The Value Premium: Systematic Risk due to Costly Reversibility, Errors in Expectation, or Lack of Recognition?

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ABSTRACT

Recent theoretical research in finance argues that the value premium is due to a systematic risk factor attributable to costly reversibility. In testing the costly reversibility hypotheses, the study recognises that there are a number of other possible explanations that need to be controlled for. Behavioural finance literature suggests that the value premium may be driven by errors in expectation about future earnings performance. An additional identified risk factor that is priced in the market is investor recognition, and since firms with capital investments that are difficult to reverse may be difficult to analyse, this may in itself contribute to the observed value premium. Empirical proxies for each of these explanations are likely to be correlated in the cross-section. The objective of this study is to jointly examine each of the explanations to determine the incremental economic significance of each theory.

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Section I: Introduction

It is well documented that value stocks realise a premium. Fama and French (1992) find an association between the fundamental firm characteristics of size and book-to-market ratio and stock returns, which appears to be inconsistent with the standard capital asset pricing model (CAPM). Specifically, they found that the average return of the highest book-to-market ratio decile (containing the “value” stocks) was 1.53% per month higher than the average return on the lowest book-to-market ratio decile (the “growth” or “glamour” stocks), a difference much greater than could be explained through variation in beta between the two portfolios. This statistical relationship has proved difficult to rationalise, and the precise economic source of this anomaly remains a subject of ongoing debate. At the centre of the dispute is whether the book-to-market ratio proxies for a nondiversifiable risk factor, or whether security mispricing drives the value premium.

Under rational expectations, intuition would suggest that growth options hinge upon future economic conditions, and consequently must be riskier than assets in place. Indeed, Gomes, Kogan, and Zhang (2003) predict that growth options will always be riskier than assets in place, as these options are “leveraged” on existing assets. Growth stocks (which derive market values principally from growth options) must be riskier than value stocks (which derive market values principally from assets in place). This suggests growth stocks should realise higher expected returns than value stocks, but the empirical evidence stands in sharp contrast to this prediction.

Recently, a number of finance scholars have developed theoretical models which explain the value premium as being due to systematic risk associated with irreversibility of investment. Zhang (2005) demonstrates that contrary to the predictions of Gomes, Kogan, and Zhang (2003), assets in place are much riskier than growth options, particularly in economic downturns when the price of risk is high, thereby reconciling why value stocks have historically earned excess returns over growth stocks. His explanation is built upon costly reversibility where firms face higher costs in reducing than in increasing capital, and the countercyclical price of risk which propagates this asymmetrical condition under optimal capital investment. Cooper (2006) extends this asset-pricing theory of nonconvex adjustment costs and irreversibility of investment by deriving a real options model that accounts for the value premium. The central prediction of both these models is that those firms for which investment is largely irreversible have a greater level of systematic risk resulting in higher expected returns.

A difficulty with testing these theories is that there is no readily available publicly disclosed information on the extent to which firms have fixed investments which are costly to reverse. But recent developments in accounting literature have provided a simple method to determine an ex-ante measure of firm-specific costly reversibility. Specifically, papers by Anderson, Banker, and Janakiraman (2003) and Banker and Chen (2006) develop empirical models to attribute the costs of a firm into fixed and variable components, and the extent to which they are sticky (i.e. irreversible). The primary contribution of this paper is to use these empirical models to develop proxies for “costly reversibility” in order to test the theoretical predictions of Zhang (2005) and Cooper (2006).
A further contribution is to recognise and develop hypotheses for two alternate explanations of the value premium: errors in expectation and investor recognition. Firms which receive limited attention are likely to lead to errors in the expectations of investors, and since value firms are more likely to suffer from limited attention, a large asymmetrical positive price response to positive earnings surprises would result. Alternatively, the investor recognition hypothesis suggests that those firms which are more complex to analyse are less likely to be followed, and subsequently earn excess returns when earnings are announced, providing another potential explanation of the empirically observed excess returns to value stocks. This study recognises that in testing the asset-pricing implications of irreversibility of investment, it is necessary to control for these alternate explanations which may be correlated with irreversibility of investment. The outline for the rest of this proposal is as follows. The hypotheses are developed in Section II and the empirical methods are set out in Section III.

Section II: Hypothesis Development

This section develops a number of hypotheses for the source of the observed value premium. While the primary focus of this proposal is on costly reversibility, it is also recognised that a number of economically significant alternate explanations must be considered in conjunction with testing the source of the value premium.

Fama and French (1992, 1995) interpret the book-to-market ratio as a proxy for a state variable associated with relative financial distress. As value stocks are typically in distress, adverse economic conditions will result in these stocks doing particularly poorly, and as such are risky. They argue that in a weakening economy, investors will require a higher risk premium on firms with distress characteristics, since distressed stocks perform poorly just when the investor least wants to hold a poorly performing stock: thus value stocks must offer a higher average return to reward the investor for bearing additional systematic risk. The observed higher returns produced by value stocks are therefore argued to be justified, being compensation for the risk borne by those who invest in value stocks.

Costly reversibility extends this systematic risk argument by suggesting that the dividends and returns of value stocks exhibit a greater covariance with economic downturns since, in a recessionary cycle, value firms are burdened with excess unproductive capital which they find more difficult to offload than growth firms do. On the other hand, in boom times when growth firms seek to invest more to take advantage of the favourable market conditions, they face higher adjustment costs, while the value firms previously unproductive capital now becomes productive, and hence have a lower urgency for expansionary capital. But since expanding capital is relatively easy, the dividends and returns of growth firms do not covary much with economic expansions. The overall net effect is a high dispersion of risk between value and growth firms in bad times, and a low (or even negative) dispersion of risk in good times. Under rational expectations, the value premium is given by the risk dispersion between value and growth firms multiplied by the price of risk. Zhang (2005) further finds that due to the countercyclical price of risk, discount rates are higher in economic downturns suggesting that value firms would want to disinvest even more. Thus, this asymmetrical risk effect would be further propagated, resulting in the high average value premium empirically observed. At
the centre of this theory is that those firms with investments that are costly to reverse will command a risk premium, leading to the first hypothesis:

**H1:** The value premium is associated with positive returns due to costly reversibility.

Lakonishok, Shleifer, and Vishny (1994) provide evidence that value strategies yield higher returns not because value stocks are fundamentally riskier, but because these strategies exploit the suboptimal behaviour of the typical investor. This alternative explanation for the economic source of the value premium has since been extensively dealt with in behavioural finance literature under different assumptions of investor behaviour (see for example Barberis, Schleifer and Vishny, 1998; Hong and Stein, 1999; Lee and Swaminathan, 1999; Hirshleifer, 2001; Daniel, Hirshleifer and Subrahmanyam, 2002; Barber and Odean, 2006). Generally, it is argued that because some investors tend to overreact to good or bad news, prices adjust by more than is justified by fundamentals and unpopular value stocks that have performed poorly are oversold and become under-priced. This mispricing is corrected at some point in the future when a switch in investor sentiment causes the prices of these stocks to revert to their fundamental values. Barber and Odean (2006) demonstrate that individual investors are net buyers of attention-grabbing stocks (described as those stocks that are in the news, experiencing abnormal trading volume, or with extreme one day returns). In addition, they find that those stocks bought by individual investors on high-attention days tend to subsequently underperform stocks sold by those investors. Fundamental to this finding is a “limited attention” behavioural bias, which can operate through a number of avenues to give rise to errors in expectations with regard to estimating the future earnings of value firms. Overreaction to bad news, for example, suggests that investors might not investigate the unused capacity of value firms, and this under-estimation will ultimately lead to positive returns when good news is announced. Similarly, an overreaction to good news announced by growth firms that are attention-grabbing stocks will lead to lower expected returns driven by market overreaction. This leads to the hypothesis:

**H2:** The value premium is associated with positive returns due to errors in expectations.

Merton (1987) developed an asset pricing model to explain the apparent pricing anomaly where neglected stocks earn a return premium over recognized stocks. His key assumption was that investors only recognize a subset of available securities, and that these subsets will differ across investors: thus some stocks are known only to a few investors. Since investors in these stocks must hold undiversified portfolios, they will require a return premium for bearing idiosyncratic risk. A primary implication of this is that the value of the security will increase as more investors know about it, and that the expected return will decrease as the numbers of investors know about it. Merton referred to his model as a model of capital market equilibrium with incomplete information, subsequently called the “investor recognition hypothesis”.

It has been shown that not only do analysts tend to follow relatively large and listed firms with more liquid trading (Matsumoto, 2001), but also it has been well documented that analyst following is negatively correlated with information asymmetry, since either analysts
act to reduce the level of information asymmetry, or they extend their coverage to more transparent firms (Chang, Dasgupta and Hilary, 2006). It follows that less covered firms will be more consistently misvalued, but even if analysts played no role in reducing information asymmetry, they are attracted to more transparent firms: a result that is not immediately obvious. While opaque firms are presumably more difficult and costlier to follow, one would expect the demand for coverage to also be greater since the benefit from coverage would be higher. Despite this, the empirical literature consistently finds that analysts follow firms that are easier to understand. This is supported by Bhushan (1989) who reports that more complex firms (as measured by the number of business segments in a firm) suffer from lower analyst coverage, and Francis and Soffer (1997) who show that firms that make corporate presentations to analysts enjoy greater analyst coverage. Lehavy and Sloan (2006) use an extension of the Merton (1987) model to demonstrate that investor recognition is an important determinant of stock returns. In this study, it is predicted that value stocks tend to be more difficult to analyse and are therefore neglected by analysts leading to a lack of recognition. This leads to the following hypothesis:

\[ H3: \text{The value premium is associated with positive returns due to a lack of investor recognition.} \]

Section III: Empirical Model

This section sets out the empirical model to jointly test the asset-pricing implications of costly reversibility (H1), errors in expectations (H2), and investor recognition (H3). While the central focus of this paper is to use proxies for cost stickiness in order to test the costly reversibility predictions of Zhang (2005) and Cooper (2006), it is necessary to control for the alternate explanations of the source of the value premium which could be correlated with irreversibility of investment.

The empirical model to jointly test the asset-pricing implications of costly reversibility, errors in expectation, and investor recognition is derived as follows. Beginning with the Fama-French (1993) three-factor model to capture the security returns, a momentum factor UMD (or up minus down) is incorporated into the model. The proxies developed above for the competing underlying causes of the value premium are then included to yield the following equation:

\[
R_{it} - \alpha = \beta_1 \text{Costly Reversibility} + \beta_2 \text{Errors in Expectation} + \beta_3 \text{Recognition} + \beta_4 \text{SMB} + \beta_5 (R_m - R_f) + \beta_6 \text{UMD} + \beta_7 \text{HML} + \epsilon_{it}
\]

(1)

Where:

- \( R_{it} \): The return on stock \( i \) in month \( t \)
- Costly Reversibility: The proxy for the costly reversibility of the stock
- Errors in Expectation: The proxy for the errors in expectation for the stock
- Recognition: The proxy for the level of investor recognition for the stock
- SMB: The Fama-French Factor to take account of the size effect

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UMD  The Fama-French Factor to take account of the momentum effect
R_m-r_f  The Fama-French Factor to take account of market return (as per the CAPM)
i and t  Denote firm i and month t respectively. Subscripts are present on all variables, however they are removed here to increase ease and elegance of expression.

In order to test this model, proxies need to be developed for costly reversibility, errors in expectations, and investor recognition, the process of which is follows:

**Costly Reversibility**
Costly reversibility is tested using an application of the sticky cost hypothesis of Anderson, Banker, and Janakiraman (2003) and Banker and Chen (2006). Based on their empirical models, costs are decomposed into fixed and variable components, from which the extent to which they are sticky (and hence irreversible) can be determined. The proxy for cost stickiness in this paper will be based on employee costs for a number of reasons. Firstly, all firms have employees which allows for a broad cross-section of firms to be included in the sample, while being a key factor of production in its own right. Secondly, investment in employees is a significant cost, and the law of diminishing returns suggests that this cost will be subject to inefficiencies. Consequently, this will likely be one of the first costs to be cut. Finally, Pindyck (1988) suggests that relative to capital expenditure, investments in employees are liquid and reversible, which allows a continuum of disinvestment to be observed.

Specifically, the test for sticky cost behaviour involves the comparison of the variation in the number of employees with sales revenue in periods when revenue increases with the variation in the number of employees with sales revenue in periods when revenue decreases. The asymmetric response in costs to volume increases and decreases occurs where firm managers face two choices. They can choose to maintain committed resources and bear the costs of operating with unutilized capacity when sales fall. Alternatively, managers can reduce the level of committed resources and incur the adjustment costs of retrenching employees and if volume is restored, replace committed resources at a later date. The following model specification is used to determine the proxy for costly reversibility for stock \( i \) in month \( t \):

\[
\log \left( \frac{\text{Employee}_{it}}{\text{Employee}_{i,t-1}} \right) = \\
\beta_0 + \beta_1 \log \left( \frac{\text{Revenue}_{it}}{\text{Revenue}_{i,t-1}} \right) + \beta_2 \times \text{Decrease Dummy}_{it} \times \log \left( \frac{\text{Revenue}_{it}}{\text{Revenue}_{i,t-1}} \right)
\]

(2)

The interaction variable Decrease Dummy takes the value of 1 when sales revenue decreases between periods \( t-1 \) and \( t \), and 0 otherwise. If the traditional fixed and variable costs model is valid, then upward and downward changes in costs will be equal, with the result that \( \beta_2 \) will be zero. To determine the level of costly reversibility on a firm-by-firm basis, individual time-series models are estimated for all firms in the sample on rolling 10-year periods. When there is cross-sectional variation in the coefficients, an alternative and more direct approach is to estimate a random coefficients model. Both specifications will be considered in order to
determine the appropriate parameter to use in the model to test for the source of the value premium.

Changes in sales revenue may reflect short-term market conditions or long-term shifts in market demand for products and services. Managers who are facing a downturn in sales may wait to obtain information that enables them to more accurately assess the permanence of the demand reduction before making decisions to cut resources. Such delays lead to sticky costs because unutilized resources are maintained during the interim between the reduction in volume and the adjustment decision. There may also be a time lag between the decision to reduce committed resources and the realization of the change in costs because it takes time to unwind contractual commitments. An implication of delayed decision-making and contracting lags is that the cost stickiness observed in one period should be reversed (i.e. offset by reductions to committed resources) in subsequent periods. This will provide a valuable test of robustness for the estimation of the sticky cost parameter.

**Errors in Expectation**
The key to evaluating errors in expectation is to identify those events that subsequently informed investors that their expectations were under-optimistic, and then to demonstrate that the superior stock price performance was concentrated around those events. Thus the errors in expectation proxy should measure the extent to which the positive abnormal returns for value stocks cluster around the earnings announcement after controlling for asymmetrically large negative price responses to negative earnings surprises for growth.

La Porta, Lakonishok, Shleifer and Vishny (1997), and Bernard, Thomas and Wahlen (1997) examined whether the differential stock returns between growth stocks and other stocks were clustered around earnings announcements, but reported weak and inconclusive results. Skinner and Sloan (2002) utilised more powerful tests by conditioning on the sign of the earnings surprise and by incorporating the price response to preannouncements of earnings news, which is important as negative earnings news is frequently preannounced for growth stocks. They reported that growth stocks exhibit an asymmetric response to earnings surprises, and when they controlled for asymmetrically large negative price responses to negative earnings surprises, they found no remaining evidence of a return differential between growth and value stocks.

**Investor Recognition**
Arbel, Carvell and Strebel (1983) suggest that a suitable proxy for the level of investor recognition for a security is the number of analysts that cover a firm. While Lehavy and Sloan (2008) and Chen, Hong, and Stein (2002) employ more rigorous models to determine the level of investor recognition for a stock, the number of analysts will provide a measure that is highly correlated with these more complex approximations.
References


*Draft Paper*


