Earnings growth volatility and the value premium

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Abstract

The volatility of future earnings growth is a significant determinant of Fama and French's Value premium. We use a stochastic earnings model of firm valuation to establish a formal link between the volatility of future earnings growth and the value premium. Furthermore we empirically confirm this relationship at the macro-level.

Key words: Asset pricing, Fama-French factor model, market efficiency;
JEL Classification: G12, G14

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1 Introduction

Fama and French's 1992 'Value' premium is well established in the literature, yet the fundamentals that drive this result are not yet well understood. Several notable studies empirically establish a link between macroeconomic variables, thought to proxy for expected changes to the investment opportunity set, to the Value premium (Aretz, Bartram, and Pope, 2010; Vassalou, 2003). Other researchers suggest that the Value premium reflects mispricing based on cognitive biases (Daniel and Titman, 1997; Lakonishok, Shleifer, and Vishny, 1994). And others suggest that the Value premium reflects compensation for systematic risk (Fama and French, 1996; **?**). We use a stochastic earnings model of firm valuation to establish the relationship between the volatility of future earnings growth and the Value premium.

Discounted cash flow models ignore higher order moments of earnings growth. We provide empirical evidence that earnings growth volatility is a major driver of the Value premium. Evidence for this relationship suggests that an alternative explanation for the Value premium lies in appropriate modelling of cash flows, and is broadly supportive the risk-compensation explanation for the Value-premium.

The role played by the volatility of earnings growth, as presented here, is fundamentally different to the posited role played by macro-economic fundamentals (Aretz, Bartram, and Pope, 2010; Vassalou, 2003). Changes in macro-economic fundamentals are said to proxy for future changes to the investment opportunity set. Our modelling identifies earnings growth volatility as a primary driver of both earnings cash flow volatility and firm value. FIrm value rises with increasing earnings growth volatility. However this increase in value is not uniform for all firms, and it is the difference in how earnings growth volatility influences firm value for different firms that drives the Value premium.

We proceed as follows. We review the related literature in Section 2. We derive the model for firm value, and the Value premium, in Section 3. We present empirical support fro our hypothesis in Section 4.

2 Literature review

Fama and French (1992) empirically identify two stock characteristics, size (market equity) and the ratio of book- to market-equity, that appear to capture a significant proportion of the variation in average stock returns. Fama and French (1993) show that these common characteristic return factors (henceforth SMB for size and HML for book-to-market, together the FF factors) significantly increase the proportion of variation in a cross-section of stock returns that is explained by the market factor alone. Fama and French (1996) argue that many of the firm characteristics typically found to cause anomalies in asset pricing, i.e. inconsistencies with the traditional CAPM, such as the reversal of long-term returns, size, book-to-market, earnings relative to price, cash flow relative to price or past sales growth (Banz, 1981; Basu, 1983; DeBondt and Thaler, 1985; Fama and French, 1995; Rosenberg, Reid, and Lanstein, 1985), are related and in fact absorbed by SMB and HML from the Fama and French (1993) three-factor model.

Factors in rational asset pricing models must proxy for risk factors in returns (Lewellen, 1999). Without an underlying economic rationale, size and book-to-market remain arbitrary indicators void of a meaningful interpretation as systematic risk factors that are priced separately from the market factor. Merton's intertemporal CAPM provides a useful framework here by arguing that market risk does not completely capture the risks in the economy that are relevant to investors. Instead, investors are also compensated for the risk of adverse shifts in the investment opportunity set. Cochrane (2005) argues that macroeconomic measures represent likely sources of priced risk factors as they reflect dynamics in the business climate and changes in non-financial market income. This insight provides the foundation for a stream of research into a suitable set of macro-economic state variables that can proxy for changes in investment opportunities.[1]

We can observe two approaches in this body of literature: i) direct tests for the predictive power of the FF factors for changes in the investment opportunity set, often proxied by aspects of changes in future economic growth, and ii) tests for the pervasiveness of the predictive power of the FF factors for cross-sectional variation of stock returns in the presence of factors that are thought to proxy for changes in the investment opportunity set.

[1] Alternative explanations of the empirical success of the FF factors include behavioural aspects, see for instance Daniel and Titman (1997); Lakonishok, Shleifer, and Vishny (1994), and data biases, see Lo and MacKinlay (1990) or Kothari, Shanken, and Sloan (1995).

In line with the first approach, Liew and Vassalou (2000) establish a relationship between SMB/HML and future economic growth. The explanatory power of the FF factors for future GDP growth persists when controlling for the market factor and a set of commonly employed business cycle variables. Kelly (2004) expands this analysis by considering innovations in real GDP growth and unexpected inflation and finds that the value premium is positively correlated with real GDP growth. SMB is negatively correlated with inflation, and positively with real economic growth.

In line with the second approach, Vassalou (2003) constructs a mimicking portfolio for news related to future nominal GDP growth and shows that this factor largely supersedes HML/SMB in explaining the cross-sectional variation in average asset returns. Hahn and Lee (2006) employ a similar approach and suggest that macro-economic variables closely linked to fluctuations of the business cycle, the default spread and the term spread, contain much of the information captured by SMB/HML. Petkova (2006) focuses on two different aspects of the investment opportunity set, the yield curve and the conditional distribution of asset returns and considers a set of indicators including the short-term interest rate, the aggregate dividend yield and the default spread. The chosen set of innovation factors appears to supersede the FF factors in the explanation of the cross-section of returns. Aretz, Bartram, and Pope (2010) unify prior efforts by considering a more comprehensive set of shocks to macroeconomic fundamentals and find that the FF factors embody much of the information contained in those fundamentals.

What most of the research into the economic meaning of the FF factors has in common is a purely empirical perspective that often relies on previously established links between macroeconomic fundamentals and stock returns. Most studies to date stop short of developing a rigorous theoretical relationship between one or both of the original FF factors and the variables that act as a proxy for the hypothesised underlying economic risk factors. In an attempt to fill this void, in the following section we propose an explicit relationship between the value premium and earnings growth volatility.

3 Earnings growth volatility and the value premium

Earnings that grow at a constant rate can be modelled using the ordinary differential equation

$$dE_t = \bar{g}E_t dt.$$

However it is unrealistic to expect earnings growth to remain constant. Many reasons exist for unforeseen fluctuations in the growth rate. For example unexpected yet continuous changes to the domestic economy will have some effect on the growth rate of many firms, whether it be an absolute or relative effect or a direct or indirect effect. In addition uncertainty in management outcomes are also likely to effect growth rates. Both these sources of uncertainty are inherent characteristics of the true growth parameter - not simply errors in parametric estimation. As a result, growth itself is subject to random fluctuations through time.

If earnings growth is assumed to be affected by exogenous innovations, then the growth rate process, $\bar{g}_t$, can be modelled by

$$\bar{g}_t = g + \sigma\Psi_t,$$

where Ψ_t is a white noise process. In this case the differential equation for earnings, E_t, is given by

$$\begin{aligned} dE_t &= \bar{g}_t E_t dt \\ &= gE_t dt + \sigma E_t dW_t, \end{aligned} \tag{1}$$

where W_t is a standard Wiener process[2].

To examine the influence of volatile earnings growth on firm value, we employ a stochastic earnings valuation model (Alcock, Mollee, and Wood, 2011). Under this model, we assume that the earnings, E_t, of a firm with finite life, T are assumed to be continuously deposited into a bank account whose current value, A_t, is given by

$$A_t = \int_0^t e^{r_f(t-s)} E_s ds. \tag{2}$$

[2] The earnings of most firms cannot be guaranteed to be a strictly positive process. Valuing firms with periods of negative earnings in any of the current valuation frameworks requires some restrictive assumptions be placed on the earnings process. For example, the DCF can value firms with negative earnings if the timing and value of any negative earnings are anticipated. For the model described above, if the true earnings process, E_t, is bounded below by $-\kappa$ then we can define $\tilde{E}_t = E_t + \kappa$ to be a strictly positive earnings process governed by a GBM (1). This is less stringent than requiring that the timing and value of any negative earnings are anticipated. Rather we only require that the minimum of any negative earnings is anticipated.

Following Black and Scholes (1973), equity is modeled as a call option on the balance of this bank account. The variation in equity, dP, is then given by

$$dP = \frac{\partial P}{\partial A} dA + \frac{\partial P}{\partial E} dE + \frac{\partial P}{\partial t} dt + \frac{1}{2}\frac{\partial^2 P}{\partial E^2}(dE)^2,$$

where $dA = (E + r_f A)\, dt$ and $(dE)^2 = \sigma^2 dt$. Standard equilibrium arguments give the value of equity in terms of the partial differential equation,

$$\frac{\partial P}{\partial t} + (E + r_f A)\frac{\partial P}{\partial A} + gE\frac{\partial P}{\partial E} + \frac{1}{2}\sigma^2 E^2 \frac{\partial^2 P}{\partial E^2} - (r_f + \lambda)P = 0, \tag{3}$$

where λ represents the market price of earnings risk, the value of which will depend upon the risk preferences of the marginal investor.

Under this stochastic framework, the price of earnings (the PE ratio) follows the PDE given by

$$\frac{\partial H}{\partial t} + (1 + (r_f - g)R_t)\frac{\partial H}{\partial R_t} + \frac{1}{2}\sigma^2 R_t^2 \frac{\partial^2 H}{\partial {R_t}^2} + (g - r_f - \lambda)H = 0, \tag{4}$$

with the following boundary conditions:

$$\lim_{R_t \to \infty} \frac{\partial^2 H}{\partial {R_t}^2} = 0, \qquad \text{as} \qquad R_t \to \infty \tag{5}$$

$$\frac{\partial H}{\partial t} + \frac{\partial H}{\partial R_t} + (g - r_f - \lambda)H = 0, \qquad \text{along} \qquad R_t = 0 \tag{6}$$

And where, in the absence of debt, the equity value at maturity is given by

$$P_T = \max(A_T, 0) \Longrightarrow H_T = \max(R_T, 0) = R_T. \tag{7}$$

Under this valuation, earnings volatility affects the PE ratio of growth and value stocks differently. In absolute terms, earnings growth volatility adds greater value to the equity of the 'growth' firm than to that of the 'value' firm. If investor returns are measured in absolute terms, volatility is preferred in a 'growth' firm as opposed to the 'value' firm (See Figures 1(a) and (b)) . However investors typically measure investment returns relative to the amount invested.

[Figure 1 about here]

The relative effect of earnings volatility for both the 'growth' and 'value' firm can be examined by scaling the PE ratio's by the PE ratio for the $\sigma = 0$ case. The PE ratio calculated for $\sigma = 0$ is consistent with the PE ratio obtained using the DCF PE ratio. The scaled PE ratios are presented in Figure 2(a) and (b). In relative terms, earnings volatility can increase equity value significantly for both the 'growth' firm and 'value' firm. However when we consider the case that both firms have the same leverage then the relative increase in equity value is greater for the 'value' stock.

[Figure 2 about here]

As a result the Value premium is negatively related with the volatility of future earnings growth.

H_1 : *The Value premium is negatively related to the volatility of future earnings growth.*

4 Data and Methodology

4.1 Empirical method

Our empirical analysis proceeds as follows. First, we establish a relationship between the value premium (HML) and future earnings growth volatility, controlling for a set of macroeconomic variables commonly found to be significantly associated with the value premium. Secondly, we consider earnings growth volatility itself as a function of a set of macroeconomic variables.

The chosen set of macroeconomic variables in the regression of the value premium follows Aretz, Bartram, and Pope (2010) who to the best of our knowledge study the most comprehensive set of candidates in this context. We employ the macroeconomic variables that are found to be significant in their work. Importantly, Aretz, Bartram, and Pope (2010) employ, amongst others, a generated variable that proxies for changes in economic growth expectations. We argue in the development of our theoretical proposition above that the forward-looking element in the explanation of the value premium is not changes in expectations about economic growth but in fact expected future earnings growth volatility. As a result, we depart from the methodology adopted in Aretz, Bartram, and Pope (2010) and include actual future economic growth as a control variable in our regression. The first step of our empirical analysis is

$$HML_{(t-q),t} = \beta_0 + \beta_1 GDP_{(t+1),(t+1+p)} + \beta_2 TRM_t + \beta_3 EGvol_{(t+1),(t+1+p)} + \epsilon_t \quad (8)$$

where $HML_{(t-q),t}$ is the value premium earned over the period $(t-q,t)$, $GDP_{(t+1),(t+1+p)}$ is the change in real U.S. GDP observed over p periods into the future, TRM_t is the term spread observed at time t, $EGvol_{t,(t+1+p)}$ is future earnings growth volatility over the subsequent period $(t+1),(t+1+p)$, and ϵ_t is an i.i.d. normally distributed error term with expected value of zero and no serial correlation. (p,q) are variables from the interval [4:4:40], representing four to 40 quarters of the year in steps of four. The second step is

$$EGvol_{(t+1),(t+1+p)} = \beta_0 + \beta_1 CPIg_{(t+1),(t+1+p)} + \beta_2 GDPg_{(t+1),(t+1+p)} + e_{t+1+p} \quad (9)$$

where $EGvol_{(t+1),(t+1+p)}$ is earnings growth volatility observed over p periods into the future, $CPIg_{(t+1),(t+1+p)}$ is CPI growth and $GDPg_{(t+1),(t+1+p)}$ is real GDP growth, both observed over that same period.

ϵ_{t+1+p} is an i.i.d. normally distributed error term with expected value of zero and no serial correlation. p is from the interval [4:4:40], representing four to 40 quarters of the year in steps of four quarters.

4.2 Data set

Monthly values for HML are obtained from the Fama/French factors. These are taken from Kenneth French's website and are constructed using the six value-weight portfolios formed on size and book-to-market. The value premium HML (High Minus Low) is the average return on the two value portfolios minus the average return on the two growth portfolios, see Fama and French (1993) for a complete description of the factor returns. The data represents monthly geometric returns on a portfolio long in value stocks and short in growth stocks. Given that the variable we intend to focus on, earnings growth volatility, is based on earnings that are commonly reported quarterly, the monthly HML values are added up over the three months of a quarter, and p quarters, depending on the time horizon of the analysis.

Quarterly figures for real U.S. GDP in billions of chained (2005) Dollars, seasonally adjusted at annual rates, are obtained from the Bureau of Economic Analysis. Quarterly consumer price index (CPI) figures are obtained from Robert Shiller's website. Quarterly earnings figures on the S&P 500 index are also obtained from Robert Shiller's website. Changes in all of these figures are calculated as the natural logarithm of the value at time $(t+1)$ over the value at time t, and added over p quarters.

The term spread (TRM) is the difference between the yield on 10-year U.S. Government bonds and 1-year U.S. government bonds. Data is obtained from the Federal Reserve Bank website. The volatility of earnings growth is calculated as the standard deviation of quarterly earnings growth values over p quarters.

All variables are collected for January 1975 to June 2010. After exclusion of observations with missing values, our final sample consists of 134 rolling four-quarter observations.

4.3 Descriptive statistics

Table 1 shows the descriptive statistics for the value premium and the regressors. The mean of the rolling annual value premium over the study period is 4.85% with a standard deviation of 13.54% and a wide range of values from -29.64% to 55.16%. The macroeconomic variables, GDP and CPI growth as well as the term spread, have mean values of 4.15%, 2.98% and 1.03% respectively, with consistently lower standard deviations. The mean rolling annual earnings growth volatility is 6.90%. However, the variable exhibits the highest standard deviation in the sample at 14.10%. Correspondingly, the distribution has very fat tails with a kurtosis of 19.75%.

[Table 1 about here]

Table 2 shows the pairwise Pearson correlation coefficients between the value premium and the regressors. As far as the pairwise analysis suggests, HML is only significantly correlated with the term spread. Interestingly, earnings growth volatility appears to be significantly correlated with GDP growth and CPI growth. This may suggest that EGVOL is in fact merely a proxy for those macroeconomic variables and contains no information significant to investors apart from the content captured in those macroeconomic indicators.

[Table 2 about here]

This insight motivates an auxiliary regression of earnings growth volatility on the macroeconomic variables it appears to be correlated with that allows us to determine to what extent earnings growth volatility is a function of macroeconomic conditions.

[Table 3 about here]

The results in Table 3 suggest that a portion of earnings growth volatility may in fact be related to macroeconomic conditions. Both GDP growth as well as CPI growth are negatively and significantly related to earnings growth volatility. This inverse relationship may suggest that higher earnings growth uncertainty tends to coincide with periods of less positive economic prospects. The correlation between earnings growth and economic conditions may imply that there are circumstances when earnings growth volatility can proxy for economic growth prospects. However, in our discussion below, we argue that earnings growth volatility may in fact also contain information relevant to investors above and beyond the general economic outlook.

5 Results

Table 4 presents our empirical findings. Our main results can be summarised as follows. Future earnings growth volatility is a highly significant predictor for the value premium. The relationship is inverse, implying a higher price for value stocks in times of higher earnings uncertainty. Earnings growth volatility supersedes future GDP growth as a predictor for the short-run value premium. Conversely, earnings growth volatility and GDP growth capture different risk factors and both contribute to the explanation of the variation in the long-run HML. Earnings growth volatility is a significant predictor for the value premium for long and short holding periods and volatility forecast horizons.

In all of our regressions, future earnings growth volatility is a significant predictor for the value premium, and the relationship is consistently inverse. We identify a significant and stable inverse relationship between the value premium and future earnings growth volatility for short (4 quarters) and long (40 quarters) holding periods as well as for short-term (4 quarters) and long-term (40 quarters) volatility forecast horizons. In periods of higher earnings uncertainty, the value premium appears to be lower. In other words, in periods of higher earnings uncertainty, high book-to-market 'value' stocks earn lower returns relative to low book-to-market 'growth' stocks. This finding is in line with our theoretical argument presented above. In times of increased earnings uncertainty, the price of value stocks increases, implying lower returns over the period. Investors appear to react to higher uncertainty and protect their portfolios from value erosion in these high-uncertainty periods through shifting into defensive value stocks. The growth stock is more susceptible to volatile earnings than the value stock and thus represents a less attractive opportunity to risk-averse investors. Our theoretical argument presented above places no restrictions on the holding period or the volatility forecast horizon. The relationship we identify empirically is robust to different holding periods as well as to the investor's volatility forecast horizon.

Merton's ICAPM framework provides the basis for Cochrane's argument that macroeconomic variables, especially those that capture changes to the future investment opportunity set, represent likely risk factors priced above and beyond the market risk factor. On that basis, the value premium has in past studies been related to changes in future GDP growth. In our empirical analysis, we therefore control for changes in future GDP growth.

We find that future earnings growth volatility supersedes future GDP growth as the forward looking element in the explanation of the value premium in the short run. When we consider a holding period of 4 to 8 quarters and a forecast period of 4 as well as 40 quarters, future GDP growth is insignificant in the explanation of the value premium whereas the predictive power of earnings growth volatility (also considered over 4 and 40 quarters, respectively) persists. We interpret this as evidence that in the short run, growth stocks are disproportionately affected by higher earnings growth volatility. Conversely, in the short run, changes in future GDP growth may affect both growth and value stocks in a similar fashion. Therefore, in the short run, earnings growth volatility is the more significant predictor of the value premium. In the long run, growth and value stocks react differently to changes in future GDP growth, and the variable thus gains in significance.

Several studies have in the past identified a relationship between future GDP growth in various forms - whether measured as realised GDP growth in the future or expected future GDP growth as proxied by a mimicking portfolio of asset returns closely related to this macroeconomic variable. In many cases, this relationship is found to be positive (Kelly, 2004; Liew and Vassalou, 2000; Vassalou, 2003). However, Aretz, Bartram, and Pope (2010) find a negative relationship between their mimicking portfolio for changes in future economic growth and the value premium and attribute their finding to the fact that they control for a number of variables ignored in previous studies. We also find an inverse relationship between the value premium and future economic growth and we attribute this finding to the fact that we control for earnings growth volatility. In keeping with our theoretical argument, the value premium reduces in periods of stronger economic growth as low book-to-market firms can benefit disproportionally from the upcoming economic boom and perform better relative to the more stable and defensive ‘value’ firms.

We include as controls in our empirical analysis those macroeconomic variables that are significant in the study by Aretz, Bartram, and Pope (2010). Alongside a proxy for future economic growth, the second significant control variable is the term spread. Hahn and Lee (2006) report that increases in the term spread tend to be associated with falling interest rates. They argue, following Fama and French (1992), that the book-to-market ratio is the difference between market leverage (the ratio of book value of assets to market value of equity) and book leverage (the ratio of book value of assets to book value of equity), thereby interpreting the effect captured by HML as an involuntary leverage effect.

Firms with high book-to-market ratios have a large amount of market imposed leverage. Since declining interest rates are likely to have a greater positive effect on rms with heavier debt burden than on less levered rms, Hahn and Lee expect increases in the term spread to be associated with a higher value premium. In line with the results described in Hahn and Lee (2006), we find a positive relationship between the term spread and the value premium. This finding is also in keeping with Petkova (2006) and Aretz, Bartram, and Pope (2010).

6 Conclusions

We derive and empirically test a new explanation for Fama and French’s 1992 Value premium. We establish the relationship between the volatility of earnings growth and the Value premium. We also provide empirical evidence for this hypothesis.

Our findings suggest that higher-order moments of earnings and earnings growth are important variables in the determination of firm value, and that ignoring these parameters may give rise to inappropriate valuations. Furthermore, we identify that these parameters are partial determinants of the Value premium. These two finding also suggest that inappropriate valuation models may have contributed to the confusion surrounding the determinants of the Value premium.

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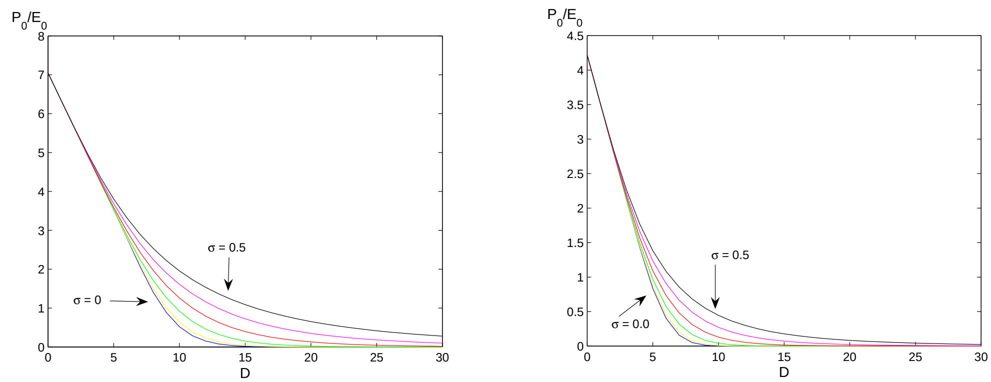
7 Figures and Tables

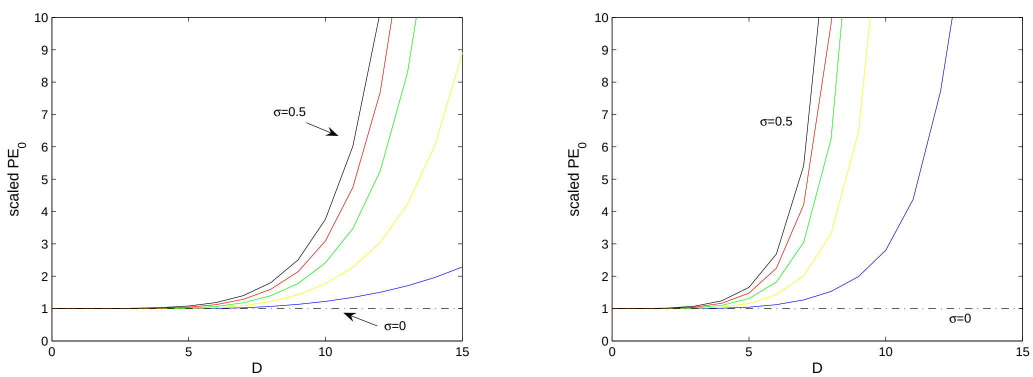


(a) PE Ratios for a 'Growth' firm: Expected Growth of Earnings, $g = 0.2$.

(b) PE Ratios for a 'value' firm: Expected Growth of Earnings, $g = 0$.

Fig. 1.

P/E as a function of debt and earnings volatility for 'growth' and 'value' firms with $r = 0.07$, $T = 5$, $E_0 = 1$, $A_0 = 0$.



(a) Expected Growth of Earnings, $g = 0.2$.

(b) Expected Growth of Earnings, $g = 0$.

Fig. 2.

Scaled P/E as a function of debt and growth for the case $r = 0.07$, $T = 5$, $E_0 = 1$, $A_0 = 0$. Earnings volatility values include $\sigma = 0, 0.1, \ldots, 0.5$. The PE ratio's are scaled by the PE ratio for $\sigma = 0$.

Descriptive statistics of the value premium and regressors

in %	HML	CPIG	GDPG	TRM	EGVOL
Mean	0.0485	0.0415	0.0298	0.0103	0.0690
Std. dev.	0.1365	0.0275	0.0216	0.0116	0.1410
Min	-0.2964	-0.0144	-0.0420	-0.0316	0.0054
Max	0.5516	0.1376	0.0814	0.0331	0.9052
Skewness	0.4885	1.5564	-0.8445	-0.3888	4.1076
Kurtosis	4.6878	5.4851	4.5221	3.3010	19.7548
Obs.	134	134	134	134	134

Table 1

The table shows the descriptive statistics for the value premium (HML) and the regressors used in our empirical analysis. Monthly values for HML are obtained from the Fama/French factors from Kenneth French's website. The raw data represents monthly geometric returns on a portfolio long in value stocks and short in growth stocks. Given that the variable we intend to focus on, earnings growth volatility, is the standard deviation (over a minimum of four quarters) of earnings that are reported quarterly, the monthly HML values are added up over the three months of a quarter, and the four quarters of a year. Quarterly consumer price index (CPI) figures are obtained from Robert Shiller's website. Quarterly figures for real U.S. GDP in billions of chained (2005) Dollars, seasonally adjusted at annual rates, are obtained from the Bureau of Economic Analysis. Quarterly earnings figures on the S&P 500 index are also obtained from Robert Shiller's website. Growth in all of these figures is calculated as the natural logarithm of the value at time $(t+1)$ over the value at time t, resulting in the growth variables $CPIG$ and $GDPG$. Quarterly growth values have been added over the four quarters of the year to ensure consistency with the calculation of the value premium and earnings growth volatility. The slope in the yield curve is represented by the term spread (TRM), i.e. the difference between the yield on 10-year U.S. Government bonds and 1-year U.S. government bonds at the end of the quarter. Data is obtained from the Federal Reserve Bank website. The volatility of earnings growth ($EGVOL$) is calculated as the standard deviation of four quarterly earnings growth values, the four quarters subsequent to those over which the value premium is calculated. All variables are collected for January 1975 to June 2010. Observations with missing values have been excluded.

Pearson correlation coefficients for the value premium and regressors

	HML	CPIG	GDPG	TRM	EGVOL
HML	1.0000				
CPIG	-0.0852	1.0000			
GDPG	0.0945	-0.0360	1.0000		
TRM	0.2405***	-0.5420***	-0.0766	1.0000	
EGVOL	-0.1325	-0.2222**	-0.4805***	0.2108**	1.0000

Table 2

The table shows the pairwise Pearson correlation coefficients between the value premium and the regressors. Significant differences from zero are indicated for the 1% (***), 5% (**) and 10% (*) level.

Regression of earnings growth volatility on real GDP growth and CPI growth
Dependent variable: $EGVOL$

p = 4	4
Constant	0.2091
t stat	2.6681
CPI growth	-1.6706
t stat	-2.2034
GDP growth	-2.6584
t stat	-2.0766
Adj. R squared	0.0515
Obs	134

Table 3

The table shows the results from the regression of earnings growth volatility$EGVOL$ on real GDP growth ($GDPG$) and CPI growth ($CPIG$), all measured over p quarters. C is a constant term. t statistics in excess of 1.9600 indicate significance at the 5% level. In order to control for autocorrelation and heteroskedasticity, Newey-West adjusted standard errors with automatic lag selection have been employed. $\bar{R}^2$ is the adjusted R squared statistic.

Regression of the value premium on real GDP growth, the term spread, and future earnings growth volatility
Dependent variable: HML

	p = 4, q = 4	p = 40, q =	4	8	12	16	20	24	28	32	36	40
C	0.0348		0.2743	0.6612	1.1084	1.2765	1.6965	1.9365	2.0463	1.7355	1.4991	1.3690
t stat	1.1216		1.3429	1.6846	2.5761	2.6044	3.8810	6.3848	6.6907	7.8624	6.0063	4.5605
GDPG	-0.2993		-0.5646	-1.5416	-2.6821	-3.0183	-4.0213	-4.3360	-4.3308	-3.3901	-2.6736	-2.2986
t stat	-0.3926		-0.8961	-1.3177	-2.1530	-2.1231	-3.2081	-5.1139	-4.9269	-6.1928	-3.7442	-2.5765
TRM	0.0354		0.0404	0.0616	0.0444	0.0434	0.0440	0.0058	-0.0295	-0.0344	0.0059	0.0506
t stat	2.8115		3.2932	3.5530	1.8878	1.4862	2.1965	0.2898	-1.7621	-1.1744	0.1716	1.9595
EGVOL	-0.2090		-1.3377	-2.2139	-2.7989	-3.0848	-3.9721	-4.5349	-4.5577	-3.7168	-3.5596	-3.5468
t stat	-3.0313		-4.2166	-3.4592	-3.6163	-3.5587	-5.3003	-8.5886	-8.3660	-7.5118	-6.3692	-6.3874
$\bar{R}^2$	0.0451		0.0227	0.0576	0.0805	0.0769	0.0495	0.0351	0.0296	0.0421	0.0441	0.0292
Obs	130		96	92	88	84	80	76	72	68	64	60

Table 4:

The table shows the results from the regression of the value premium HML on future real GDP growth looking ahead p quarters from the end of the period over which the value premium is measured ($GDPG$), the term spread measured at the end of the period over which the value premium is measured (TRM) and future earnings growth volatility looking ahead p quarters from the end of the period over which the value premium is measured ($EGVOL$). C is a constant term. The dependent variable is the value premium calculated over q quarters from four to 40 to demonstrate the persistence of the relationship. t statistics in excess of 1.9600 indicate significance at the 5% level. In order to control for autocorrelation and heteroskedasticity, Newey-West adjusted standard errors with automatic lag selection have been employed. $\bar{R}^2$ is the adjusted R squared statistic.