

**Traditional methods to develop
Quant Trading strategies**

Quant Trading strategies

A trading strategy is a set of decisions

1. What **frequency** should we trade at?

Daily/Weekly/Monthly

2. In each period, **which stocks** should we trade?

3. For each stock, should we **go long or short**?

Quant Trading strategies

A trading strategy is a set of decisions

Daily/Weekly/Monthly

1. What **frequency** should we trade at?

**This decision usually depends on the
resources available to the trader**

2. In each period, which **stocks** should we trade?

Time, Transaction costs,

3. For each stock, should we **buy or short?**
Risk appetite

Quant Trading strategies

A trading strategy is a set of decisions

Daily/Weekly/Monthly

1. What frequency should we trade at?

The **higher the frequency of trading, higher**
is the requirement of each thing below

2. In each period, which stocks should we trade?

Time, Transaction costs,

3. For each stock, should we go long or short?
Risk appetite

Quant Trading strategies

Once we've decided the frequency,
the below decisions decide the

1. What frequency should we trade at?

actual trade

Daily/Weekly/Monthly

2. In each period, **which stocks** should we trade?

3. For each stock, should we **go long or short**?

Quant Trading strategies

Some strategies are very simple

1. What frequency should we trade at?

Daily/Weekly/Monthly

2. In each period, **which stocks** should we trade?

3. For each stock, should we **go long or short?**

Quant Trading strategies

For example, go long on railway stocks in April

A trading strategy is a set of decisions

This strategy uses just the month of
the year to decide the trade

1. What frequency should we trade at?

Daily/Weekly/Monthly

2. In each period, **which stocks** should we trade?

3. For each stock, should we **go long or short?**

Quant Trading strategies

A trading strategy is a set of decisions

Other strategies might require the use of many complex factors

1. What frequency should we trade at?

Daily/Weekly/Monthly

2. In each period, **which stocks** should we trade?

3. For each stock, should we **go long or short?**

Quant Trading strategies

In order to develop trading strategies, it's helpful to understand how markets behave

Quant Trading strategies
There are **2 schools of analysis**

1. Fundamental Analysis

2. Technical Analysis

Quant Trading strategies

There are **2 schools of analysis**

1. Fundamental Analysis

This involves the study of
Financial Statements
Competitor analysis
News
Macroeconomic factors

2. Technical Analysis

This involves the study of
Historical price
movements only

Quant Trading strategies

There are 2 schools of analysis

1. Fundamental Analysis

2. Technical Analysis

Traders generally use a combination of both to develop their strategies

There are 2 schools of analysis

1. Fundamental Analysis

2. Technical Analysis

Both these schools believe
that by studying data, it's
possible to pick stocks that
are underpriced or overpriced

There are 2 schools of analysis

1. Fundamental Analysis

2. Technical Analysis

**This is somewhat in contradiction
to a fundamental hypothesis in
Financial Economics**

Efficient Markets Hypothesis

Efficient Markets Hypothesis

This hypothesis proposes that

Prices always fully reflect all the
information available

No stock is overpriced or
underpriced

Efficient Markets Hypothesis

If you accept this hypothesis, then

1. All investors have the same information
No one has any edge

2. All investors behave rationally
ie. they react to the information
in a logical manner

1. Fundamental Analysis

2. Technical Analysis

Coming back to Fundamental/technical analysis,
these techniques only work, if

1. There is an **information asymmetry**

With more knowledge or experience, you
can identify inefficiencies in the market

2. Investors sometimes **behave irrationally**

Everyone doesn't react in the same
way to same information

Quant Trading strategies

Whether markets are efficient or inefficient is a hotly debated topic

There is a lot of evidence to
support both sides

Quant Trading strategies

2 such documented effects on the side of investor irrationality

Short term
momentum and
long term reversal

Mean
reversion

Quant Trading strategies

In the 90s, a couple of researchers discovered that stock prices exhibit

Short term momentum and **long term reversal**

Stocks which have
done really well in
the last 3-6 months
continue to do well

Stocks which have
done really well
over the last year
will start losing

Short term momentum

The momentum effect means that

If a stock's price has been increasing recently

It will continue to increase

If a stock's price has been decreasing recently

It will continue to decrease

Short term momentum

The momentum effect means that

Recency here **increasing recently**
is considered to
be 3-6 months **decreasing recently**

It will continue to decrease

Short term momentum

The recent trend will continue
for 3-6 months

If a stock's price has been increasing recently

It will continue to increase

If a stock's price has been decreasing recently

It will continue to decrease

Short term momentum

The momentum effect means that

If a stock's price has been **increasing recently**

It will **continue to increase**

If a stock's price has been **decreasing recently**

It will **continue to decrease**

Why does this happen?

Short term momentum

The momentum effect means that

If a stock's price has been **increasing recently**

It will **continue to increase**

If a stock's price has been **decreasing recently**

It will **continue to decrease**

One theory is that investors **under
react to information** in the short term

Short term momentum

The momentum effect means that

If a stock's price has been **increasing recently**

It will **continue to increase**

If a stock's price has been **decreasing recently**

It will **continue to decrease**

This means that if there is information that should increase the stock price, it **takes time for the increase** to fully reflect in the price

Short term momentum

The momentum effect means that

If a stock's price has been **increasing recently**

It will **continue to increase**

If a stock's price has been **decreasing recently**

It will **continue to decrease**

This effect suggests a
trading strategy

Short term momentum

This effect suggests a trading strategy

If a stock has **positive returns** over last 3-6 months

Go long for the **next 3-6** months

Short term momentum

This effect suggests a trading strategy

If a stock has **negative returns** over last 3-6 months

Go short for the **next 3-6** months

Short term momentum

There are different ways to
measure the momentum of a stock
ie, the returns over the last 3-6 months

Short term momentum

Option 1: Sum of **daily returns** over last 3 months

Option 2: Sum of **daily returns** over last 3 months/
Standard deviation

Option 3: Sum of **daily excess returns** over last 3
months/Standard deviation

Short term momentum

Option 1: Sum of **daily returns** over last 3 months

Option 2: Sum of **daily returns** over last 3 months/
Standard deviation

**This option captures the cumulative trend
of the returns over the last 3 months**

Option 4: Sum of **daily excess returns** over last 3
months/Standard deviation

Short term momentum

Dividing by the standard deviation normalizes the measure

Option 2: Sum of **daily returns** over last 3 months/
Standard deviation

Option 4: Sum of daily excess returns over last 3 months/Standard deviation

Short term momentum

It makes sure the momentum is not due to spikes, but a consistent trend

Option 2: Sum of **daily returns** over last 3 months/
Standard deviation

Option 4: Sum of daily excess returns over last 3 months/Standard deviation

Short term momentum

Excess Returns are the returns of this stock over and above the market

Option 2: Sum of daily returns over last 3 months/
Standard deviation

Option 3: Sum of daily excess returns over last 3 months/Standard deviation

Short term momentum

We can use an index to measure
the returns of the market

Option 2: Sum of daily returns over last 3 months

Option 2: Sum of daily returns over last 3 months/
Standard deviation

**Option 3: Sum of daily excess returns over last 3
months/Standard deviation**

Short term momentum

When we use excess returns, we are putting a stronger constraint over the momentum

Option 3: Sum of **daily excess returns** over last 3 months/Standard deviation

Short term momentum

Here we want to look at stocks which exhibit a momentum that is over and above the momentum of the market

Option 3: Sum of **daily excess returns** over last 3 months/Standard deviation

Quant Trading strategies

In the 90s, a couple of researchers discovered that stock prices exhibit

Short term momentum and **long term reversal**

Stocks which have
done really well in
the last 3-6 months
continue to do well

Stocks which have
done really well
over the last year
will start losing

Quant Trading strategies

In the 90s, a couple of researchers discovered that stock prices exhibit

Short term momentum and **long term reversal**

Stocks which have done really well in the last 3-6 months continue to do well

Stocks which have done really well over the last year will start losing

Long term Reversal

The Reversal effect is
exactly the opposite of the
momentum effect

Long term Reversal

While the momentum effect asserts that the stock price will continue its current trend,

The reversal effect asserts that the trend will reverse itself

Long term Reversal

It's been shown that stock prices
exhibit both momentum and reversal

But over different lengths of
time

Long term Reversal

The Reversal effect means that

If a stock's price has been increasing recently
It will decrease in the future

If a stock's price has been decreasing recently
It will increase in the future

Long term reversal

The reversal effect means that

Recency here is **increasing recently**
considered to be a
longer period of
time ie. 12 months **decreasing recently**

It will increase in the future

Long term reversal

The reversal effect means that
The past trend will reverse
over the next 3-6 months

If a stock's price has been increasing recently
It will decrease in the future

If a stock's price has been decreasing recently

It will increase in the future

Long term Reversal

The reversal effect means that

If a stock's price has been **increasing recently**

It will **decrease in the future**

If a stock's price has been **decreasing recently**

It will **increase in the future**

Why does this happen?

Long term Reversal

The reversal effect means that

If a stock's price has been **increasing recently**

It will **decrease in the future**

If a stock's price has been **decreasing recently**

It will **increase in the future**

One theory is that investors **over**
react to information in the long term

Long term Reversal

The reversal effect means that

If a stock's price has been **increasing recently**

It will **decrease in the future**

If a stock's price has been **decreasing recently**

It will **increase in the future**

This means that if there is information that should increase the stock price, investors keep reacting to it **for far longer than they should**

Long term Reversal

The reversal effect means that

If a stock's price has been **increasing recently**

It will **decrease in the future**

If a stock's price has been **decreasing recently**

It will **increase in the future**

This effect suggests a
trading strategy

Long term Reversal

This effect suggests a trading strategy

If a stock has **positive returns** over last 12 months

Go short for the **next 3-6** months

Long term Reversal

This effect suggests a trading strategy

If a stock has **negative returns** over last 12 months

Go long for the **next 3-6** months

Long term Reversal

There are different ways to
measure the reversal of a stock
ie, the returns over the last 12 months

Long term Reversal

Basically, $\text{Reversal} = - (\text{Momentum})$

To compute reversal, compute the momentum over the last 12 months and reverse the sign

Long term reversal

Option 1: $-(\text{Sum of daily returns})$ over last 12 months

Option 2: $-(\text{Sum of daily returns over last 12 months}) / \text{Standard deviation}$

Option 3: $-(\text{Sum of daily excess returns over last 12 months}) / \text{Standard deviation}$

Quant Trading strategies

In the 90s, a couple of researchers discovered that stock prices exhibit

Short term momentum and **long term reversal**

Stocks which have
done really well in
the last 3-6 months
continue to do well

Stocks which have
done really well
over the last year
will start losing

Quant Trading strategies

2 such documented effects on the side of investor irrationality

Short term
momentum and
long term reversal

Mean
reversion

Quant Trading strategies

2 such documented effects on the side of investor irrationality

Short term
momentum and
long term reversal

Mean
reversion

Mean reversion

The mean reversion theory says that

When prices move too far away from the average,
they start to move back towards the average

This is generally a moving
average over a long period of time

Mean reversion

When prices move too far away from the average, they start to move back towards the average

This happens because, when prices start moving in 1 direction, some traders start taking a contrarian side

Mean reversion

When prices move too far away from the average, they start to move back towards the average

When enough traders join the contrarian side, the price starts to revert back

Mean reversion

When prices move too far away from the average, they start to move back towards the average

How far away is too far?
What should be the average?

Mean reversion

How far away is too far?
What should be the average?

Determining the answer to these is a
little bit of an art

Mean reversion

How far away is too far?
What should be the average?

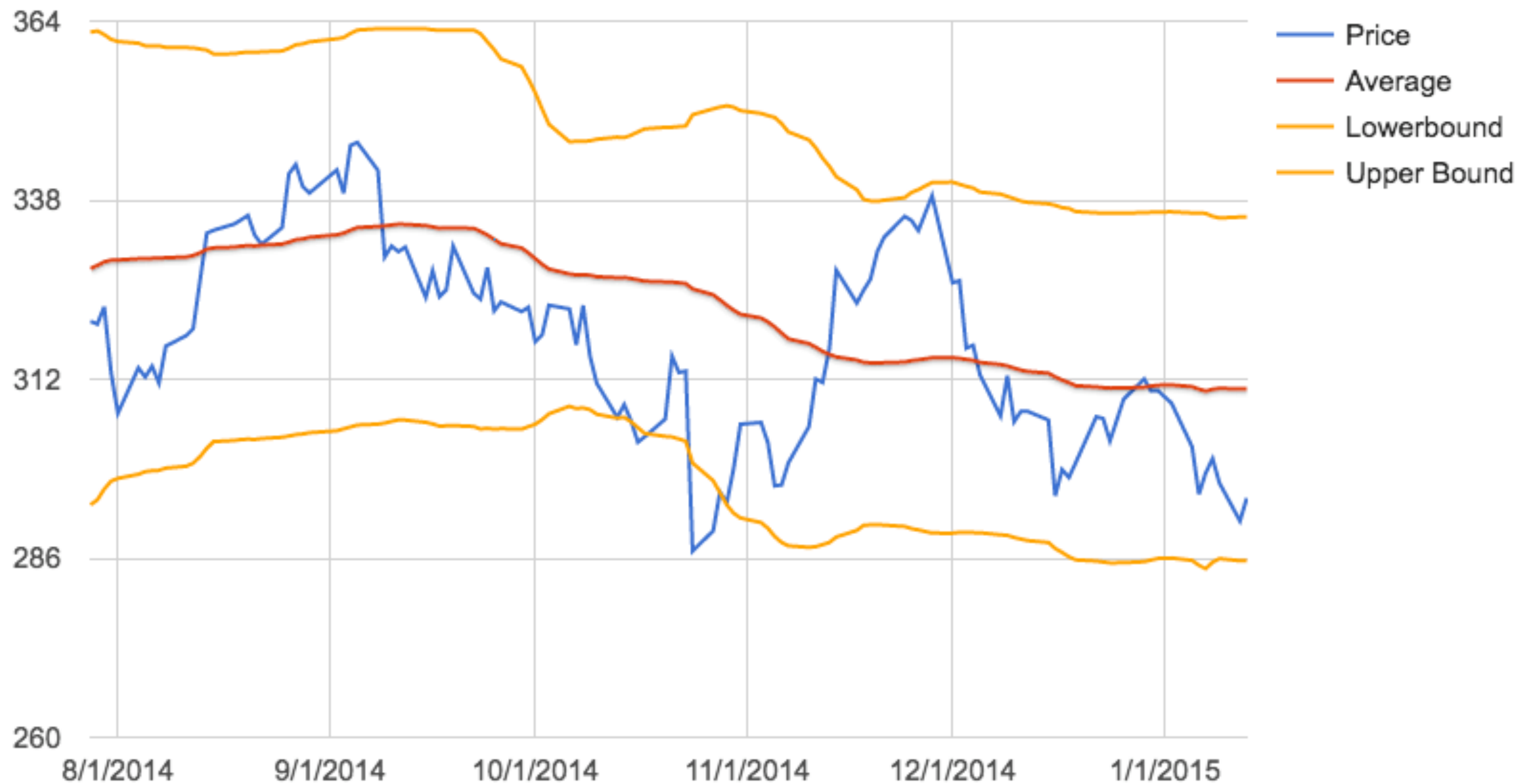
Analysts sometimes study historical price charts to determine the answer to these

Mean reversion

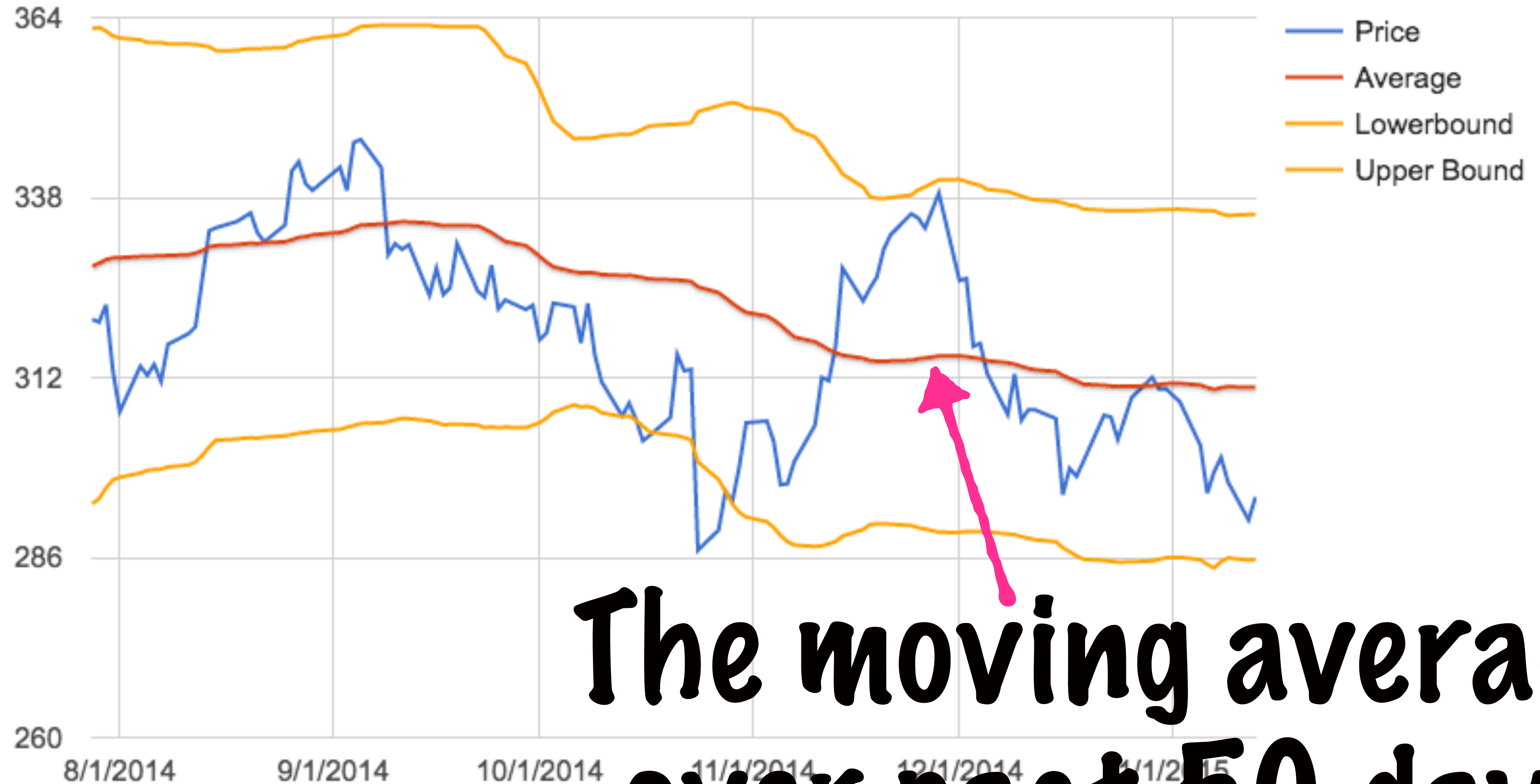
We assume that there is **a band around the average** that the price will not cross

Mean reversion

Here is a time series for Amazon stock in 2014

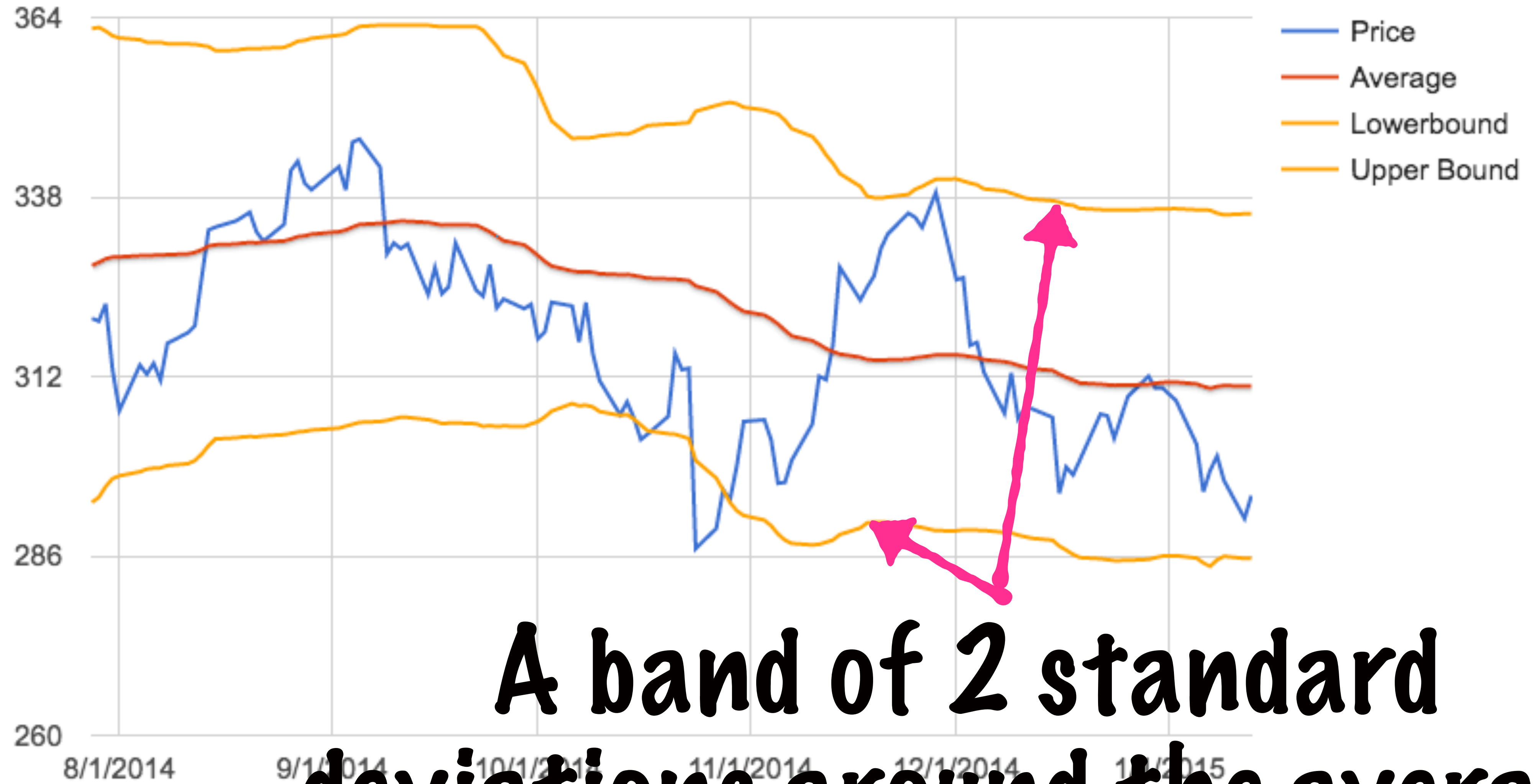


Mean reversion



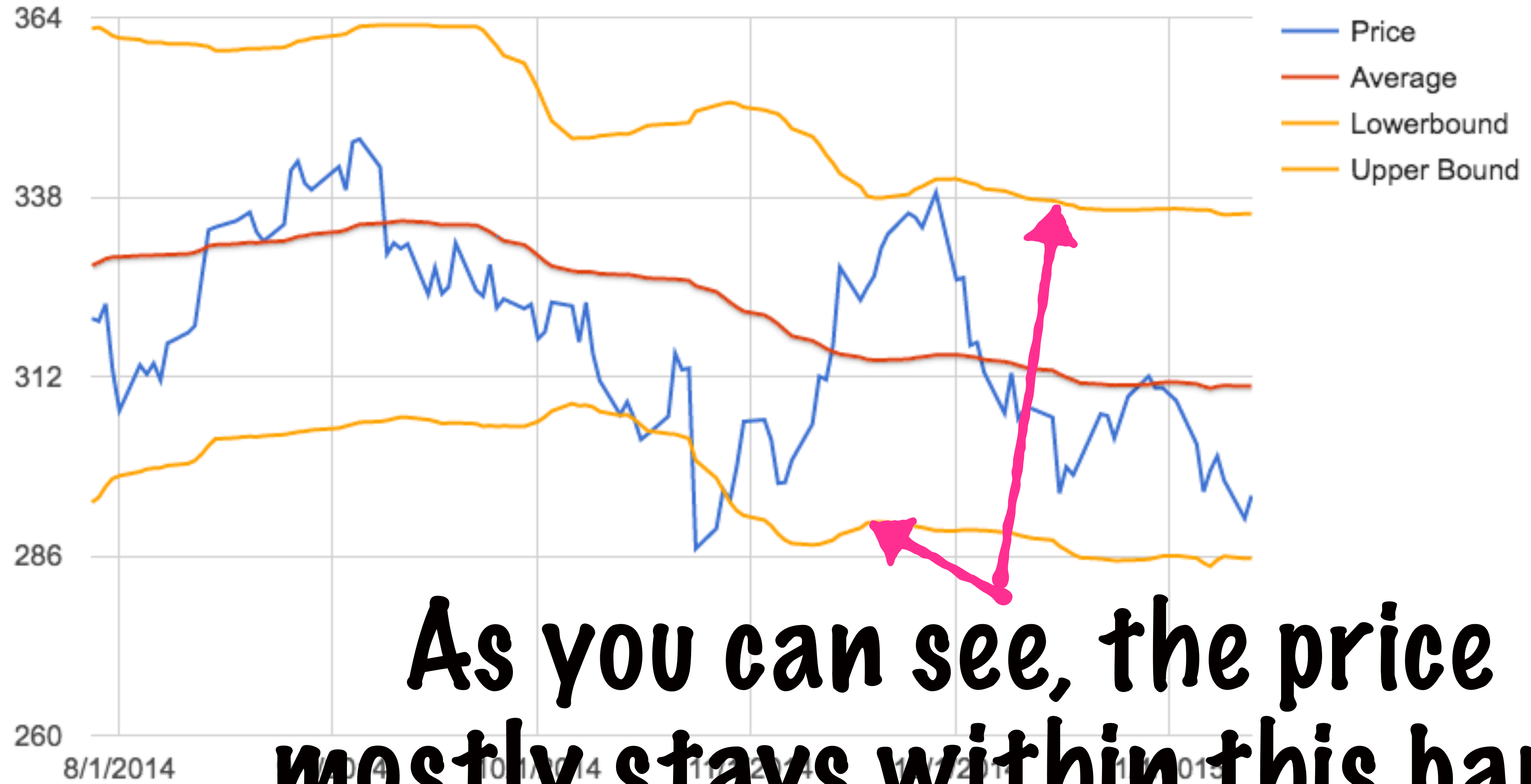
The moving average
over past 50 days

Mean reversion



**A band of 2 standard
deviations around the average**

Mean reversion



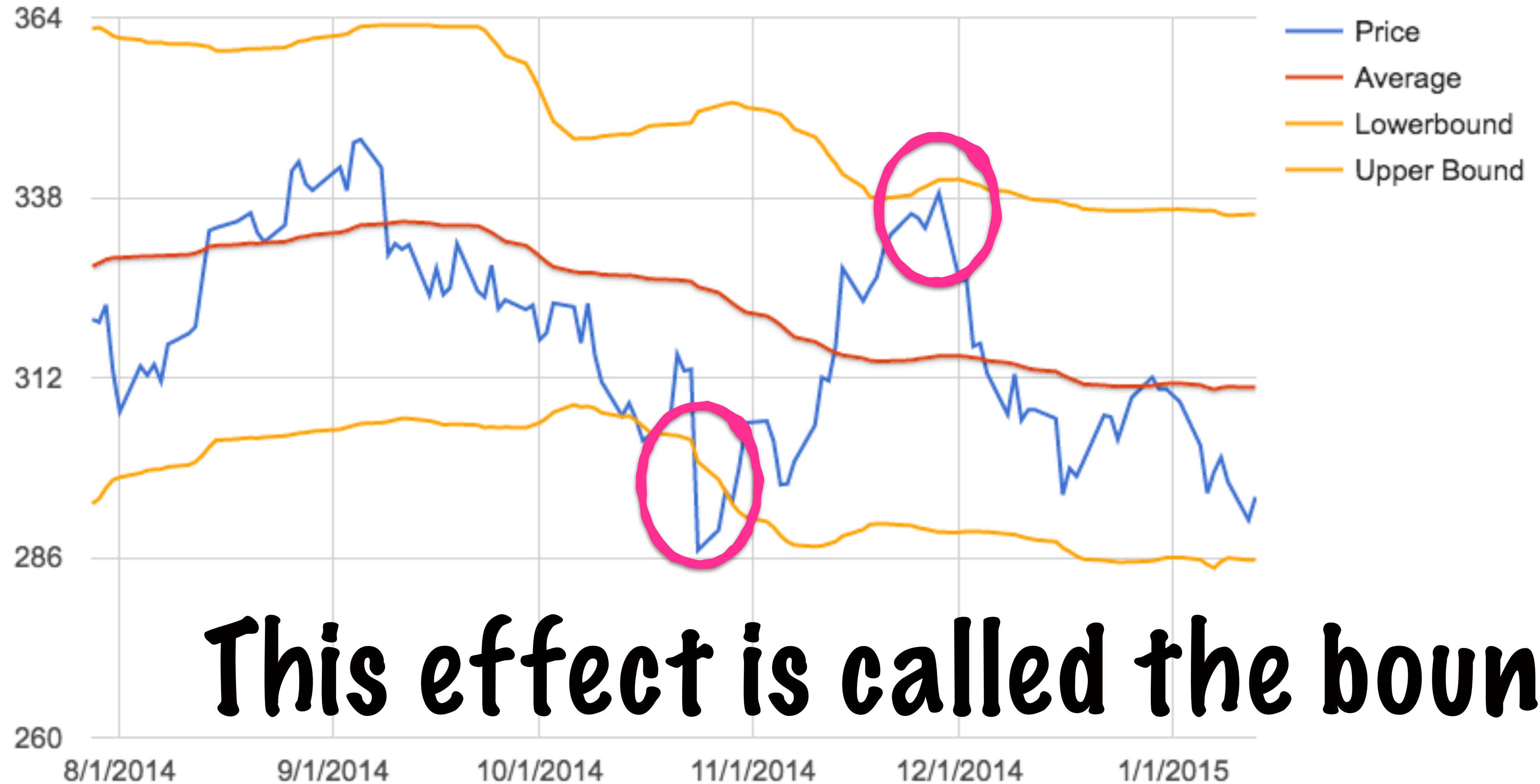
As you can see, the price mostly stays within this band

Mean reversion



**When the price reaches the bounds,
the trend reverses soon after**

Mean reversion



This effect is called the bounce

Mean reversion

A trading strategy using mean reversion

Measure the recent
Jump in the stock price

Mean reversion

Jump in the stock price

Measure the average return
in last 2 periods compared the
long term average

Mean reversion

Jump in the stock price

If the difference is too high,
then take a position in the
reverse direction of the jump

Mean reversion

Jump in the stock price

There are a few different ways to measure the jump

Option 1: Average return in recent past -
Average return in long term

Option 2: Option 1/Standard deviation in last 2 years

Option 3: Using excess returns instead of returns

Mean reversion

Jump in the stock price

There are a few different ways to measure the jump

Option 1: Average return in recent past -
Average return in long term

The recent past should be very short term -
For instance: last 3 days for daily returns
last 2 months for monthly returns

Mean reversion

Jump in the stock price

There are a few different ways to measure the jump

Option 1: Average return in recent past -
Average return in long term

Option 2: Option 1/Standard deviation in last 2 years

The long term can be last 50 days for daily
returns, last 2 years for monthly returns

Option 3: Using excess returns instead of returns

Mean reversion

Jump in the stock price

There are a few different ways to measure the jump

Option 1: Average return in recent past -
Average return in long term

Option 2: Option 1 / Standard deviation in last 2 years

The difference between these 2, tells
us if there is a spike in the recent past

Option 3: Using excess returns instead of returns

Mean reversion

Jump in the stock price

There are a few different ways to measure the jump

Option 1: Average return in recent past -
Average return in long term

If that spike is beyond a certain threshold,
we can make a bet on a movement in the
reverse direction

Mean reversion

Jump in the stock price

There are a few different ways to measure the jump

We can look at a normalized measure after dividing by the standard deviation

Option 2: Option 1/Standard deviation in last 2 years

Option 3: Using excess returns instead of returns

Mean reversion

Jump in the stock price

There are a few different ways to measure the jump

This is akin to computing a Z-statistic - or a normalized distance from the average

Option 2: Option 1/Standard deviation in last 2 years

Option 3: Using excess returns instead of returns

Mean reversion

Jump in the stock price

There are a few different ways to measure the jump

Using excess returns puts a stronger constraint on the jump

Option 2: Option 1/Standard deviation in last 2 years

Option 3: Using excess returns instead of returns

Mean reversion

Jump in the stock price

There are a few different ways to measure the jump

We want to consider a jump over and above the movement of the market

Option 2: Option 1/Standard deviation in last 2 years

Option 3: Using excess returns instead of returns

Quant Trading strategies

2 such documented effects on the side of investor irrationality

Short term
momentum and
long term reversal

Mean
reversion

Quant Trading strategies

We've studied a few different factors that can be used to develop trading strategies

Quant Trading strategies

Let's use these to develop
a trading strategy in Excel

Quant Trading strategy in Excel

Here is a time
series of price
data for the
NIFTY

Date	Price
3/31/2016	7738.4
3/30/2016	7735.2
3/29/2016	7597
3/28/2016	7615.1
3/23/2016	7716.5
3/22/2016	7714.9
3/21/2016	7704.25
3/18/2016	7604.35
3/17/2016	7512.55
3/16/2016	7498.75
3/15/2016	7460.6
3/14/2016	7538.75
3/11/2016	7510.2
3/10/2016	7486.15
3/9/2016	7531.8
3/8/2016	7485.3
3/4/2016	7485.35
3/3/2016	7475.6
3/2/2016	7368.85
3/1/2016	7222.3
2/29/2016	6987.05
2/26/2016	7029.75
2/25/2016	6970.6
2/24/2016	7018.7

Quant Trading strategy in Excel

The objective is to
come up with a
monthly trading
strategy for the NIFTY

Date	Price
3/31/2016	7738.4
3/30/2016	7735.2
3/29/2016	7597
3/28/2016	7615.1
3/23/2016	7716.5
3/22/2016	7714.9
3/21/2016	7704.25
3/18/2016	7604.35
3/17/2016	7512.55
3/16/2016	7498.75
3/15/2016	7460.6
3/14/2016	7538.75
3/11/2016	7510.2
3/10/2016	7486.15
3/9/2016	7531.8
3/8/2016	7485.3
3/4/2016	7485.35
3/3/2016	7475.6
3/2/2016	7368.85
3/1/2016	7222.3
2/29/2016	6987.05
2/26/2016	7029.75
2/25/2016	6970.6
2/24/2016	7018.7

Quant Trading strategy in Excel

On the first trading
day of each month, we
need to decide whether
to go long or short on
the NIFTY

3/1/2016
2/1/2016
1/1/2016
12/1/2015
11/2/2015
10/1/2015
9/1/2015
8/3/2015
7/1/2015
6/1/2015
5/4/2015
4/1/2015
3/2/2015
2/2/2015
1/1/2015
12/1/2014
11/3/2014

Quant Trading strategy in Excel

**We will use
factors like
momentum and
jump**

3/1/2016
2/1/2016
1/1/2016
12/1/2015
11/2/2015
10/1/2015
9/1/2015
8/3/2015
7/1/2015
6/1/2015
5/4/2015
4/1/2015
3/2/2015
2/2/2015
1/1/2015
12/1/2014
11/3/2014

Quant Trading strategy in Excel

For each month,
we build a 'signal',
a number between
-3 and +3

3/1/2016	-1.14
2/1/2016	0.00
1/1/2016	-0.95
12/1/2015	-0.67
11/2/2015	-0.54
10/1/2015	-0.70
9/1/2015	-0.44
8/3/2015	-0.92
7/1/2015	-0.61
6/1/2015	-0.33
5/4/2015	-0.34
4/1/2015	0.26
3/2/2015	0.83
3/2/2015	-0.21
2/2/2015	1.08
1/1/2015	0.80
12/1/2014	0.12
11/3/2014	1.05

Quant Trading strategy in Excel

**The signal indicates
whether we want to
go long or short, and
the size of the position**

3/1/2016	-1.14
2/1/2016	0.00
1/1/2016	-0.95
12/1/2015	-0.67
11/2/2015	-0.54
10/1/2015	-0.70
9/1/2015	-0.44
8/3/2015	-0.92
7/1/2015	-0.61
6/1/2015	-0.33
5/4/2015	-0.34
4/1/2015	0.26
3/2/2015	0.83
2/2/2015	-0.21
1/1/2015	1.08
12/1/2014	0.80
11/3/2014	0.12
	1.05

Quant Trading strategy in Excel

Step 1: Compute the daily returns from the prices

Date	Price	DailyReturns
3/31/2016	7738.4	0.04%
3/30/2016	7735.2	1.82%
3/29/2016	7597	-0.24%
3/28/2016	7615.1	-1.31%
3/23/2016	7716.5	0.02%
3/22/2016	7714.9	0.14%
3/21/2016	7704.25	1.31%
3/18/2016	7604.35	1.22%
3/17/2016	7512.55	0.18%
3/16/2016	7498.75	0.51%
3/15/2016	7460.6	-1.04%
3/14/2016	7538.75	0.38%
3/11/2016	7510.2	0.32%
3/10/2016	7486.15	-0.61%
3/9/2016	7531.8	0.62%
3/8/2016	7485.3	0.00%
3/4/2016	7485.35	0.13%
3/3/2016	7475.6	1.45%
3/2/2016	7368.85	2.03%
3/1/2016	7222.3	3.37%
2/29/2016	6987.05	-0.61%
2/26/2016	7029.75	0.85%
2/25/2016	6970.6	-0.69%
2/24/2016	7018.7	-1.28%

Price	DailyReturns
7738.4	0.04%
7735.2	1.82%

$\text{DailyReturns} = \frac{\text{Price}_{\text{today}}}{\text{Price}_{\text{yest}}} - 1$

$$\text{Return} = P_{\text{today}} / P_{\text{yest}} - 1$$

Quant Trading strategy in Excel

Step 2: Compute the daily log returns

Date	Price	DailyReturns	Daily Log Returns
3/31/2016	7738.4	0.04%	0.04%
3/30/2016	7735.2	1.82%	1.80%
3/29/2016	7597	-0.24%	-0.24%
3/28/2016	7615.1	-1.31%	-1.32%
3/23/2016	7716.5	0.02%	0.02%
3/22/2016	7714.9	0.14%	0.14%
3/21/2016	7704.25	1.31%	1.31%
3/18/2016	7604.35	1.22%	1.21%
3/17/2016	7512.55	0.18%	0.18%
3/16/2016	7498.75	0.51%	0.51%
3/15/2016	7460.6	-1.04%	-1.04%
3/14/2016	7538.75	0.38%	0.38%
3/11/2016	7510.2	0.32%	0.32%
3/10/2016	7486.15	-0.61%	-0.61%
3/9/2016	7531.8	0.62%	0.62%
3/8/2016	7485.3	0.00%	0.00%
3/4/2016	7485.35	0.13%	0.13%
3/3/2016	7475.6	1.45%	1.44%
3/2/2016	7368.85	2.03%	2.01%
3/1/2016	7222.3	3.37%	3.31%
2/29/2016	6987.05	-0.61%	-0.61%
2/26/2016	7029.75	0.85%	0.84%

DailyReturns	0.04% ×	Returns
0.04%	=ln(1+E3)	
1.82%		1.80%
-0.24%		-0.24%
-1.31%		-1.32%

Quant Trading strategy in Excel

Step 2: Compute the daily log returns

We use log returns because they can be summed to compute the total return over a period

Daily Log Returns	
	0.04%
	1.80%
	-0.24%
	-1.32%
	0.02%
	0.14%
	1.31%
	1.21%
	0.18%
	0.51%
	-1.04%
	0.38%
	0.32%
	-0.61%
	0.62%
	0.00%
	0.13%
	1.44%
	2.01%
	3.31%
	-0.61%
	0.84%

Quant Trading strategy in Excel

Step 3: Compute the daily momentum over last 75 days

Momentum = Sum of Returns/Standard deviation

This will tell us the trend of returns over the last 75 days and adjust for any spikes

Daily Log Returns	
	0.04%
	1.80%
	-0.24%
	-1.32%
	0.02%
	0.14%
	1.31%
	1.21%
	0.18%
	0.51%
	-1.04%
	0.38%
	0.32%
	-0.61%
	0.62%
	0.00%
	0.13%
	1.44%
	2.01%
	3.31%
	-0.61%
	0.84%

Quant Trading strategy in Excel

Daily Log Returns	
	0.04%
	1.80%
	-0.24%
	-1.32%
	0.02%
	0.14%
	1.31%
	1.21%
	0.18%
	0.51%
	-1.04%
	0.38%
	0.32%
	-0.61%
	0.62%
	0.00%
	0.13%
	1.44%
	2.01%
	3.31%
	-0.61%
	0.84%

Step 3: Compute the daily momentum over last 75 days

Momentum = Sum of Returns / Standard deviation

This will tell us the trend of returns over the last 75 days and adjust for any spikes

Quant Trading strategy in Excel

Daily Log Returns	1.60% ×	ays Sum
0.04%	=sum(F4:F78)	
1.80%		-1.37%
-0.24%		-1.95%
-1.32%		-0.84%
0.02%		-1.92%
0.14%		-2.91%
1.31%		-4.51%
1.21%		-5.47%
0.18%		-5.75%
0.51%		-5.52%
-1.04%		-3.81%
0.38%		-4.42%
0.32%		-4.83%
-0.61%		-4.05%
0.62%		-3.24%
0.00%		-4.60%
0.13%		-4.33%
1.44%		-5.20%
0.04%		-0.00%

Momentum = $\frac{\text{Sum of Returns}}{\text{Standard deviation}}$

Compute a trailing sum
over the last 75 days

Quant Trading strategy in Excel

Daily Log Returns	Last 75 Days Sum	1.17% × days sd
0.04%	1.60%	=stdevp(F4:F78)
1.80%	-1.37%	1.16%
-0.24%	-1.95%	1.17%
-1.32%	-0.84%	1.16%
0.02%	-1.92%	1.16%
0.14%	-2.91%	1.17%
1.31%	-4.51%	1.16%
1.21%	-5.47%	1.15%
0.18%	-5.75%	1.15%
0.51%	-5.52%	1.15%
-1.04%	-3.81%	1.15%
0.38%	-4.42%	1.15%
0.32%	-4.83%	1.15%
-0.61%	-4.05%	1.14%
0.62%	-3.24%	1.15%
0.00%	-4.60%	1.16%
0.13%	-4.33%	1.16%
1.44%	-5.20%	1.15%
2.01%	-8.02%	1.13%
3.31%	-10.79%	1.06%
-0.61%	-11.86%	1.08%
0.84%	-13.20%	1.07%
-0.69%	-12.53%	1.07%

Momentum = Sum of Returns /
Standard deviation

Compute the
standard deviation
over last 75 days

Quant Trading strategy in Excel

Daily Log Returns	Last 75 Days Sum	$1.17\% \times$ days sd <small>=stdevp(F4:F78)</small>	Momentum
0.04%	1.60%	1.16%	1.36
1.80%	-1.37%	1.16%	-1.18
-0.24%	-1.95%	1.17%	<small>=G5/H5</small>
-1.32%	-0.84%	1.16%	-0.73
0.02%	-1.92%	1.16%	-1.65
0.14%	-2.91%	1.17%	-2.49
1.31%	-4.51%	1.16%	-3.90
1.21%	-5.47%	1.15%	-4.77
0.18%	-5.75%	1.15%	-5.01
0.51%	-5.52%	1.15%	-4.80
-1.04%	-3.81%	1.15%	-3.32
0.38%	-4.42%	1.15%	-3.85
0.32%	-4.83%	1.15%	-4.22
-0.61%	-4.05%	1.14%	-3.54
0.62%	-3.24%	1.15%	-2.81
0.00%	-4.60%	1.16%	-3.95
0.13%	-4.33%	1.16%	-3.72
1.44%	-5.20%	1.15%	-4.51
2.01%	-8.02%	1.13%	-7.08
3.31%	-10.79%	1.06%	-10.16
-0.61%	-11.86%	1.08%	-11.03
0.84%	-13.20%	1.07%	-12.34
-0.69%	-12.53%	1.07%	

**Momentum = Sum of Returns/
Standard deviation**

**Divide the 2 to
compute the
momentum**

Quant Trading strategy in Excel

Daily Log Returns	Last 75 Days Sum	$1.17\% \times$ days sd =stdevp(F4:F78)	Momentum
0.04%	1.60%	1.16%	1.36
1.80%	-1.37%	1.16%	-1.18
-0.24%	-1.95%	1.17%	=G5/H5
-1.32%	-0.84%	1.16%	-0.73
0.02%	-1.92%	1.16%	-1.65
0.14%	-2.91%	1.17%	-2.49
1.31%	-4.51%	1.16%	-3.90
1.21%	-5.47%	1.15%	-4.77
0.18%	-5.75%	1.15%	-5.01
0.51%	-5.52%	1.15%	-4.80
-1.04%	-3.81%	1.15%	-3.32
0.38%	-4.42%	1.15%	-3.85
0.32%	-4.83%	1.15%	-4.22
-0.61%	-4.05%	1.14%	-3.54
0.62%	-3.24%	1.15%	-2.81
0.00%	-4.60%	1.16%	-3.95
0.13%	-4.33%	1.16%	-3.72
1.44%	-5.20%	1.15%	-4.51
2.01%	-8.02%	1.13%	-7.08
3.31%	-10.79%	1.06%	-10.16
-0.61%	-11.86%	1.08%	-11.03
0.84%	-13.20%	1.07%	-12.34
-0.69%	-12.53%	1.07%	

Step 4: Compute the monthly long/short signal

We can now filter this data for the monthly time series

Quant Trading strategy in Excel

Date	Returns	Momentum
3/1/2016	0.07%	-10.16
2/1/2016	0.07%	-9.31
1/1/2016	0.07%	4.17
12/1/2015	0.07%	-6.48
11/2/2015	0.08%	-4.03
10/1/2015	0.07%	-0.68
9/1/2015	0.07%	-4.40
8/3/2015	0.08%	-2.00
7/1/2015	0.07%	-3.83
6/1/2015	0.07%	-2.64
5/4/2015	0.08%	-0.71
4/1/2015	0.07%	2.41
3/2/2015	0.07%	7.47
2/2/2015	0.08%	11.52
1/1/2015	0.07%	3.02
12/1/2014	0.07%	15.42
11/3/2014	0.08%	11.02
10/1/2014	0.07%	5.04
9/1/2014	0.07%	14.23
8/1/2014	0.07%	14.57
7/1/2014	0.07%	19.04
6/2/2014	0.07%	22.50

**We can now filter
this data for the
monthly time series**

Quant Trading strategy in Excel

Date	Returns	Momentum
3/1/2016	0.07%	-10.16
2/1/2016	0.07%	-9.31
1/1/2016	0.07%	4.17
12/1/2015	0.07%	-6.48
11/2/2015	0.08%	-4.03
10/1/2015	0.07%	-0.68
9/1/2015	0.07%	-4.40
8/3/2015	0.08%	-2.00
7/1/2015	0.07%	-3.83
6/1/2015	0.07%	-2.64
5/4/2015	0.08%	-0.71
4/1/2015	0.07%	2.41
3/2/2015	0.07%	7.47
2/2/2015	0.08%	11.52
1/1/2015	0.07%	3.02
12/1/2014	0.07%	15.42
11/3/2014	0.08%	11.02
10/1/2014	0.07%	5.04
9/1/2014	0.07%	14.23
8/1/2014	0.07%	14.57
7/1/2014	0.07%	19.04
6/2/2014	0.07%	22.50

The Returns column represents the returns in the **period ending** on that date shown

Quant Trading strategy in Excel

Date	Returns	Momentum
3/1/2016	0.07%	-10.16
2/1/2016	0.07%	-9.31
1/1/2016	0.07%	4.17
12/1/2015	0.07%	-6.48
11/2/2015	0.08%	-4.03
10/1/2015	0.07%	-0.68
9/1/2015	0.07%	-4.40
8/3/2015	0.08%	-2.00
7/1/2015	0.07%	-3.83
6/1/2015	0.07%	-2.64
5/4/2015	0.08%	-0.71
4/1/2015	0.07%	2.41
3/2/2015	0.07%	7.47
2/2/2015	0.08%	11.52
1/1/2015	0.07%	3.02
12/1/2014	0.07%	15.42
11/3/2014	0.08%	11.02
10/1/2014	0.07%	5.04
9/1/2014	0.07%	14.23
8/1/2014	0.07%	14.57
7/1/2014	0.07%	19.04
6/2/2014	0.07%	22.50

Assume we are sitting at a trading terminal on Feb 1, we want to compute a signal for long/short between Feb 1 - Mar 1

Quant Trading strategy in Excel

Date	Returns	Momentum
3/1/2016	0.07%	-10.16
2/1/2016	0.07%	-9.31
1/1/2016	0.07%	4.17
12/1/2015	0.07%	-6.48
11/2/2015	0.08%	-4.03
10/1/2015	0.07%	-0.68
9/1/2015	0.07%	-4.40
8/3/2015	0.08%	-2.00
7/1/2015	0.07%	-3.83
6/1/2015	0.07%	-2.64
5/4/2015	0.08%	-0.71
4/1/2015	0.07%	2.41
3/2/2015	0.07%	7.47
2/2/2015	0.08%	11.52
1/1/2015	0.07%	3.02
12/1/2014	0.07%	15.42
11/3/2014	0.08%	11.02
10/1/2014	0.07%	5.04
9/1/2014	0.07%	14.23
8/1/2014	0.07%	14.57
7/1/2014	0.07%	19.04
6/2/2014	0.07%	22.50

This signal has
to be between
-3 to +3

Quant Trading strategy in Excel

Date	Returns	Momentum
3/1/2016	0.07%	-10.16
2/1/2016	0.07%	-9.31
1/1/2016	0.07%	4.17
12/1/2015	0.07%	-6.48
11/2/2015	0.08%	-4.03
10/1/2015	0.07%	-0.68
9/1/2015	0.07%	-4.40
8/3/2015	0.08%	-2.00
7/1/2015	0.07%	-3.83
6/1/2015	0.07%	-2.64
5/4/2015	0.08%	-0.71
4/1/2015	0.07%	2.41
3/2/2015	0.07%	7.47
2/2/2015	0.08%	11.52
1/1/2015	0.07%	3.02
12/1/2014	0.07%	15.42
11/3/2014	0.08%	11.02
10/1/2014	0.07%	5.04
9/1/2014	0.07%	14.23
8/1/2014	0.07%	14.57
7/1/2014	0.07%	19.04
6/2/2014	0.07%	22.50

We can do this by
computing a Z-score of
the momentum and
bounding it between -3
to +3

Quant Trading strategy in Excel

Date	Returns	Momentum
3/1/2016	0.07%	-10.16
2/1/2016	0.07%	-9.31
1/1/2016	0.07%	4.17
12/1/2015	0.07%	-6.48
11/2/2015	0.08%	-4.03
10/1/2015	0.07%	-0.68
9/1/2015	0.07%	-4.40
8/3/2015	0.08%	-2.00
7/1/2015	0.07%	-3.83
6/1/2015	0.07%	-2.64
5/4/2015	0.08%	-0.71
4/1/2015	0.07%	2.41
3/2/2015	0.07%	7.47
2/2/2015	0.08%	11.52
1/1/2015	0.07%	3.02
12/1/2014	0.07%	15.42
11/3/2014	0.08%	11.02
10/1/2014	0.07%	5.04
9/1/2014	0.07%	14.23
8/1/2014	0.07%	14.57
7/1/2014	0.07%	19.04
6/2/2014	0.07%	22.50

Computing a Z-score normalizes the momentum so that we can compare it across different months

MomZscore	MomSignal	Mom Returns
<code>= (F5 - average(F5:\$F\$120)) / stdevp(F5:\$F\$120) ')</code>		

$$\frac{[\text{Momentum} - \text{Average}(\text{Momentum})]}{\text{SD}(\text{Momentum})}$$

Quant Trading strategy in Excel

One important detail:

Momentum here uses the data for 75 days ending Feb 28, 2016

Date	Returns	Momentum
3/1/2016	0.07%	-10.16
2/1/2016	0.07%	-9.31
1/1/2016	0.07%	4.17
12/1/2015	0.07%	-6.48

Quant Trading strategy in Excel

One important detail:

To compute the signal for Feb 1-Mar1,
we can **only use the data upto Jan 31**

Date	Returns	Momentum
3/1/2016	0.07%	-10.16
2/1/2016	0.07%	-9.31
1/1/2016	0.07%	4.17
12/1/2015	0.07%	-6.48

Quant Trading strategy in Excel

One important detail:

To compute the signal for Feb 1-Mar1,
we can **only use the data upto Jan 31**

Date	Returns	Momentum
3/1/2016	0.07%	-10.16
2/1/2016	0.07%	-9.31
1/1/2016	0.07%	4.17
12/1/2015	0.07%	-6.48

Quant Trading strategy in Excel

One important detail:

Shift the momentum series
forward by 1 cell

Date	Returns	Momentum
3/1/2016	0.07%	-10.16
2/1/2016	0.07%	-9.31
1/1/2016	0.07%	4.17
12/1/2015	0.07%	-6.48



Quant Trading strategy in Excel

Now we have a momentum signal for each month
We can use these to run a backtest

Returns	MomSignal	
0.07%	-1.49	$-0.10\% \times \text{Returns}$ <code>=H5*D5</code>
0.07%	0.10	0.01%
0.07%	-1.17	-0.09%
0.07%	-0.89	-0.06%

Strategy returns = Actual Returns * Signal

Quant Trading strategy in Excel

Compute the Sharpe Ratio for these returns

-0.39 ×	I	J
=sqrt(12)*I2/I3		Sharpe
	-0.01%	Mean
	0.07%	SD

Note: Here, we assume the risk free rate =0

Quant Trading strategy in Excel

-0.39 ×	I	J
=sqrt(12)*I2/I3		Sharpe
	-0.01%	Mean
	0.07%	SD

Using Momentum only

Sharpe Ratio = -0.39

Quant Trading strategy in Excel

Let's build a trading strategy using a Jump Factor

Returns	0.27 ×
0.07%	$=(\text{average}(\text{D6:D7}) - \text{average}(\text{D6:D29})) / \text{stdevp}(\text{D6:D29})$
0.07%	
0.07%	
0.07%	
0.08%	

This measures if there is a spike in last 2 months compared to the last 2 years

Quant Trading strategy in Excel

Since the Jump factor is already like a Z-score, it can be used directly as the Strategy signal

We want to bet in the reverse direction of the Jump factor

Jump	Jump Signal
0.27	-0.27
-0.39	0.39
-0.07	=-K7
0.18	-0.18

Quant Trading strategy in Excel

Returns	Jump Signal	$-0.02\% \times \text{Jumps}$
0.07%	-0.27	$=M5*D5$
0.07%	0.39	0.03%
0.07%	0.07	0.01%
0.07%	-0.18	-0.01%
0.08%	0.71	0.05%
0.07%	-0.23	-0.02%
0.07%	-0.46	-0.03%
0.08%	1.05	0.08%
0.07%	0.05	0.00%

Let's run a backtest using the Jump signal and compute the Sharpe Ratio

Using Jump only

Sharpe Ratio = 1.21

Quant Trading strategy in Excel

**Usually trading strategies
use more than 1 factor**

Quant Trading strategy in Excel

We can use a
weighted average of
Momentum and Jump

0.8	0.2	
MomWeight	JumpWeight	Combined Signa
-1.19	0.05	-1.14
0.08	-0.08	0.00
-0.93	-0.01	-0.95
-0.71	0.04	-0.67
-0.39	-0.14	-0.54
-0.75	0.05	-0.70
- - -	- - -	- - -

Quant Trading strategy in Excel

**This weights can be
determined in different ways**

Through trial and error

**By fixing the desired output
and solving a set of equations**

0.8	0.2	
MomWeight	JumpWeight	Combined Signa
-1.19	0.05	-1.14
0.08	-0.08	0.00
-0.93	-0.01	-0.95
-0.71	0.04	-0.67
-0.39	-0.14	-0.54
-0.75	0.05	-0.70
- - -	- - -	- - -

Quant Trading strategy in Excel

The more factors you want
to use, the more
complicated finding a
combined strategy becomes

0.8	0.2	
MomWeight	JumpWeight	Combined Signa
-1.19	0.05	-1.14
0.08	-0.08	0.00
-0.93	-0.01	-0.95
-0.71	0.04	-0.67
-0.39	-0.14	-0.54
-0.75	0.05	-0.70
- - -	- - -	- - -

Quant Trading strategy in Excel

Updating the weights
as we get more
historical data can be
very cumbersome

0.8	0.2	
MomWeight	JumpWeight	Combined Signa
-1.19	0.05	-1.14
0.08	-0.08	0.00
-0.93	-0.01	-0.95
-0.71	0.04	-0.67
-0.39	-0.14	-0.54
-0.75	0.05	-0.70
- - -	- - -	- - -

Quant Trading strategy in Excel

This is where using
Machine Learning
techniques can come in
handy

0.8	0.2	
MomWeight	JumpWeight	Combined Signa
-1.19	0.05	-1.14
0.08	-0.08	0.00
-0.93	-0.01	-0.95
-0.71	0.04	-0.67
-0.39	-0.14	-0.54
-0.75	0.05	-0.70
- - -	- - -	- - -

Quant Trading strategy in Excel

Machine learning techniques can find relationships between variables given lots of data

We can combine the historical price data with ML techniques to develop sophisticated trading strategies