Introduction to chapter 4

Chapters 1 and 2 provided an overview of the development of rational/traditional finance theory as well as the assumptions about the motivation, preferences and decision-making behavioral patterns of market participants.

In contrast with chapter 1 and 2, chapter 3 introduced Behavioural Finance with its understanding of how financial markets function based on its assumptions that translates into prospect theory, framing and mental accounting.

Chapter 4 introduces the second fundamental element of rational finance theory, namely efficient markets. The classical statement about efficient markets was provided by Fama in 1970, when he said that the primary role of the capital market is the allocation of ownership of capital, and that in order to achieve that, prices should be accurate signals for resource allocation. A market in which firms can make production-investment decisions, and investors can choose among securities that represent ownership of firms' activities under the assumption that security prices "fully reflect" all available information, is an efficient market. Three common forms to state the efficient-market hypothesis are weak-form, semi-strong-form and strong-form efficiency; each expressing a different degree of efficiency in terms of prices reflecting available information.

It is important to note that the hypothesis does not require each and every decision-maker to be rational. It allows that, when faced with new information, some investors may over-react and some may under-react. What is required though is that investors' reactions are random and follow a normal distribution pattern, so that the net effect on market prices cannot be reliably exploited to make an abnormal profit. Thus, any one person can be wrong about the market but the market as a whole is always right. The implication is that individual market participants could not beat the market through intelligent guessing. This can also be formulated as "the market knows best". What efficient markets therefore accomplish is a better assessment of what an asset is worth,

better than any individual investor can. A further implication is that efficient markets do not allow investors to earn above-average returns without taking above-average risks (Malkiel, 2005:27).

The efficient market hypothesis

Core of the hypothesis

Against this background it can be stated that the logic of rational finance theory forms a basis for all subsequent theorizing, which was and remains of great importance.

The efficient market hypothesis (or EMH) states that price changes of individual securities are independent, i.e. do not influence each other. Most simply, the theory implies that stock price changes have no memory – the past history cannot be used to predict the future in any meaningful way. The unpredictability of prices on stock markets led to the well known expression that these price changes happen as a "random walk"[1]. The randomness and unpredictability are seen to come about because of the efficiency of markets. Fama described it as follows:

> "… [I]n an efficient market at any point in time the actual price of a security will be a good estimate of its intrinsic value. In an uncertain world the intrinsic value of a security can never be determined exactly; however, the actions of the many competing participants should cause the actual price of a security to wander randomly about its intrinsic value. If the discrepancies between actual prices and intrinsic values are systematic rather than random in nature, then knowledge of this should help intelligent market participants to better predict the path by which actual prices will move towards intrinsic values. When the many intelligent traders attempt to take advantage of this knowledge, however, they will tend to neutralize such systematic behavior in price series. Although uncertainty concerning intrinsic values will remain, actual prices of securities will wander randomly about their intrinsic values." (Fama 1965: 41)

In his original formalization of the random walk hypothesis, Samuelson (1965) argues that randomness in financial market price changes is achieved through the active

[1] The term "random walk" to describe what stock price patterns amount to, was popularized by Burton Malkiel's 1973 book, 'A Random Walk Down Wall Street'. In their book "A non-random walk down Wall Street", Andrew Lo and Craig MacKinlay (2002) argue that the idea is not all that new and was already conceived in the sixteenth century, but the first serious application of the hypothesis to financial markets can be traced to Paul Samuelson (1965).

participation of many investors seeking greater wealth. Unable to curtail their greed, an army of investors aggressively pounce on even the smallest bit of information advantage at their disposal. In doing so they incorporate all information into market prices quickly, and thereby eliminate the profit opportunity that has given rise to their aggression. This is the essence of an arbitrage-driven financial market.

Although it is conceded by supporters of the random walk hypothesis that it does not provide an exact description of the behavior of stock market prices, they view the model as by and large acceptable in terms of its practical applications. This acceptability is predicated on the often demonstrated evidence that even the smartest investors cannot beat the markets consistently. Under the hypothesis, therefore, no investor should ever be able to beat the market, or do better than the average annual returns of all intelligent investors put together. There are, however, many examples of investors who do consistently beat the market; Warren Buffett arguably the best-known.

Unease about the hypothesis

Already by the late 1960s the elegant logic of the hypothesis was critically challenged by contradictory evidence from the real world of financial investment decisions. Evidence was accumulating that stock prices are not random by the strictest definition of that term, because some elements of predictability could be detected, particularly in long-term returns.

Empirical evidence had been mounting ever since, and currently consists of an enormous body of work. For instance, literature documenting the predictability of stock returns from past information includes:

- lagged returns: Fama and French (1998a), Poterba and Summers (1988),
- the dividend-to-price ratio: Campbell and Shiller (1988a), Fama and French (1988), Hodrick (1992),
- the earnings-to-price ratio: Campbell and Shiller (1988b),
- the book-to-market ratio: Lewellen (1999),

- the dividend payout ratio: Lamont (1988),
- the share of equity in new finance: Nelson (1999), Baker and Wurgler (2000),
- yield spreads between long-term and short-term interest rates and between low- and high-quality bond yields: Campbell (1987), Fama and French (1988), Keim and Stambaugh (1986),
- recent changes in short-term interest rates: Campbell (1987), Hodrick (1992),
- the level of consumption relative to income and wealth: Lettau and Ludvigson (1999a),
- stages of the business cycle and the predictability of counter-cyclical variation in stock returns: Fama and French (1988), Lettau and Ludvigson (1999b).

Main responses from supporters of the theory

The key response from the supporters of the EMH on the issue of whether publicly available information could be used successfully to predict stock prices, was to rephrase the question of whether the observed departures from randomness of returns were true profit opportunities, after transaction costs and risk adjustment. Paul Samuelson (1965), the first person to apply the random walk hypothesis in a meaningful manner to financial markets, did not account for risk at all. However, Malkiel's well-known book, "*Random walk down Wall Street"* (1973), was published well after Harry Markowitz (1952) introduced the idea that extra risk deserved to be compensated by extra return. And so, with the shift in focus from returns to cost and risk-adjusted returns, the efficient markets debate did not remain a matter of statistics, but became one of economics. This association with economics (and the unflinching defense of its central tenets) helps to explain why the EMH in finance remains influential, despite the steady drumbeat of empirical studies directed against it.

Grossman (1976) and Grossman and Stiglitz (1980) went further by arguing that perfectly efficient markets are an impossibility; for if markets were perfectly efficient, the return to gathering information would be nil, in which case there would be little reason to trade, and markets would eventually collapse. Boiled down to its essence, the

argument is that if all information were already contained in prices and investors were fully rational, then not only could one not profit from using one's own information; indeed, there might not be any trade at all. Alternatively, the degree of market inefficiency determines the effort investors are willing to expend to gather and trade on information. Hence a non-degenerate market equilibrium will arise only when there are sufficient profit opportunities (i.e. inefficiencies) to compensate investors for the costs of trading and information-gathering. However, above-normal profits, wherever they are found, inevitably carry with them the seeds of their own decay. As long as arbitrage is not compromised — so the argument goes — what does it matter if share price returns are somewhat predictable?

Despite these rescue attempts, the theoretical conundrum was not finally settled. Although the EMH remains one of the more resilient empirical propositions in finance theory — in spite of Robert Shiller's critique (1981b) — it still lacks a sufficiently sound theoretical grounding.

Problems with CAPM

From an academic viewpoint, one of the predominant limitations of CAPM is that it is impossible to test the model's validity because the "market portfolio" cannot be defined. This limitation was pointed out by various authors, including Fama, who admitted that in the efficient market approach the theory only has empirical content within the context of a specific model of market equilibrium, that is, within a model that specifies the nature of market equilibrium when prices fully reflect available information (1970:413)[2].

A pointed criticism of CAPM came from Roll (1977, 1978), who analyzed this problematic aspect of rational financial markets. Roll pointed out that applying a mean-variance analysis amounts to a tautology, because any mean-variance portfolio which has to satisfy the CAPM equation and the market portfolio (which is necessary to apply the formula) is unobservable, because it would be necessary to include every single

[2] In a later publication Fama made the even stronger statement that "…market efficiency *per se* is not testable. It must be tested jointly with some model of equilibrium, an asset-pricing model" (Fama, 1991:1576).

possible available asset — including real estate, precious metals, stamp collections, jewelry, and anything with any value. The problem is that returns on all possible investments opportunities are unobservable.

Consequently, testing for market efficiency (which is what models such as CAPM aspire to achieve) always involves tests of models that are chosen to represent efficient markets — clearly not an objective testing procedure. For example, the beta technique of risk-adjusted performance requires the matching of portfolio return against some benchmark that "represents" the market return. Traditionally, market indices such as the S&P 500 are used for this purpose.

Despite this challenge to the inherent logic of CAPM, adherence to it was not substantially shaken on theoretical grounds. What was more troubling was the ever-increasing evidence that its predictions could not stand up to empirical scrutiny. Some of the most controversial results initially came from research by Basu (1977). By reporting that certain stocks (value stocks) outperformed the market even after accounting for risk, he presented his findings as a direct challenge to the foundation of CAPM, viz. the efficient market hypothesis itself. Ball (1977) agreed that contradictions in terms of the efficiency of financial markets (anomalous findings about earnings versus stock prices) clearly required some revision. He did not regard the efficient market hypothesis itself in need of revision, but rather the model of risk and return which CAPM was based on. He suggested that it had to be acceded that beta was not the only risk that mattered. This response was followed later in the expansion of CAPM into a multi-factor model.

A further compelling challenge to CAPM was made in the early 1980s by Banz (1981), who suggested that "smallness" (i.e. company size) had to be added as a risk factor. This flowed from an analysis using fifty-three years' worth of New York Stock Exchange data which showed that small-capitalization stocks consistently outperformed large ones – implying higher average returns than could be explained by CAPM. In defense of CAPM, Banz argued that investors had to be compensated for the estimation risk

involved in buying small company stock, because less information was available about them.

Yet another important contribution to the burgeoning body of evidence viz-a-viz the reliability of predictions based on CAPM, came from Shiller (1981b). In a mixture of support for and rejection of rational financial markets, Shiller focused closely on volatility in various financial markets – interpreted as the continuous changing of people's minds about uncertain future events. What this revealed, Shiller reported, were such substantial swings in security prices relative to the changes in underlying fundamentals, that he could find "no evidence of market behavior in accordance with the hypothesis of an efficient market." (Bernstein, 2007:69).

Arguably the most telling finding with regard to how well CAPM stood up to empirical evidence, came from a remarkable landmark study by Fama and French (1992). In Fama's earlier seminal contributions to CAPM, he had maintained that — according to the model — it was beta that determined how well stocks would perform over time. It was a simple trade-off between risk and reward. In their 1992 study, however, Fama and French confronted head-on the accumulating evidence against the combination of efficient markets and CAPM. Examining market data from 1941 through to 1990, they found that beta (or more precisely, beta alone) could no longer suffice as an explanation for what was actually happening. They conceded: "We are forced to conclude that the SLB model [CAPM] does not describe the last fifty years of average stock returns." (Fama and French, 1992:464)

While beta, in Fama and French's view, remained important as a risk factor, the superior performance of certain stocks (especially value stocks) could simply not be explained in terms of risk. The findings of Fama and French (and others mentioned above) have since given rise to both increasingly sophisticated defenses of CAPM, and the growth of the current major alternative framework in finance, viz. behavioral finance. The defense of CAPM will be discussed below, and behavioral finance will form the topic of the next chapter.

Anomalies and CAPM

Collectively, the incongruence (or conflict) between CAPM – as well as its foundation, the efficient market hypothesis – and the variety of empirical findings about asset prices in actual financial markets, is described in the literature as anomalies. Anomalies can be defined as "a documented pattern of price behavior that is inconsistent with the predictions of traditional efficient markets, rational expectations asset pricing theory" (Brav and Heaton, 2002:575). Before focusing on the very persistent and consequential anomaly called the "value premium", a brief discussion is provided of the larger collection of financial market anomalies.

Some recognized anomalies in financial markets

Logically speaking, anomalies can only be defined relative to what could be viewed as "normal returns" in a market. Fama (1970) had already noted this fact early on, by admitting that the idea of market efficiency was also implicitly tested whenever a hypothesis about expected asset returns in equilibrium were investigated. A finding that seems to indicate market inefficiency may therefore also serve as evidence that the underlying asset-pricing model is inadequate (Schwert, in Constantanides, 2003:940).

A useful overview and discussion of the most notable anomalies is provided in a paper by Malkiel (2003). He traced the following main categories:

(1) Short term momentum effects: Lo and MacKinlay (2000) found that serial correlations are not zero, and these findings led them to reject the random walk hypothesis. Jegadeesh and Titman (1993) showed that stocks which performed the best (worst) over a three to twelve month period tended to continue to perform well (poorly) over the subsequent three to twelve months. With most other anomalies, it seemed as if the higher returns disappeared or at least weakened once information of it became generally known. However, despite the popularity of the momentum strategy in the investment community and its visibility in the academic community, there is no evidence that the validity of short-term momentum effect is disappearing (Jegadeesh and Titman, 1993).

(2) Long term return reversals: A considerable body of evidence exists for negative serial correlations over longer holding periods (i.e. one to three years), meaning that winners (losers) over a one to three year period tend to be losers (winners) in the subsequent one to three year period (see. Fama and French,1988b; Poterba and Summers,1988).

(3) Seasonal and day-of-the-week patterns: The "January effect" indicates unusually high returns during the first two weeks of every year (Keim, 1983; Haugen and Lakonishok, 1987). Higher returns are also recorded on Mondays (French, 1980) and around the turn of the month (Lakonishok and Schmidt, 1988), but these patterns are not dependable if various periods are compared with one another.

(4) Initial valuation parameters: This deals with the possibility that valuation ratios may have substantial predictive power.

- Predicting on the basis of dividend yields: Fama and French (1988) and Campbell and Shiller (1988a) found that as much as 40% of the variance of future returns for the US stock market as a whole could be predicted on this basis.
- Predicting on the basis of P/E multiples: Campbell and Shiller (1988b) also found that initial P/E ratios could explain a significant percentage of the variance of future stock price returns.

(5) Value stocks versus growth stocks: Value stocks are defined in various studies as those whose market price is relatively low in relation to earnings per share (Basu, 1977), cash flow per share (Lakonishok, Shleifer and Vishny, 1994), book value per share (Fama and French, 1992), and dividends per share (Blume, 1980; Rozeff, 1984). In comparison, growth stocks have been defined as having relatively high prices in relation to those same fundamental factors. Findings of this kind date back to Graham

and Dodd (1934), who expounded on this in their classic early book on security analysis.

Bauman, Conover and Miller (1998:88) concluded that "…based on several different measures used to define value stocks and growth stocks in twenty-one international stock markets, with observations of more than 28,000 annual stock returns, value stocks generally outperformed growth stocks on a total-return and a risk-adjusted basis, in the ten-year period from 1986 to 1996". Chan and Lakonishok (2004:71) came to the same conclusion, but were more emphatic: "…based on the accumulated weight of the evidence, the academic community has generally come to agree that value investment strategies, on average, outperform growth investment strategies".

Of all the anomalies that had been identified, the value premium (superior returns on value compared to growth stocks) is the most notable, because no convincing explanation for it has so far been provided from within the traditional neo-classical framework (Cochrane, 1999). While some progress has been made to address the other anomalies in a way that keeps the assumptions and basic logic of the traditional finance framework intact, the answer to the question: "What explains the value premium?" is still to be provided (Fama and French, 2008).

Various explanations for the persistence of the value premium have been suggested by CAPM and rational finance supporters — essentially rebuttals of any idea that markets are not efficient.

Main responses from supporters of CAPM

The general response from adherents to CAPM, and the underlying EMH, is that many of the well-known anomalies do not hold up in different sample periods. This led them to argue that anomalies are more apparent than real, and even if the anomalies existed in the sample period in which they were first identified, the activities of practitioners who implement strategies to take advantage of anomalous behavior, would cause the anomalies to disappear (Schwert, 2003), or to "self-destruct", as Malkiel (2003:22) put it.

So, the logical conclusion is that one should be cautious not to overemphasize these anomalies.

More systematically, supporters of the CAPM argued that there are two potential explanations for the value anomaly:

- The most conservative interpretation is that the anomaly is nothing more than the result of “data snooping”;
- Over-dependence on a single factor (beta) in standard CAPM. This led to expanding the CAPM model into a three-factor model. The three-factor model incorporates size and book-value-to-market-value (BV/MV) together with beta.

Each of the three explanations will now be examined in more detail.

Data snooping

This possibility was first raised by Kothari, Shanken and Sloan (1995) who suggested a selection bias in the construction of value portfolios because the same data basis (most often COMPUSTAT) was used for testing the same anomaly over the same period (1963 to 1990). If it could be proven that the value premium is nothing more than an over-mining of COMPUSTAT data sources, it would mean the rational finance theory framework would not be fundamentally challenged at all.

COMPUSTAT data suffer from at least four shortcomings:

1. The first problematic issue with the data is its survival bias. When a company stops trading, its records are removed from the COMPUSTAT databank. Kothari, Shanken and Sloan (1995) argued that the Fama and French (1992) portfolios were based on COMPUSTAT data, and only included companies that had survived — a feature that created bias in the sample because it included a pre-selected group only.

2. The second problem with COMPUSTAT data is a look-ahead bias, as identified by Banz and Breen (1986). This bias occurs where a study assumes that information was available to investors at a specific point in time when, in fact, that information was not publicly available at the time. For example, it is not always appropriate to assume that a firm's financial statements for the period closing December 31st are available to the public by the following March.

3. A third problem is "data snooping proper" (Lo and MacKinlay, 1990), which refers to new research that studies the return patterns of value companies with data in which certain patterns had already been documented. The "new" findings may be valid within the test set, but the results have no statistical significance in the wider population.

4. The fourth limitation of COMPUSTAT data is that it has been available only since 1963.

To test if the value premium can be explained through unmethodical research design, Davis (1994) formed BV/MV (value) portfolios from Moody's Industrial Manuals published between 1940 and 1962 — i.e. before the COMPUSTAT era, which started in 1963. Moody's Manuals are free from survival bias, as companies that stopped trading cannot be removed from the hard copy manuals. Davis (1994) tested data between 1950 and 1963 (as opposed to the 1963 to 1992 sample period that Fama and French used) and came up with a BV/MV effect similar in magnitude to that found by Fama and French. This finding was supported by Cohen and Polk (1995), who also constructed portfolios in a way that completely eliminated the COMPUSTAT selection bias and still proved the existence of the value premium.

The research of Chan, Jegadeesh and Lakonishok (1995) supported the findings of Davis (1994) and that of Cohen and Polk (1995), by showing that the selection biases are not large. They found that the primary reasons for delisting from the COMPUSTAT database are unrelated to financial distress but rather due to mergers and non-standard accounting information, listed closed-end investment funds, and so forth. Their

investigation revealed that only 3.1% of the company-year in the “Centre for Research into Security Prices” (CRSP) sample — the most respected source for security research — is omitted from the COMPUSTAT tapes because of financial distress.

All of the above puts methodological biases as explanation for the persistence of the value premium to bed, and leaves distress factors as potential explanation.

Multi-factor CAPM

In order to keep it alive, supporters of CAPM had to identify the factors that allow investments to earn returns not explained by the beta factor. It subsequently had to be admitted — as Fama and French (1992) did — that a single risk factor (namely beta) is not enough to describe the cross-section of expected returns. A model with more factors than beta had to be advanced as a more plausible treatment of the data than the single factor CAPM.

The expansion of the basic CAPM into a multi-factor model was the obvious thing to do. Fama and French (1992, 1993) incorporated size and book-to-market value as two additional risk factors into the standard CAPM to measure abnormal performance, as follows:

$$(R_{it} - R_{ft}) = \alpha_i + \beta_i (R_{mt} - R_{ft}) + s_i SMB_t + h_i HML_t + \varepsilon_{it}$$

In the formula above, SMB represents the difference between the returns to portfolios of small- and large-capitalization firms, with the BV/MV ratios for these stocks remaining constant; and HML represents the difference between the returns to portfolios of high and low BV/MV ratio firms, with the capitalization for these stocks staying constant. This formula suggests that the regression coefficients s_i and h_i represent exposures to size and value risk in much the same way that β_i measures the exposure to market risk.

Fama and French (1993) used their three-factor model to explore several of the anomalies identified in earlier literature, where the test of abnormal returns is based on

whether $\alpha_i = 0$ in the formula above. They found that explanations of abnormal returns from the three-factor model are not reliably different from zero for portfolios of stocks sorted by size, BV/MV ratios, dividend yield, or earnings-to-price ratios.

Even though the three-factor model is now widely accepted, it is still not clear if it provides a satisfactory explanation for the value premium. Also lurking in the background is the more fundamental question of whether all the findings and studies mentioned come down to the following question: Is existing empirical evidence convincing enough to overturn the cherished view that markets are efficient, or could the traditional viewpoint on market efficiency be saved by "tinkering" with models built on it?

Conclusion

In their study, Lakonishok, Shleifer and Vishny (1994) warned against the "metaphysical" approach to risk, in which higher average returns on an investment strategy, such as value investing, are taken necessarily to reflect some source of risk. Testing the role of risk by employing traditional measures such as beta and volatility, they came to the conclusion that risk does not explain the difference in return between value and growth investment strategies.

The response from the supporters of the rational finance approach to the mounting contrary evidence remains essentially simple: they argue that arbitrage is still functioning, and whenever above normal profits are found, investors will incorporate that knowledge in an arbitrage-driven market, so that any excess profit opportunity will disappear quickly. The suggestion is that the anomalies may simply have been overlooked by a large fraction of improperly informed market participants who helped sustain the appearance of anomaly for a while, but – so the argument continues – once large numbers of investors have included value stocks in their portfolio, the value premium will disappear. Above-normal profits, wherever they are found, inevitably carry with them the seeds of their own decay. This is essentially the rational finance defense put forward by Schwert (2003). He provides evidence that many trading strategies

which generated abnormal returns in earlier periods (such as the January effect) were unprofitable in the past decade.

Against the arguments and data presented in this chapter, the conclusion cannot be avoided that substantial and practically consequential anomalies have come to the fore and persist in financial markets – anomalies that cannot be explained within the framework of the conventional and dominant paradigm of rational finance theory. The most telling of these anomalies, with high relevance for investment decision-making, is the value premium.

A further conclusion about the value premium is that the cornerstone of rational finance theory's explanation for different returns on different kinds of investment choice — viz. the level and kind of risk involved – does not provide a sufficient explanation of the value premium anomaly.

The question arises whether the impasse in which rational finance theory and its practical application find itself, can be disposed of by invoking the classic instrumentalist position regarding economic methodology provided by Milton Friedman (1953). For Friedman, an instrumentalist, hypotheses are chosen because they are successful in yielding useful predictions. In other words, hypotheses and theories are viewed as instruments for successful predictions. Concentrating on successful predictions obviates any further consideration of either the realism of theoretical assumptions or the "truthfulness" of theories.

According to Friedman, false assumptions might be applied as a convincing explanation of an observed phenomenon. He argues that as long as the observed phenomenon can be considered a logical conclusion from the argument containing the false assumption, the use of that assumption is acceptable. In particular, if we are trying to explain the effect of the assumed behavior of individuals, so long as the effect is observed and it would be the effect if they were to behave as we assume, then we can use our assumption even when the assumption is false.

The crux of the usefulness for Friedman's position lies with successful application (or testing) of a theory in predicting outcomes. His position allows a theory so long as it is sufficient for the successful predictions at issue.

Applying Friedman's instrumentalist logic to defend the conundrums in rational finance theory could therefore mean that criticism of the realism of its assumptions, or the completeness of the theoretical construct, is irrelevant. The issue is whether rational finance can predict outcomes such as the value premium in financial markets. Given the demonstrated (though contested) inability of mainstream thinking to predict this major anomaly within its framework, it must be concluded that rational finance theory does not convincingly, or fully, meet the instrumentalist criterion for a useful theory. This result forces attention to return again to the assumptions of finance theory, in order to find models that are not in persistent and intrinsic conflict with empirical findings. The rise of behavioral finance is currently the obvious outcome of this need for a re-examination.

Even a supporter of the core underlying ideas of efficient markets such as Malkiel (2003:4) had to acknowledge that:

> "By the start of the twenty-first century, the intellectual dominance of the efficient market hypothesis had become far less universal. Many financial economists and statisticians began to believe that stock prices are at least partially predictable. A new breed of economist emphasized psychological and behavioral elements of stock-price determination, and came to believe that future stock prices are somewhat predictable on the basis of past stock price patterns as well as certain "fundamental" valuation metrics. Moreover, many of these economists were even making the far more controversial claim that these predictable patterns enable investors to earn excess risk-adjusted rates of return".

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