Modern Portfolio Theory and the Myth of Diversification

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The year 2008 was an annus horribilis for investors in financial markets. Not one investor was protected against the downfall in asset prices. Even the stars of the last decade, the wizards of Greenwich who promised investment portfolios to be immune against this correction by adding “portable alpha” to their portfolios, had to admit that there was no safe haven. Diversification across several different asset classes didn’t work either, since every major asset class appeared to be under attack.

What the credit crunch and recession has taught us was that diversification and the efficient portfolio theory is a myth. Those challenging the diversification principle are entering Nobel Prize territory and Professor Markowitz himself. The view we posit in this article is that a cornerstone of modern finance, the Modern Portfolio Theory (MPT), did not withstand the test during the market crisis of 2007-2008. If our view is correct then it places a large question mark beside the fee-driven business of the professional fund management industry. Because why would a less-sophisticated investor pay X% per annum in fees to a professional investment manager if that manager is not creating any value? Moreover, less-sophisticated investor pay X% per annum in fees to a professional investment manager, assuming that manager is not creating any value? Moreover, in a bear market it can be demonstrated that diversification to hedge or spread risk destroys rather than creates value, because it merely magnifies the existing risk exposure for no reward.

We begin the article with a summary introduction to the basics of MPT. We then consider the weaknesses inherent in the model as they appear, and link those weaknesses empirically to the current market environment. We conclude the paper with policy recommendations.

A summary introduction to MPT

Modern Portfolio Theory as formalised by HM Markowitz is based upon four major components, which we summarise below:

1. Investors are risk averse. Investors are more concerned with risk than with reward. Given the choice of two securities which offer the same return, the investor will choose the security which offers less risk. Therefore rational investors will not accept additional risk unless the level of return compensates them for this risk.

2. Security markets are efficient. The Efficient Market Hypothesis states that while the returns of different securities may vary as new information becomes available, these variations are inherently random and unpredictable. Assets are re-priced literally every second of the day according to what news is immediately available. As new information enters the market it is quickly reflected in the prices of securities, and thus temporary pricing discrepancies are extremely difficult, if not impossible, to exploit for profit. Advanced information dissemination technology and increased sophistication on the part of investors are causing the markets to become even more efficient, further complicating attempts to exploit price fluctuations arising from inefficient dissemination of information.

3. Focus on the portfolio as a whole and not on individual securities. The risk and reward characteristics of all of the portfolio’s holdings should be analysed as one, not separately, with assumptions that equities offer higher returns than bonds, small-company equities offer higher returns than large-company equities and value equities offer greater returns than growth equities, all with their respective commensurate risk levels. An efficient allocation of capital to specific asset classes of equities and bonds is far more important than selecting the individual securities.

This is illustrated in Figure 1, reproduced from Brinson, Hood and Beebower (1986). As shown, asset allocation can determine over 90% of the performance variation of an investment portfolio. How one’s investment dollars are allocated far outweighs the potential effects of individual security selection and market timing.

4. Every risk level has a corresponding optimal combination of asset classes that maximises returns. Portfolio diversification is not so much a function of how many individual stocks or bonds are involved, but rather the lack of correlation of one asset to another. The higher a correlation between two investments, the more likely they are to move in the same direction. A portfolio of many different oil company stocks is highly correlated and poorly diversified. In this example, a disruption in oil supply will likely have a similar effect on all of these stocks. A portfolio of oil company stocks and alternative energy stocks is not as correlated and an oil supply disruption would probably have a different effect on oil company stocks than alternative energy company stocks. A higher lack of correlation equates to a greater level of diversification.

The ‘efficient frontier’ represents the range of hypothetical portfolios that offer the maximum return for any given level of risk. Portfolios positioned above the range are unachievable on a consistent basis; portfolios below the efficient frontier range are too risky based on the amount of reward offered and thus inefficient. The goal is to find the point along the efficient frontier which offers the maximum return at the risk level appropriate to an investor’s risk tolerance (see Figure 2).

The portfolio represented by point A in Figure 2 is inefficient because portfolios exist with the same value but less risk (Portfolio B) and portfolios with the same risk but more value (Portfolio C) as well as portfolios with a combination of these two conditions (Red Area). The Efficient Frontier, as originally defined in MPT, is a line that represents the continuum of all efficient portfolios relative to risk and value. (HM Markowitz, 1991)

The Efficient Market Hypothesis is at odds with traditional investment strategies. However, it has been supported by numerous academic studies, both theoretical and empirical. These studies show, among other things, that the risk-adjusted returns achieved by most professional investment managers are no better than those of the market as a whole, and many
times inferior. This is primarily due to expenses and taxes incurred with active management. That's the bad news for active fund managers and investors.

The implications of the Efficient Market Hypothesis are profound for investors. In essence, we should be sceptical of anyone who claims to know how to “beat the market.” One cannot expect to consistently beat the market by picking individual securities or by “timing the market.”

Flaws in the model
The Markowitz paper on portfolio diversification, Sharpe’s Capital Asset Pricing Model (CAPM) and the Modigliani-Miller theorem were groundbreaking works and became the cornerstones of modern corporate finance. Modigliani-Miller was more a debate on the fundamental nature of debt versus equity. But all of them made similar assumptions to develop their model, which are (from WF Sharpe, 1964 and HM Markowitz, 1952):

A. Volatility as a measure of risk
B. Exclusion of correlation of 1.00
C. No transaction costs
D. Liquidity is infinite
E. Investors act rationally
F. Investors as a group look at risk-return relationships over the same time horizon
G. Investors as a group have similar views on how they measure risk
H. All assets can be bought and sold in the market
I. Politics and investor psychology have no effect on the markets

Note that both papers were written during a time of extreme market stability. MPT was written in 1959, Modigliani-Miller’s paper is spread over three articles in 1958, 1961 and 1963 and Sharpe’s paper was published in 1964. All the theories, MPT in particular, have been seen to have their merits in a bull market environment and this explains why they were so brilliant at the time. In the current market environment however the MPT model shows clearly weaknesses. This is best represented by the Dow Jones performance shown at Figure 3.

Figure 3. Dow Jones Index Annual Evolution: Dec 1959 – Dec 2008

Both Markowitz and Sharp needed a proxy for risk and used volatility (in terms of standard deviation or beta) to define it. Consequently the assumption was made that the higher the volatility of an investment, the higher the risk. However, is volatility the right parameter for risk? Neither Markowitz nor Sharp did research on this matter. Probably this assumption was made building further on the Efficient Market Theory which in turn made the assumption that investors are risk-averse and act rationally. This assumption was accepted by the market without challenge.

We suggest that it is viable to argue that investors are more concerned about downside volatility than upward moves. The volatility approach in MPT and Sharpe’s model values both of these equally. But such an approach is flawed in the current market environment. During the 1970s research was done on this matter; however a decade later Markowitz and Sharpe received Nobel Prizes for their work on portfolio theory and CAPM, having never reviewed their assumptions on risk.

We argue that high volatility does not give better results, and nor does lower volatility give poorer results. This thesis is supported by for example Murphy (1977) who stated “realised returns appear to be higher than expected for low risk securities and lower than expected for high risk securities...or that the risk-reward relationship was far weaker than expected. Other important studies have concluded that there is not necessarily any stable relationship between risk and return, and that there often maybe virtually no relationship between return achieved and risk taken.” (JM Murphy, 1977)

Another major problem in the volatility concept is the assumption that it is constant over time. Skewness of the volatility curve is completely ignored in the model although it is not ignored by option market makers. An option trader does not quote the same volatility every day, but rather adjusts prices to take volatility skew into account for in-/out-of-the-money options.

Figure 4 shows the skew of the volatility of a 6-month option of XAU versus USD. One can clearly see that the volatility for Calls compared to Puts is higher and rises for far out-of-the-money options. So the assumption of constant volatility is a fundamental weakness in the orthodox theory.

The major reasons why a volatility curve shows a smile are:

- Supply and demand amongst hedgers and speculators
- Directional view of the market
- Implied volatility usually goes up when the spot price moves
- Exotic options: market makers use OTM options to statically hedge exotic risk which means that they are unwilling to short OTM options

There is also empirical evidence of irrationality. A good example of the current irrational behaviour of investors is the price of certain holding stocks. At the time of writing (January 2009) some of these shares are trading at a lower price than the capitalized amount of cash these holdings have in their accounts. A good example is RH International, trading at a market cap of €311.39m but with over €500m in cash on account at its bankers. More such anomalies can be found in the credit and fixed income market; for example we note the high number of negative basis trade opportunities currently available for financial-sector companies. The credit crisis, which started in the summer of 2007, was triggered by the fall in confidence amongst investors for the US commercial paper (CP) and asset-backed CP (ABCP) markets. According to the academic theory of risk, this should not have been the case, as equities are considered to be a more risky investment than CP. It is outside the scope of this article to consider the irrationality of investors although there is recent literature on this subject. For instance Kahneman (2003) clearly supports the thesis that rational decision taking is often extremely biased due to the restricted resources each individual has available to him.

Other assumptions behind MPT, such as infinite access to liquidity, have clearly been proven to be a misjudgement during the 2007-2008 crisis. On its own this one flawed assumption renders the theory unworkable. Other assumptions on the neutral impact of investor psychology and politics are also flawed given that these two factors do have an effect on the markets.
Empirical evidence

We suggested above that in the current environment investors have not acted rationally. That is, the current anomalies in the stock and fixed income markets, and also the concept of volatility, has given investors some false guidance.

An important element in Markowitz theory is the issue of correlation. In his paper he argues that the risk of a portfolio could be reduced and the expected rate of return increased when assets with dissimilar price movements are combined. Such diversification reduces risk only when assets are combined whose prices move inversely with each other. In other words the lower the correlation the better for the risk-reward profile on the efficient frontier.

If we look at the Credit Suisse Tremont Hedge Fund Index at Figure 5 we see that this is clearly not the case. All the strategies shown (except for dedicated shorts and managed futures) are pure directional plays, like betting in a casino, and anticipate a negative downturn, and so would always perform positive in the current environment. Such strategies cannot be said to represent the application of MPT.

The problem is that MPT and the diversification argument, like so many supposedly good investment ideas, only works in a bull market, when investors pay at least lip-service to “fundamentals” and apply some logic in share valuation (and even then they don’t always; for example, the dot.com crash). In a bear market, or in any period of negative sentiment, all asset prices and markets go down. And in times of crises, as we have observed during 2007-08, correlation between asset classes is practically unity.

It does not matter what industry, country or level of managerial expertise is being considered, all prices go down and all credit spreads widen in a bear market such as the one we have observed now. In this crisis, everyone has lost money: banks, hedge funds, volatility traders, private equity, long-short investors, and traditional long-only fund managers have all registered losses.

More significantly if we look closer at the Credit Suisse Tremont Index we notice that even the “long-short” equity index is down in this period as well, by over 30%. This refutes the claim that they can outperform the market over anything other than the very short-term.

Summary and conclusions

The Markowitz Modern Portfolio Theory clearly had its merits over the last 30-35 years. It was the basis for an investment and banking model that generated significant returns from the 1980s onwards. However in a severe bear market the model has clearly been seen to be flawed, and contributed to the development of a banking business model that suffered large losses. The assumptions on which it is based clearly prove that a paradigm shift in economics needs to take place that modifies or completely replaces MPT.

Portfolio diversification only makes sense if one has the possibility to pick out assets which are uncorrelated. Unfortunately in a severe recessionary environment correlation tends to go to one among every asset class, so this is a non-starter for anything other than a very short term (less than five year) investment horizon.

In this respect the fund management industry will need to restructure its operating model and also review performance fees, since we can see that in a bear market it cannot add value to portfolios. Adding “alpha” to a portfolio in this type of market is a myth. Showing positive returns in a bear market is just a matter of shorting the markets, which is a directional play and has nothing to do with MPT or diversification.
Our suggestion is that the paradigm shift in financial economics should be a reversion to “traditional” markets. Not only does diversifying across asset classes and geographical regions not spread risk, we have seen how in a bear market it amplifies risk. The clear lesson from the crisis is to “know one’s risk,” and that is best served by concentrating on assets and sectors that one is familiar with. Diversifying in the name of the MPT will only erode value.

Our policy recommendations are:

- Restructure the business model to concentrate assets and regions for which one has genuine understanding and expertise;
- Secure liquidity to allow for times of market corrections and illiquidity. To this end we further recommend ensuring a maximum of only 20% of funding requirement in less than the one-month maturity, and avoiding over-leveraging on the capital base over fifteen times.

A paradigm shift that results in a greater concentration on familiarity and an acceptance of lower average returns will do much to prevent large-scale losses at the time of the next market correction.

References

HM Markowitz “Portfolio Selection” Journal of Finance 77-91, 1952

1. To quote: “With well-functioning markets (and neutral taxes) and rational investors, who can ‘undo’ the corporate financial structure by holding positive or negative amounts of debt, the market value of the firm – debt plus equity – depends only on the income stream generated by its assets. It follows, in particular, that the value of the firm should not be affected by the share of debt in its financial structure or by what will be done with the returns – paid out as dividends or reinvested (profitably)?”, Modigliani and Miller (1958).

2. An investor who held only risk-free sovereign securities such as Treasuries, Gilts and Bunds would not have lost money. But if this was done for risk-averse reasons then it is not actually a “strategy” as such, merely the basic risk-free option. If it was done as a directional play on interest rates, again this is not a value-added fund management strategy but rather the tactics of the casino. Either way, the fact that investors in risk-free sovereign securities made money reinforces our argument.