

The clash between titans - behavioral portfolio theory versus Markowitz's modern portfolio theory

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Abstract: *Markowitz's Mean Variance Theory (MVT) from 1952, Nobel Prize awarded, is considered as one of the fundamental in finance and specifically in portfolio management. It sets the relation in which the expected return is maximized for a given level of risk. This is a framework where the investor aims to minimize the variance of his portfolio. On the other hand, the Behavior portfolio theory (BPT) works with the assumption that investors seek to secure a minimal final return and they are not rational but driven by different types of emotions within taking their final decisions. The aim of the current article is to examine the different perspectives of both theories, the clash between expectations, beliefs, rationality and asymmetric information that are to be the main variables in terms of non-material changes that may occur when investor takes his decision how to structure his portfolio environment. Except for defining the differences between the two theories, the article will try to define any empirical evidences to justify the answer of the question: is our standard perception of diversification obsolete and are the decision makers really rational within trying to be on the efficient markets frontier?*

Key words: *Behavioral Finance, Modern Portfolio theory, Portfolio Choice, Investment Decisions, Financial risk, Mental Accounting, Neurofinance, Herd Behavior.*

JEL Code: *G41*

I. Introduction:

The starting point in drawing the circle of finance philosophy...

I have general problem with finance as a PhD student and as an individual with rational understanding and utility function. In finance and investment theory at first you are trying to search for a model that can explain certain phenomenon and then you realize that it is “broken” and captures unrealistic assumptions.

For example, looking into the question:

How individuals take theirs portfolio investment decisions?

Per the traditional theory, diversification is a key through optimizing an investment portfolio. However, in the real world, limited from the intuition and formalization of theoretical framework, investors are not to use fully the diversification to optimize their results. Looking out from the opportunity window – factors as information asymmetry, preference for home assets, transaction costs and risk aversion are the drivers of “non-conformist” to general investment rules strategy.

The most famous framework on this topic is created by Markowitz. His Modern Portfolio Theory (MPT) has an amazing success at the time, getting the fresh air to the tired, breathless investors that learn “by their chance” how to invest money.

However, it appears that the base of this theory is laying on unrealistic assumptions. There, in searching for alternative, comes the behavior portfolio theory where we try to look beyond the simplified statistical and mathematical variables and get into the human’s brain and emotions.

But is this going to be sufficient? Or just a clash between Titans?

II. Exposition

Or how I can resolve my PhD student problem for the Titan's models?

Titan#1: Markowitz– The modern portfolio perspective

Born in 1927, Markowitz broke the traditional view of investment portfolios defining the features of the Modern Portfolio theory. In 1952 he wrote an article named “Portfolio selection” where he firstly developed a mathematical model to distinct the volatility reduction in a portfolio when combining investments with different patterns of returns. He is the first to get the mathematical interpretation of expected utility on one hand and the risk experience through the statistical meaning of variance on the other.

Before Markowitz, the world was struggling with diversification focused on the return and risk characteristics of separate securities irrespective of the fact how they behave together in the investor's strategy. In brief, Markowitz belief is that by combining securities from different classes that are not moving together, one can reduce the risk and increase risk adjusted performance. Thus, **combining non-correlated assets will produce an efficient portfolio** generating greatest return for a given amount of risk. The theory is based on the normal distribution assumption – this means that risk is defined as the standard deviation of returns.

However, in reality the efficiency of the markets is not within the “normal” assumptions so the correlation and risk may not follow the simple mathematical logic settled in. All the crisis already left their fingerprint as a clue of the normal distribution not being true. There are the so called “black swan” events that occur more often than statistically expected on certain financial markets and are consequently reflected in the global one. Then, it follows that the basic measure of risk – the standard deviation may be misleading and the correlation – distorted. In addition – within a crisis – the correlation increases between asset classes so then the asset allocation becomes less useful as risk management strategy.

On the other hand, diversification is the alphabet of investment theory or another way to save yourself from the danger to “put all your eggs in the same basket”. It seems as a child game: you build your own model, take the securities that you consider as “save” ones, in terms of your

expectations and own utility curve, look through the best possible correlation so if anything sinks – the rest of the portfolio to remain save and dry.

So why we cannot fully rely on the MPT theory to explain how to make good portfolio decisions?

The sinking of Titan#1: MPT Assumptions

Splash #1:

- ❖ **Investors' utility functions are quadratic.** This MPT assumption can be decrypted as: investors will invest fewer dollars in risky assets as their wealth increases (i.e increasing absolute risk aversion), which contradicts observed investor behavior.
- ❖ **The joint distribution of asset returns is normal.** Real world asset return distributions are negatively skewed (long left tails) and leptokurtic (left and right tails are fatter than the normal distribution). The actual distribution of asset returns are negatively skewed (the left tail is longer than the right tail).

Splash #2:

MPT is a **single period** model which is valid over multiple periods only if investor utility functions are myopic (i.e they only care about the next period and nothing beyond) or if asset returns are independent across periods.

However:

- ❖ Myopic utility is hard to believe: investors must care today about the return distribution in the subsequent months
- ❖ There is clear empirical evidence that asset returns are not independent over time. They display negative autocorrelation over long horizons

Splash #3:

MPT assumes **symmetric utility functions**. It means that the gain in utility (i.e ‘happiness’) for an investor after their wealth increased by, say \$10 is equal to the loss in utility when their wealth

decreases by \$10. Kahneman & Tversky¹ have shown that real world investor utility falls more due to \$10 loss than it rises due to a \$10 gain, i.e. investors are loss averse and this is proven by their “Prospect Theory”.

The big Splash #4:

Any transaction costs, no spreads, no tax is paid- it is only the risk that leads the investor. This in the globalized and highly integrated economy cannot happen in practice. Even though the transactional costs are one of the main drivers for investors to prefer certain market or specific portfolio as the premiums need to be paid are expenses over the planned ones that certainly won’t bring any added value. This is one of the main drivers for the *home bias* phenomenon. This bias is believed to have arisen as a result of the extra difficulties associated with investing in foreign equities, such as legal restrictions and additional transaction costs. Other investors may simply exhibit home bias due to a preference for investing in what they are already familiar with rather than moving into the unknown, with “features” as lack of self-control, availability heuristic, emotion and cognition, mental accounting, herding, ignorance of correlations and overconfidence.

Yes, here we have more psychology than finance.

In brief, MPT is a theoretical construct that attempts to describe how capital markets operate, not a recipe for designing investment portfolios as we have seen by the analysis of its assumptions.

When Markowitz was awarded with a Nobel Prize in 1990, it was only then when investors started to pay attention in efficient frontiers, variance and correlation. Afterwards, when in 2002 Kahneman was awarded for his research in Behavior finance, everyone started to look in the behavior features to manage their risk. So it seems that these two Titans’ theories may just be a representation of the problems they had at the time of their researches.

Titan#2: Behavior Finance

Is everything a subject of the efficiency line and the rational choice of investor? What happens when a human needs to take a decision whether to invest or not in an instrument with a certain final aim and all the surrounding obstacles?

¹ Kahneman, D., Tversky, A. A. Prospect theory: An analysis of decision under risk. *Econometrica*, 1979.

Is the modern portfolio theory something we are using as a last resort to explain human's choice?
Is the efficiency curve an anchor to explain the portfolio investor behavior?

An alternative to the modern portfolio theory is the **behavior theory** set in the framework by Shefrin and Statman (2000)². It is an area of knowledge of behavior finance which Shefrin describes as “the application of psychology to financial behavior”.

Shefrin and Statman's theory is based on the basic economic utility theory of Van Neuman and Morenstein (1944)³. On its turn, their theory is based on the basic Bernoulli's utility theory from 18th century.

Fundamental questions to be examined:

- *Where the behavior theory comes from?*
- *Why we have per Statman contradiction between Normal and Rational people?*
- *Are the rational people the dummy variable in each financial model?*

In economic science it is the eternal question how an individual makes his choice for uncertain outcomes, defined by the “game theory” and “decision theory”. The main hypothesis is defining the preference as “statistical expectation of individual's valuations of the outcomes of a gamble, where these valuations may differ from the dollar value of those outcomes”. This was set by **Daniel Bernoulli in 1738** explaining choices that seem to contradict the expected value criterion (which takes into account only the sizes of the payouts and the probabilities of occurrence), such as occur in the contexts of gambling and insurance.

The subsequent **von Neumann–Morgenstern utility theorem** incorporates a behavior toward risk variance. It shows that when a consumer is faced with a choice of items or outcomes subject to various levels of chance, the optimal decision will be the one that maximizes the expected value of the utility (i.e., satisfaction) derived from the choice made. Expected value is the sum of the products of the various utilities and their associated probabilities. The consumer is expected to be

² Shefrin, Hersh & Statman, Meir. (2000). Behavioral Portfolio Theory. Journal of Financial and Quantitative Analysis. 35. 127-151. 10.2307/2676187

³ Von Neumann, J., & Morgenstern, O. (1944). Theory of games and economic behavior. Princeton, NJ, US: Princeton University Press.

able to rank the items or outcomes in terms of preference, but the expected value will be conditioned by their probability of occurrence.

Friedman–Savage utility function, 1948⁴. This is the theory of Milton Friedman and Leonard Savage postulating that the curvature of an individual's utility function differs based upon the amount of wealth the individual has. This has the aim to explain why an individual is risk loving when having more wealth and risk averse when he is poorer. Here the main idea is again the social gambling that was the core one set up from Bernoulli on.

Kahneman & Tversky, 1979, Prospect theory - developed by framing risky choices. Assumptions are that people are loss-averse - individuals dislike losses more than equivalent gains, they are more willing to take risks to avoid a loss. Kahneman won a Nobel Prize for this theory and he is the first psychologist to take a Nobel Prize in economy.

Rank-dependent utility proposed by Quiggin (1982), Yaari (1987), Allais (1988) - assumes that returns are ordered from lowest to highest and substitutes decision weights for probabilities and the function transforms decumulative probabilities into the range [0; 1].

Shefrin and Statman, 2000 - based on the Prospect Theory, compare the behavior portfolio efficient frontier with the mean-variance efficient frontier and show that, in general, the two frontiers do not coincide. They use as a main tool single and multiple mental accounts that resemble layered pyramids, where layers are associated with individual aspirations – the main driver to make an investment choice.

Looking through investor's behavioral anomalies:

Some of the key features of the behavior theory empirical findings are:

- *lacking diversification*, individual investors hold only a few assets, not diversifying the standard way we have read in finance manuals
- *naive diversification*- tendency to split money evenly across available assets and not being a real risky “gambler”

⁴ **Friedman, M., Savage, L. J.** The utility analysis of choices involving risk. The Journal of Political Economy, 1948.

- *home bias* (that was reviewed above in regards with the insolvent MPT assumptions)- the tendency to prefer domestic over foreign assets
- *lacking self-control*- individual's difficulty controlling their emotions within searching the most profitable investment
- *availability*- individual's tendency to predict the likelihood of an outcome based on how many outcomes of each type come readily to mind
- *emotions and cognition*- errors that stem from the way that individual percept certain facts from the environment
- *herding*- individuals in a group act together without planned individual direction, the so-called “crowd effect” when someone takes a conformist decision just because everyone is acting this way

And some accents:

- **Disposition effect** -> behavioral anomaly in which investors tend to sell assets whose prices have increased while keeping assets whose prices have decreased (Shefrin & Statman, 1985)
- **Mental accounts** -> manage your separate investment choices, not as a whole portfolio but as individual opportunities to increase your own wealth
- **Overconfidence** -> When subjective confidence is reliably greater than objective accuracy (Barber and Odean, 2001). This comes as a result of everyone’s personal experience and expectations but is identified as a common feature of investor’s behavior.

The splash of Titan#2: Limitations

In a sense, behavioral finance picks up from where modern portfolio theory leaves off, completing the circle.

It describes how investors *actually behave*, rather than how they *should behave*. It recognizes that we sometimes act in our own best economic interests, and sometimes we don’t. Assuming that modern portfolio theory largely correctly describes the way markets operate, behavioral finance describes how we might best profit from that knowledge. So the examined area of behavior theory is in the *ex post* so it cannot give us a forecast of the essential steps so as to maximize our return.



Additionally, being “behavioral”, findings are based on thorough statistical analyses. If it cannot be objectively measured and confirmed by large, long time period studies, then it is not objective. In these terms, a very long examine period is needed so as to define a strong relationship within certain variables, minimizing the chance of error.

As the behavior theory is supposed to take human attitude measured in a model, there is a high risk of subjectivity. Certain emotions when reported can be miscommunicated in empirical studies. Thus, a mathematical measurement of individual’s perceptions can be highly inappropriate to make conclusions due to communication and character differences.

III. Isn’t the clash in fact a circle?

...an attempt for conclusion that appears to be my starting point...

Portfolio theory is setting up the explored dimensions above through the Behavioral opposed to Markowitz standard theory. It may be assumed (Keeping the finance assumptions illusion!) that Behavior perception starts where the MPT leaves off, completing the “nuances” on the rationalism and trying to give an explanation of the reported events of investor behavior. Considering this can be a never ending issue- can human behavior enter a financial model where hopes, fear and greed are the variables?

If modern portfolio theory largely describes the way markets operate, does behavioral finance describes how we might best profit from that knowledge?

Standard theory offers baskets of risk from where you can choose, however, “behavioral” angle gives the response how it is perceived and assessed within taking investment decisions. However, it cannot fully explain the individual full perception due to lack of resources, but just “clustering” the subjects in groups to be explored.

In fact, whatever model we try to use, it cannot capture all the variables within the market environment and human behavior, so we cannot state a general rule to explain any process. So it is quite philosophical issue in finance and I consider that this pure psychology points outlined above



are just the starting feature of something bigger, overviewed from above, called **F I N A N C E P H I L O S O P H Y .**

The lack of model that can fully explain what happens within global financial decision makers is a wide field to be explored in philosophical sense where the rationalization of the subjects and objects is another story to begin a circle, left by the *serious* numbers. This can highly remind the circles of Hegel since is a concept of theories that fulfill the logic of one another.

So my PhD problem, trying to search for a model where I can find the absolute responses is justified now with the circle I need to explore between the “traditional” and “alternative” perception of risk and return. My own invented circle based discipline – Finance philosophy can complete all the outstanding assumption holes, getting the completed answer of *how individuals take their investment decisions*.

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