

02-08 Efficient Markets Hypothesis

Compiled by Shipra De, Fall 2016

Our Hypothesis



- We haven't stated these explicitly, but we've been operating under some assumptions.
 - For technical analysis we assume that there is information in historical price and volume data that we can discover and exploit in advance of the market.
 - For fundamental analysis we assume there is information in fundamental data, like earnings, that can be exploited and traded upon in advance of the market.
- The efficient markets hypothesis says we're wrong about both.

EMH Assumptions

EMH assumptions

- Large number of investors
- New information arrives randomly
- Prices adjust quickly
- Prices reflect all available information



1863



Fama

- The first ideas that eventually became the Efficient Markets Hypothesis were postulated by Jules Regnault in 1863. Eugene Fama carried those ideas further in the 1960's, and it became his PhD thesis. Fama recently received a Nobel Prize, so we know those ideas were good.
- So what's the efficient market hypothesis about? We'll start by looking at some of the assumptions that it makes.
- Probably the most important assumption is it that there are a large numbers of investors interacting in the market for profit. So they have an incentive to find opportunities where the price of a stock is out of line with what its true value is. Because there are so many of these investors operating simultaneously, any time a little bit of information comes out there, the price is going to move.
- The next assumption is that new information arrives randomly. So it arrives at random times, it arrives at random rates for different stocks, but it's constantly arriving and investors are paying attention to that information and therefore the prices are adjusting quickly.
- Finally, the efficient market hypothesis assumes that the current price reflects all available information.
- In other words, all this information that's trickling in is acted upon by the investors, the price adjusts quickly to that information, and the current price reflects all of the information about that stock.

Origin of Information

Where does information come from?

- Price/volume
- Fundamental
- Exogenous
- Company insiders

- There's a number of places information can come from. Let's step through a few of these sorted from most public to least public. But even this is certainly not an exhaustive list. There's many other places we can get information. But let's step through them.
- Price volume, this is public. It's rapid, it's quick, everybody can see it. This is the basis of technical analysis.
- Fundamental data. This is reported quarterly and everybody can see it as well. It's public, but it points more to the root of the value of the company than just the price volume.
- Exogenous data, that's a fancy name for a simple concept. It's just information about the world that effects the company. As an example, if we were looking at an airline stock, an exogenous piece of data that would affect the price of the airline stock is the price of oil. If price of oil goes down, usually the price of the airline stock goes up because energy is the number one cost for airlines.
- A very important and secretive type of information relates to company insiders. So, let's suppose you're a CEO, and you know that this drug that you've invented is about to be improved. You might go buy shares of your stock because you think the price of your stock is going to go up because that drug is going to be approved. Now, depending on the circumstance it may or may not be legal, but this reflects information that you have that people outside the company do not have. And so this insider information is probably the least accessible of all these types, of course, and of most other types of information as well.
- Now, each of these types of information has a relationship to the efficient markets hypothesis. In particular there's three forms of the efficient markets hypothesis. And these types of information relate to each of these three forms. We'll get in to that in just a second.

3 Forms of the EMH

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- Weak: Future prices cannot be predicted by analyzing historical prices
- Semi-strong: Prices adjust rapidly to new public information
- Strong: Prices reflect all information public and private

- There are three versions of the official markets hypothesis that go from weak to strong and we'll take a look at them each one at a time.
- The weak form of the EMH says that future prices cannot be predicted by analyzing previous prices. The idea here is that the current price reflects all information we might know. So just by looking at these historical prices you can't predict what is going to happen next. Notice, however, that this does leave room potentially for fundamental analysis.
- The semi-strong version of the EMH suggests that prices adjust immediately to new public information. So, for instance, when companies have their quarterly reports, that contain fundamental information, prices react immediately to that information. So, if semi-strong is correct, that would seem to prohibit even fundamental analysis.
- There's one possibility left though. One way that we might make money and that is based on insider information. Well, the strong version of the EMH says we can't even make money on insider information. Prices reflect all information, public and private. So even if there's some secret information within the company that points to a higher price later. The price will go up in the face of that knowledge. So, if the strong version of the EMH is true, it is essentially impossible to make money by holding a portfolio, other than the market portfolio.
- So let's recap each one of these real quick. The weak form says that you can't predict future prices by looking at historical prices. It is silent on things like fundamentals or insider information, it's just about price. You can't profit by looking at historical price.
- Semi-strong says that public information such as quarterly reports cause the price to adjust quickly. The price adjusts rapidly to this new public information. So semi-strong essentially says that even fundamental analysis won't work.
- Finally, the strong version says that even insider information can't be leveraged to profit in the market.

The EMH Prohibits

Q: The EMH prohibits?

	Weak	semi-strong	strong
Technical	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fundamental	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Insider	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- Consider the three forms of the deficient markets hypothesis. Weak, semi-strong, and strong. Which one of these types of analyses or strategies would these corresponding versions of the EMH would prohibit?
- So for instance if you think that the weak version of the efficient market hypothesis prevents fundamental analysis from working. You would check the box there. Okay, have at it.

Q: The EMH prohibits?

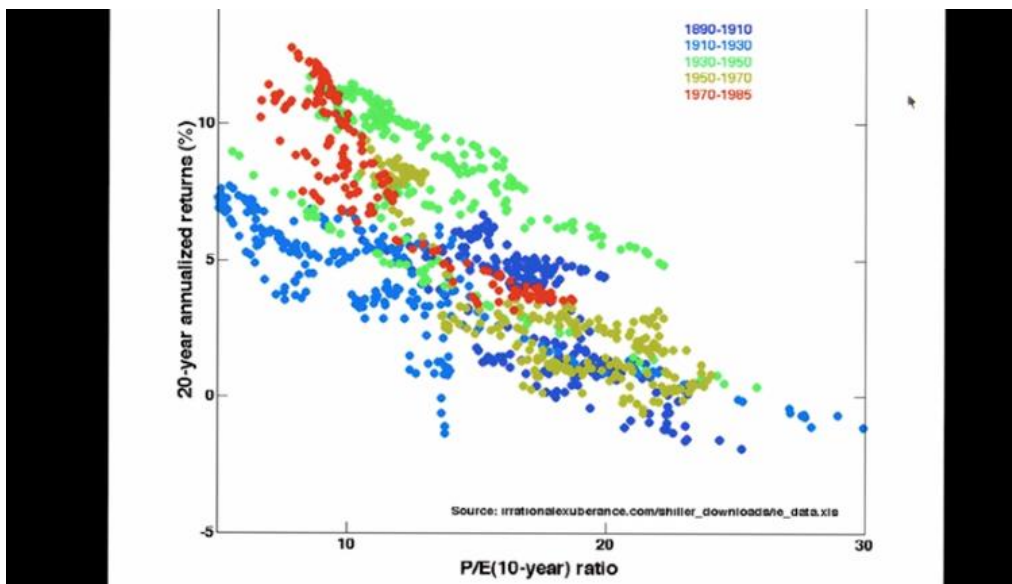
	Weak	semi-strong	strong
Technical	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Fundamental	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Insider	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

- The weak version prohibits us from profiting from technical analysis, because the weak version says that, you can't predict future prices from past prices. But the weak version didn't say anything about fundamental or insider information.
- Semi-strong prohibits technical analysis, also fundamental. But it's silent on insider.
- And finally the strong versions says that, you can't profit from any of those three types.

Is the EMH Correct?

Is the EMH correct?

- Is the efficient markets hypothesis correct? Well, if it is, then a lot of what we're trying to do in this course is not possible. Namely, we can't beat the market using any of these strategies we might be looking at.
- Now, I think there is evidence that certain versions of the hypothesis are not correct. And there are a number of very successful hedge funds out there that would seem to indicate that you can make money in the market by investing in things other than just the market portfolio.
- I would say the strong version of the efficient markets hypothesis is the least solid. In other words, the strong version says that you can't even profit from insider information. The reason that I think that one is not true is because we have seen people make money from insider information. Some of them have gone to jail, but clearly, it's a method that can provide profit, even though it might be illegal.



- This is an interesting data set that seems to refute the semi-strong version of the efficient markets hypothesis as well. It's a little bit complex, so I'll step through it carefully.
- So, let's look at the blue dots. Each dot here represents the P/E ratio on a particular date, so, for instance, this stock had a P/E ratio of 20, that's price to earnings. That's the horizontal component of its location. The vertical location is how much money did it make in terms of price over 20 years. So for instance, this stock had a price/earnings ratio of 20. And it made about 4% annualized returns.

- As we go down this way, the P/E ratio is lower. So lower numbers for P/E ratio are better. If you think about it, price divided by earnings, if it's a lower price and has higher earnings, you'll get a lower number. So, presumably, lower values this way indicate higher value for a stock.
- And each group of colors represents different decade when the analysis was done. So, for instance, this dark blue was an analysis based on what the P/E ratios of stocks were in 1890 to 1910 and all the way up to the red, which was 1970 through 1985. Now for all of these decades, we saw that at the beginning of the corresponding time period, low P/E ratios corresponded with higher returns.
- So this shows that price/earnings ratios are very predictive across many, many decades of future returns, and that tends to refute the semi-strong version of the EMH.
- Okay, that's it for the efficient markets hypothesis. I will see you again soon, bye, bye.