karthik Rangappa* says:

[October 6, 2019 at 12:20 pm](#)

Yes Punith, that makes a difference. I will include that in later topics.

[Reply](#)

3.  *Govil Bhole* says:
[October 7, 2019 at 6:50 pm](#)


The only drawback of Varsity is that you have to wait eagerly for the next chapter. I wish you can start like Binge reading in varsity!! 😊
Great content Sir!!

[Reply](#)

- o  *Karthik Rangappa* says:
[October 8, 2019 at 9:19 am](#)

Govil, I'll take that as a compliment 😊

[Reply](#)

4.  *Mohammed Jidin MP* says:
[October 9, 2019 at 3:30 am](#)


Personal Finance is a much needed subject on wealth creation. Zerodha understood the need for such module and presented it in a simplified manner. Hope this module will covers all the relevant asset classes. Keep going Zerodha.

[Reply](#)

- o  *Karthik Rangappa* says:
[October 9, 2019 at 1:17 pm](#)

Yes, sir. We will 😊

[Reply](#)

5.  *DILIP* says:
[October 11, 2019 at 8:49 am](#)

Sir, Thanks a lot for nice explanation.

There are 2 sheets are already available , however rest are not.

With Regards,

[Reply](#)

- o  *Karthik Rangappa* says:
[October 11, 2019 at 12:27 pm](#)

Ah, I may have forgotten to upload this. I'll do it right away. Thanks.

[Reply](#)

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