The Value Premium and Time-Varying Idiosyncratic Risk

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Abstract

Recent research has discussed the possible role of unsystematic risk in explaining equity returns. Simultaneously, but somehow independently, numerous other studies have documented the failure of the static and conditional capital asset pricing models to explain the differences in returns between value and growth stocks. This paper examines the post-1963 value premium by employing a model that captures the time-varying total risk of the value-minus-growth portfolios. In accordance with existing studies, we find that the static CAPM has no explanatory power for the value premium, and that firm size has only a limited role to play. Our results show that the conditional variance specification incorporating time-varying idiosyncratic risk can fully capture the post-1963 value premium and that the value premium is a compensation for exposure to time-varying risk. This conclusion is robust to different characteristics of value and growth stocks and to the country under review (US and UK).

Keywords: value premium, time-varying unsystematic risk, factor model, GJR-GARCH(1,1)-M.

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The value premium, or the difference in returns between a portfolio of value stocks and a portfolio of growth stocks, has been identified in academic studies and exploited by financial market practitioners for over a decade. Basu (1977), Fama and French (1992, 1993, 1995, 1996) and Lakonishok, Shleifer and Vishny (1994) report US evidence that value stocks with high figures for the ratios of book-to-market equity (B/M), cash flow to price (C/P) or earnings to price (E/P) outperform growth stocks with low figures for these ratios. Similar evidence has also been found in the UK and other international stock markets by Dimson, Nagel and Quigley (2003) and Fama and French (1998). While the existence of this value premium goes largely undisputed, interpreting the premium and identifying its causes has been more controversial. Haugen (1995), Lakonishok, Shleifer and Vishny (1994) and La Porta, Lakonishok, Shleifer and Vishny (1997) focus on behavioral explanations, attributing it to the judgment biases of investors which lead value stocks to be underpriced and growth stocks to be overpriced. The argument goes that investors base their expectations of future performance on past performance and, as a result, they underprice value stocks and overprice growth stocks. Eventually, overly enthusiastic growth investors are disappointed by the poor earnings announcements of growth stocks while overly pessimistic value investors are pleasantly surprised by the performance of value companies. The market then corrects previous mis-pricings such that value stocks become winners and growth stocks become losers.[1]

By contrast, Fama and French (1993, 1995 and 1996) and Chen and Zhang (1998) document that the value premium is a compensation for risk. They argue that high B/M, C/P and E/P companies (value stocks) suffer from a relatively high likelihood of financial distress with continuously low earnings and high earnings risk. On the other hand, low B/M, C/P and E/P companies (growth

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[1] However, Levis and Liodakis (2001) test this extrapolation hypothesis using UK data. They find that market does not extrapolate from either past earnings growth or previous price performance. Their evidence suggests that positive and negative surprises have an asymmetric effect on the returns of value and growth stocks. Good news has a stronger positive impact on the returns of value stocks than on the returns of other stocks. On the other hand, bad news has a minor impact on the returns of value stocks but a significantly more negative impact on the performance of growth stocks.

stocks) experience strong growth with continuously high earnings and low earnings risk. Therefore, they propose that the superior returns from value investing are merely compensation for holding risky stocks. The two studies by Fama and French (2005) and Ang and Chen (2003) examine the value premium using the Capital Asset Pricing Model (CAPM) of Sharpe (1964) and Lintner (1965). They find that the CAPM is able to capture the value premium of 1926-1963, but fails to explain it for the post-1963 period.

Jagannathan and Wang (1996), Lettau and Ludvigson (2001), Ang and Chen (2003) and Adrian and Franzoni (2005) argue that a significant weakness of the static CAPM is its assumption that the beta of the asset is constant through time. They develop a conditional CAPM by allowing betas and expected returns to vary over time and find that the conditional CAPM performs substantially better than the static CAPM in explaining the cross-sectional variation in expected returns on size and B/M portfolios. However, Lewellen and Nagel (2006) argue that while betas do fluctuate substantially over time, these variations are not large enough to explain the value premium and the momentum effect, a result echoed by Petkova and Zhang (2005). Fama and French (2005) confirm that even after allowing betas to vary annually, the conditional CAPM still fails to describe the post-1963 value premium.

The goal of this study is to analyze the post-1963 value premium defined using the ratios of B/M, C/P and E/P. Instead of using the capital asset pricing model, this study examines time-varying risk as measured by a model for the conditional variance of the value and growth portfolios and tests whether value stocks are riskier than growth stocks in the sense of time-varying risk through a conditional measure of portfolio-specific risk. The study is distinct from existing work in that it models the time-dependent structure of conditional volatility and its impact on the returns of value and growth portfolios through a generalized autoregressive conditionally heteroskedastic (GARCH) process (see Engle, 1982; and Bollerslev, 1986). The rationale for choosing this model is that, as well as having constant betas, the static CAPM also assumes that the variances of the error terms are constant. However, numerous researchers have found that for financial time series, the variances of the error terms change over time in a partially predictable fashion (see for example French, Schwert and Stambaugh, 1987; and Schwert and Seguin, 1990) and exhibit volatility clustering, where large (small) volatility changes tend to be followed by large (small) volatility changes. In the financial literature, the error term in asset pricing models is often interpreted as representing information arriving in the market. The static CAPM ignores the impact of conditional information on the expected stock return caused by heteroskedasticity. By contrast, the GARCH model is designed to capture the impact of new information on the conditional variance through the most recent squared error. The essence of the motivation for using the GARCH model is that the release of new information (captured by the error term) may cause the risk (conditional variance) of value and growth stocks to change over time in a way that is priced and can be captured by the model.

Another rationale for explaining the value premium through a model that does not solely rely on systematic risk comes from recent evidence that idiosyncratic risk may matter to investors who fail to hold the market portfolio. The question as to whether average stock variance is priced is still open with convincing evidence on both sides of the debate. On one hand, Goyal and Santa-Clara (2003), Ghysels, Santa-Clara and Valkanov (2005), Fu (2005), Diavatopoulos, Doran and Peterson (2006) and Jiang and Lee (2007) show that there is a positive relation between idiosyncratic risk and stock market return. On the other hand, Bali, Cakici, Yan and Zhang (2005) and Bali and Cakici (2007) put forward the claim that the relation could be spurious since it is driven by illiquid small capitalization stocks traded on the Nasdaq and depends on the measure of idiosyncratic volatility used, on the sample analyzed and on the data frequency. With relatively few exceptions, the papers listed above measure idiosyncratic risk in a time-invariant fashion either as the average stock variance or as the standard deviation of a firm's residual returns. We take a different route and model the variations in the unsystematic risk of the value and growth portfolios through a GARCH framework. Extending from Bollerslev, Engle and Wooldridge (1988), we specify different versions of the GARCH-based conditional variances with the CAPM and market capitalization. In particular, we examine whether the value premium is a compensation for exposure to 1) the time-varying risk of the market; 2) the time-varying risk of a size factor; 3) unsystematic risks that affect value and growth portfolios in opposite ways that are captured by the GARCH specification; and 4) a combination of all three. The advantage of this approach is that it allows estimation of the CAPM and GARCH-in-mean model simultaneously.

The contributions of this paper to the literature can be further specified as follows. First, we use a conditional variance term in the equation for returns which does not assume that the level of risk is time-invariant. Our results are in support of the idea that value stocks do not have higher *market* risk than growth stocks. While the CAPM beta has strong explanatory power for the value and growth portfolio returns when examined separately, it cannot explain the post-1963 value premium. We find that this premium is a compensation for exposure to unsystematic risk which can be fully explained by the conditional variance model. Noticeably, the results are robust to different definitions of value and growth stocks (B/M, C/P and E/P) and to variations in the country under review (the US and UK). Our model is able to explain the value premium without resorting to *ad hoc* rationalizations based on behavioral considerations, transactions costs or illiquidity. Our risk measure is based on the total risk of the value and growth portfolios, hence allowing the idiosyncratic component of risk to vary over time. This suggests that although they contain a large number of stocks, the value and growth portfolios might fail to be well-diversified and, as a result, firm-level idiosyncratic risk is an important factor to explain the value premium. Second, the use of GARCH models for the value and growth portfolios is able to deal directly with the problem of conditional heteroskedasticity that has plagued previous studies using the static and conditional versions of the CAPM.

The remainder of the paper is organized as follow. Section 1 develops a model for the time-varying unsystematic risk within a GARCH-M framework and discusses the econometric specifications.

Section 2 describes the data. Sections 3 and 4 report the empirical results for US and UK data respectively. Section 5 provides an analysis of the findings and finally, Section 6 offers some concluding remarks.

1. Econometric Framework

1.1. The Static CAPM

Letting r_{it} and r_{mt} denote excess returns on asset *i* and on the market portfolio of all assets in period *t*, the static CAPM of Sharpe (1964) and Lintner (1965), which was further developed by Black (1972), can be written as follows

$$E\left(r_{it}\right) = \beta_i E\left(r_{Mt}\right) \qquad i = 1, \ldots, n \tag{1}$$

where

$$\beta_i = Cov\left(r_{it}, r_{Mt}\right) / Var\left(r_{Mt}\right) \tag{2}$$

and $E(.)$, $Cov(.)$ and $Var(.)$ denote the expectation, covariance and variance, respectively. This single-period CAPM assumes that the ratio of the expected market excess return to the expected asset excess return remains constant over time; that is, all investors have the same expectations about asset returns for any given time period. However, in practice investors may update their expectations each period according to new information and this leads to conditional expectations, which are stochastic rather than constant.

1.2. Model Specifications

We start by considering the static CAPM in *ex-post* form given by

Model 1:

$$r_{Pt} = \alpha + \beta\left(R_{Mt} - R_{ft}\right) + \varepsilon_{Pt} \tag{3}$$

where r_{Pt} is either the excess returns on the value and growth portfolios or the return on the high-minus-low (HML) portfolio, R_{Mt} is the value-weighted return on the market portfolio of all assets, R_{ft} is the three-month Treasury bill rate and $\varepsilon_{Pt} \sim N\left(0, \sigma^2\right)$. If the static CAPM is valid, the alpha coefficient should be equal to zero in statistical terms.

The CAPM model with a standard GARCH (1, 1) process (see Bollerslev, 1986) for the conditional variance of portfolio returns is given by

Model 2:

$$\begin{aligned} r_{Pt} &= \alpha + \beta(R_{Mt} - R_{ft}) + \varepsilon_{Pt} \\ \sigma^2_{Pt} &= \omega + \gamma\varepsilon^2_{Pt-1} + \theta\sigma^2_{Pt-1} \end{aligned} \quad (4)$$

where $\varepsilon_{Pt} \sim N(0, \sigma^2_{Pt})$, σ^2_{Pt} is the conditional variance of portfolio returns, γ, θ, and ω are parameters to be estimated. To ensure that σ^2_{Pt} is non-negative, non-degenerate and that the GARCH (1, 1) process is covariance stationary, the conditions $\omega > 0$, $0 < \gamma < 1$, $0 \le \theta < 1$ and $\gamma + \theta < 1$ are imposed. The CAPM with a GARCH specification for the conditional variance allows expected excess returns, the conditional variances and the covariances of asset returns to vary over time. It follows that the conditional variance depends not only on past shocks but also on past realizations of the conditional variance itself.

According to Nelson (1991), Glosten, Jagannathan and Runkle (1993) (hereafter GJR) and Rabemananjara and Zakoian (1993), good news (as measured by positive shocks) and bad news (as measured by negative shocks) may have an asymmetric impact on the conditional variance of stock returns. In particular, it has been shown that volatility is higher for negative returns than positive returns of the same magnitude. This has been argued to arise either from "leverage" (the impact of falling versus rising stock prices on a firm's debt-to-equity ratio) or "volatility feedback" effects. In Model 3, we explicitly capture this potential asymmetric effect and test whether value and growth stocks respond in the same way to good and bad news. Therefore, we obtain:

Model 3:

$$\begin{aligned} r_{Pt} &= \alpha + \beta(R_{Mt} - R_{ft}) + \varepsilon_{Pt} \\ \sigma^2_{Pt} &= \omega + \gamma\varepsilon^2_{Pt-1} + \eta I_{t-1}\varepsilon^2_{Pt-1} + \theta\sigma^2_{Pt-1} \end{aligned} \quad (5)$$

where η measures any asymmetric response of volatility to good and bad news, $\varepsilon_{Pt} \sim N(0, \sigma_{Pt}^2)$, $I_{t-1} = 1$ if $\varepsilon_{t-1} < 0$ (bad news) and $I_{t-1} = 0$ otherwise. Now the conditions for non-negative and non-degenerate σ_{Pt}^2 and covariance stationarity are $\omega > 0$, $0 < \gamma < 1$, $0 \le \theta < 1$, $\gamma + \eta \ge 0$ and $\gamma + \eta / 2 + \theta < 1$.

In Models 4 and 5, we follow Bollerslev, Engle and Wooldridge (1988) and add to Models 2 and 3 a conditional standard deviation term in the mean equation that models the time-varying risk premium of value and growth stocks. The resulting model, which we term the GJR-GARCH-M (Standard Deviation) (hereafter GARCH-M (SD)) formulation, is

Model 4:

$$\begin{aligned} r_{Pt} &= \alpha + \beta(R_{Mt} - R_{ft}) + \delta\sigma_{Pt} + \varepsilon_{Pt} \\ \sigma_{Pt}^2 &= \omega + \gamma\varepsilon_{Pt-1}^2 + \theta\sigma_{Pt-1}^2 \end{aligned} \tag{6}$$

Model 5:

$$\begin{aligned} r_{Pt} &= \alpha + \beta(R_{Mt} - R_{ft}) + \delta\sigma_{Pt} + \varepsilon_{Pt} \\ \sigma_{Pt}^2 &= \omega + \gamma\varepsilon_{Pt-1}^2 + \eta I_{t-1}\varepsilon_{Pt-1}^2 + \theta\sigma_{Pt-1}^2 \end{aligned} \tag{7}$$

where δ measures the risk premium, σ_{Pt} captures the time-varying risk, and $\varepsilon_{Pt} \sim N(0, \sigma_{Pt}^2)$. These models imply that increased risk as measured by the conditional standard deviation leads to a rise ($\delta > 0$) or fall ($\delta < 0$) in the level of compensation for holding the asset.

Following Nelson (1991) and Hentschel (1995) for the sake of comparison and completeness, we adopt another commonly used functional form for capturing the time-varying risk in Models 6 and 7, which instead of the conditional standard deviation, uses the conditional variance in the mean equation. Therefore, we obtain

Model 6

$$r_{Pt} = \alpha + \beta\left(R_{Mt} - R_{ft}\right) + \nu\sigma_{Pt}^2 + \varepsilon_{Pt}$$
$$\sigma_{Pt}^2 = \omega + \gamma\varepsilon_{Pt-1}^2 + \theta\sigma_{Pt-1}^2 \qquad (8)$$

Model 7:

$$r_{Pt} = \alpha + \beta\left(R_{Mt} - R_{ft}\right) + \nu\sigma_{Pt}^2 + \varepsilon_{Pt}$$
$$\sigma_{Pt}^2 = \omega + \gamma\varepsilon_{Pt-1}^2 + \eta I_{t-1}\varepsilon_{Pt-1}^2 + \theta\sigma_{Pt-1}^2 \qquad (9)$$

where $\nu\sigma_{Pt}^2$ measures the time-varying risk premium and $\varepsilon_{Pt} \sim N\left(0, \sigma_{Pt}^2\right)$. The models specified in equations (6) to (9) imply that there are serial correlations in asset returns which arise through the introduction of the conditional variance, which is itself autocorrelated, in the mean equation. In addition, the conditional expected portfolio return is a linear function of the conditional variance.

Using Models 2 to 7, the main hypothesis involves whether the value premium can be explained by the conditional GARCH-CAPM model, which would imply $\alpha = 0$. We also analyze the impact of more recent information (as measured by γ) and older information (as measured by θ) on the volatility of the value and growth portfolio returns. For Models 6, 7, 8 and 9, we examine the null hypothesis that the value premium is a compensation for time-varying risk, which implies that either $\delta > 0$ or $\nu > 0$. For Models 5, 7 and 9, we further test for the existence of any asymmetric impact of good and bad news on the volatility of the value and growth portfolios returns under the null hypothesis that $\eta = 0$.

2. Data Description

Our US data comprise portfolios that include all NYSE, AMEX, and NASDAQ stocks.[2] At the end of June, all stocks are ranked into 10-decile portfolios based on the ratios of B/M, C/P and E/P. The stocks in the portfolios are value-weighted and the positions are held over the following 12 months, when the portfolios are formed again. A value portfolio contains the top 10% of stocks ranked by

[2] The return series of portfolios are downloaded from Kenneth R. French's website: Data are obtained from http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html.

each ratio and a growth portfolio contains stocks in the bottom 10%. The full sample period for B/M portfolios runs from July 1926 to June 2006 for consistency with the studies of Fama and French (2005) and Ang and Chen (2003). For the C/P- and E/P -sorted portfolios, the sample covers the period July 1963 to June 2006.

In order to provide comparative evidence for a different market, we obtain the UK return series of the value and growth portfolios sorted on B/M, C/P and E/P, also from Kenneth R. French's website. However, the ranking method for the UK value and growth portfolios is slightly different to that of the US portfolios. At the end of December each year, all stocks listed on the UK stock market are ranked into 3 groups based on the ratios of B/M, C/P and E/P. The value portfolio is constructed to contain stocks in the top 30% after ranking according to each ratio and the growth portfolio contains stocks in the bottom 30%. The sample period runs from January 1975 to December 2002.

Possibly due to the different ranking method and sample period, we find that the high B/M portfolio does not significantly outperform the low B/M portfolio for the UK data over the 1975 to 2001 period. Fama and French (1998) report a similar result for the period 1975 to 1995. By contrast, Dimson, Nagel and Quigley (2003) show a strong value premium (when value is measured by B/M) in the UK stock market over the period 1955 to 2001. Their value (growth) portfolio contains stocks in the top (bottom) 40% by B/M ranking. In order to investigate this value premium, in all subsequent tests using UK data in this study, we use the same return series of value and growth portfolios sorted on B/M as employed in the study of Dimson, Nagel and Quigley (2003).[3] The sample covers the period January 1963 to December 2001.

3. The US Value Premium Sorted on B/M, C/P and E/P

The core objective of this study is to examine whether time-varying risk can explain the post-1963

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[3] Data are obtained from Stefan Nagel's web site: http://faculty-gsb.stanford.edu/nagel/index.htm.

value premium. However, before moving on to this, we first analyze the mean returns on the US B/M, C/P and E/P portfolios and then examine their performance within the static CAPM. Next, we allow for time-varying risk of the value, growth and HML portfolios through different GARCH model specifications. Finally, we add a size factor to the conditional variance model.

3.1. The Mean Return on Value and Growth Portfolios

Table 1 presents summary statistics for the monthly returns on the US B/M, C/P and E/P portfolios. *High* represents a value portfolio containing stocks in the top 10% of each ratio, while *Low* represents a growth portfolio containing stocks in the bottom 10% of each ratio. HML measures the value premium as the return on a portfolio that is long value stocks and short growth stocks. To be more comparable with the studies of Fama and French (2005) and Ang and Chen (2003), we explore the monthly return on B/M-sorted portfolios for the full sample period from July 1926 to June 2006 (hereafter 26-06), and two sub-sample periods from July 1926 to June 1963 (hereafter 26-63) and from July 1963 to June 2006 (hereafter 63-06). For the C/P and E/P portfolios, the sample period covers July 1963 to June 2006. The *t*-statistics reported in Table 1 are for the significance of the mean based on heteroskedasticity- and autocorrelation-robust (Newey and West, 1987) standard errors.

Consistent with the evidence in Fama and French (1992, 1993 and 2005), Davis, Fama and French (2000) and Ang and Chen (2003), we find that the growth portfolio has low mean returns, ranging from 0.81% to 0.93% per month on the B/M-sorted portfolios. In contrast, the value portfolio has high mean returns from 1.39% to 1.43% per month. As a result, there is a reliable value premium in returns. The value premium is 0.54% per month on average over the period 26-06 and is significant at the 5% level (t = 2.49). For the two sub-samples, the value premium is 0.5% (t = 1.23) and 0.57% (t = 2.88) per month over the 26-63 and 63-06 periods, respectively. The monthly mean returns of the C/P and E/P sorted portfolios are of a similar magnitude to those of the B/M portfolios over the same sample period.

The estimates of monthly standard deviation suggest that the average level of total risk has changed over time. The average standard deviation of the B/M value portfolio is 12.57% per month over the period 26-63 and only 5.34% per month over the period 63-06. Similarly, for the B/M growth portfolio, it is 6.39% per month for 26-63 and 5.18% per month for 63-06. In addition, the results also show that the value portfolio has more total risk than the growth portfolio over the early period 26-63; but over the period 63-06, the average standard deviations of the value and growth portfolios are almost the same. Consequently, the value premium of 26-63 has more total risk attached than that of 63-06. The average standard deviation of the HML portfolio is 8.55% per month for 26-63 and 4.52% per month for 63-06. Similar levels of total risk are reported over the period 63-06 on the C/P and E/P sorted portfolios.

3.2. The Static CAPM

Table 2 reports OLS estimates of the static CAPM for the B/M, C/P and E/P portfolios. The results confirm the findings of Fama and French (1992, 1993 and 2005) and Ang and Chen (2003) that the (B/M) value premium of 26-06 and 26-63 can be explained by the static CAPM as the α coefficient is 0.25% per month (t = 1.36) for 26-06 and -0.13% per month (t = -0.43) for 26-63. In particular, the t-statistic shows that both the α coefficients are statistically insignificant. On the other hand, the static CAPM is rejected for the B/M, C/P and E/P value premia of 63-06 since the α coefficients at 0.62%, 0.59% and 0.69% per month respectively are significant at the 1% level. The goodness of fit statistics confirm this finding. The R-squared values are much higher in periods when the static CAPM captures the value premium (13% to 31% for the periods 26-06 and 26-63, versus 1% to 5% only for the period 63-06 and for the B/M, C/P and E/P-sorted value premia).

The market risk as measured by beta also changes over time. The CAPM beta of the B/M value portfolio decreases from 1.7 for 26-63 to 0.98 for 63-06. Conversely, the estimated beta of the B/M growth portfolio increases from 0.96 for 26-63 to 1.09 for 63-06. Over the 26-63 period, the value portfolio has higher market risk than the growth portfolio. However, over the 63-06 period, the value portfolio has less market risk than the growth portfolio. As a result, the market beta of the B/M HML portfolio is positive and significant for 26-63, (β = 0.74, t = 5.95), while it is negative and insignificant for 63-06 (β = -0.11, t = -1.69). Similarly, the market betas of the C/P and E/P HML portfolios are also negative and significant at the 1% level. These results suggest that beta cannot explain the positive value premium of 63-06.

If the static CAPM is an adequate characterization of the temporal variation in returns, the variances of the error terms should be constant. This motivates us to perform a series of Lagrange Multiplier (LM) tests to assess the validity of the static CAPM under the null hypothesis that there is no autoregressive conditional heteroskedasticity (ARCH) (Engle, 1982) in the errors. Following previous studies in the time-series literature, we test for ARCH-effects of order up to 5. The test statistic is asymptotically distributed as a χ^2 with 5 degrees of freedom under the null hypothesis of no ARCH. The results, reported in Table 2, clearly indicate that the B/M, C/P and E/P value, growth and HML portfolios over the 63-06 period show substantial evidence of ARCH effects as all the LM statistics are significant at the 5% level. Conversely, the LM statistics of the B/M portfolios over the earlier 26-63 period are statistically insignificant. Therefore, it is perhaps no surprise that the static CAPM cannot explain the post-1963 value premium but can capture the value premium of 26-63.

3.3. The CAPM within a GARCH Framework

In order to allow for heteroskedasticity (and autocorrelation) in the errors of the CAPM models for the post-1963 value, growth and HML portfolios, we assume that the conditional variances of portfolio returns follow a GARCH (1, 1) process. Table 3 presents the estimates of Models 2 to 7 for the value, growth and HML portfolios over the 63-06 period. The decision to allocate a stock to either the value or growth portfolio is based on B/M in Panel A, on C/P in Panel B and on E/P in Panel C. The estimation method in this table is Maximum Likelihood with Bollerslev-Wooldridge robust standard errors. Akaike information criterion (*AIC*) values are also reported in Table 3.[4] A model with the lowest value of *AIC* is preferred.

Portfolios Sorted on B/M

Table 3, Panel A, Model 2 reports the estimates of the conditional CAPM with a standard GARCH (1, 1) specification. The market beta of the value portfolio is 0.96 (t = 28.04) and of the growth portfolio is 1.09 (t = 48.91). Clearly, the value portfolio has less market risk than the growth portfolio and beta has strong explanatory power for the separate value and growth portfolio returns. However, the beta of the HML portfolio is negative (β = -0.07, t = -1.5), implying that the CAPM cannot explain the positive B/M value premium. The γ coefficient measures the impact of recent information on volatility and is equal to 0.13 for the value portfolio and 0.04 for the growth portfolio, indicating that recent information has stronger impact on the volatility of the value portfolio than on that of the growth portfolio. The θ coefficient captures the impact of historical information on volatility and is equal to 0.85 for the value portfolio and 0.94 for the growth portfolio, suggesting that older information has less influence on the volatility of the value portfolio than on that of the growth portfolio. The positive and significant coefficients γ and θ also suggest that both historical and more recent information have strong impact on the volatility of the value, growth and HML portfolios.

Model 3 allows good news and bad news to have an asymmetric impact on volatility of portfolio returns by adding a leverage effect term, $\eta I_{t-1}\varepsilon_{t-1}^2$, to the variance equation of Model 2. The estimated value of this parameter for the value portfolio is 0.07, which is statistically insignificantly

[4] *AIC* is a function of the maximized value of the log-likelihood function and is used to compare the relative merits of models. The rationale for reporting *AIC* instead of R^2 is that the former is designed for any model while the latter is only applicable for linear regression models and will not reflect any goodness of fit in the conditional variance equation.

different from zero (t = 1.01). Thus, no matter whether the announcement represents good news or bad news, the impact on the volatility of the value portfolio is symmetric. On the other hand, η for the growth portfolio is -0.05, which is statistically significant at the 5% level. Therefore, after an announcement of good news, the volatility of the growth portfolio increases more than after the announcement of bad news.

In models 4 and 5, we add a time-varying risk term, $\delta\sigma_t$, to the mean equations of Models 2 and 3. The results show that the excess return on the value portfolio is positively related to its time-varying premium as the δ coefficient of Model 4 is 0.35 (t = 2.16) and of Model 5 is 0.33 (t = 2.07). Conversely, the excess return on the growth portfolio is negatively related to its premium as the δ coefficient of Model 4 is -0.32 (t = -2.04) and of Model 5 is -0.23 (t = -1.69). While a negative premium on time-varying total risk for the growth portfolios might at first blush appear counter-intuitive, this result is entirely consistent with that of Hirt and Pandher (2005), who show that idiosyncratic risk is negatively priced in S&P 500 stocks. This can be attributed to the key characteristic of S&P 500 companies that they have low book-to-market ratios, high price-to-earnings ratios and low cashflow-to-price ratios - i.e., that they are growth stocks.

Therefore, once we explicitly model the time-varying total risk of the value and growth portfolios, the value portfolio appears to command a higher risk premium than the growth portfolio ($\delta_{value} > \delta_{growth}$). As a result, the expected return on the HML portfolio is positively and significantly related to its time-varying risk and the δ coefficients of Model 4 is 0.50 (t = 2.46) and of Model 5 is 0.46 (t = 2.36), respectively. These findings suggest that the value premium could in part be the result of increased levels of risk, as modeled by the conditional standard deviation of the HML portfolio returns. More importantly, the α coefficient of Model 4 supports the hypothesis that indeed conditional risk is the reason behind the better performance of value stocks in Table 1. Once the portfolio-specific time-varying risk of the value and growth stocks is explicitly modeled, the alpha of the value portfolio drops from 0.46% a month in Table 2 to -0.49% in Table 3 (Model 4).

Similarly, the risk-adjusted return of the growth stocks in Table 3 (0.45%) is much higher than the CAPM suggested (-0.16% in Table 2). Interestingly, the alpha of the value portfolio is statistically insignificant in Table 3, while it was positive at the 1% level in Table 2. Similarly, the alpha of the growth portfolio in Table 3 is indistinguishable from 0, while it was negative and significant at the 10% level in Table 2. Results that are qualitatively similar are obtained from alternative specifications of the model. Altogether, the evidence in Table 3 suggests that the conditional CAPM with a (GJR-) GARCH-M (SD) specification is able to capture the expected returns on the value and growth portfolios.

Models 6 and 7 use the conditional variance to replace the conditional standard deviation as a time-varying measure of risk in the mean equations of Models 4 and 5. Most of the estimates from these two models are similar to those of Models 4 and 5. The time-varying risk premium coefficient, v, of the HML portfolio is 5.63 (t = 2.48) for Model 6 and 5.28 (t = 2.46) for Model 7. Both of them are statistically significant at the 5% level. The null hypothesis of $\alpha = 0$ is also supported by Models 6 and 7 not only for the value and growth portfolios, but also for the HML portfolio. The α coefficient of the HML portfolio is -0.45% (t = -1.07) per month for Model 6 and -0.44% (t = -1.12) per month for Model 7. The *AIC* results also support the finding that Models 6 and 7 are the preferred models for capturing the value premium since they have the lowest *AIC* figures.

Portfolios sorted on C/P and E/P

Panels B and C present similar results as in Panel A, but this time we sort stocks into value or growth portfolios based on their C/P and E/P ratios, respectively. Like the B/M portfolios, the value portfolio has less market risk than the growth portfolio since the average CAPM beta is 0.98 (1.03) for the C/P (E/P) value portfolio and 1.17 (1.15) for the C/P (E/P) growth portfolio. As the beta of the HML portfolio is negative and significant at the 10% level, the CAPM fails to explain the positive C/P and E/P value premium. The risk premium coefficients, δ and v, are positive for the value portfolio and negative for the growth portfolio as for the B/M sort. This suggests that the value portfolio is more risky than the growth portfolio in the sense of time-varying total portfolio risk. Therefore, the superior return on the value portfolio may be a compensation for the additional risk of holding value stocks. Time-varying total risk plays a central role in explaining the C/P and E/P value premium as the risk premium coefficients of Model 6 (v = 4.52 in Panel B and v = 5.44 in Panel C) and Model 7 (v = 4.4 in Panel B and v = 5.26 in Panel C) are statistically significant at either the 1% or 10% level.

Most interestingly, the difference in time-varying total risk explains most of the difference in abnormal returns that was observed in Table 2. Indeed, most of the α coefficients of the CAPM with the (GJR-) GARCH (1, 1)-M (SD) and (GJR-) GARCH (1, 1)-M (V) specifications (Models 4 to 7) are statistically insignificant for the C/P and E/P value and growth portfolios. The alpha of the C/P HML portfolio in Panel B is -0.18% (t = -0.5) per month for Model 6 and -0.19% (t = -0.53) per month for Model 7. The alphas of the E/P HML portfolio in Panel C are insignificant even at the 10% level for Models 6 and 7. Clearly, the conditional CAPM with a (GJR-) GARCH(1, 1)-M (V) specification not only explains the returns on value and growth portfolios, but can also captures the C/P and E/P value premium. The *AIC* values for the HML portfolios in Panels B and C also suggest that Model 6, the CAPM with GARCH(1, 1)-M (V) terms, best captures the value premium. Overall, the results of the C/P and E/P portfolios are consistent with our findings for the B/M portfolios that once time-varying total portfolio risk is taken into account, the value premium disappears.[5]

3.4. The CAPM and Conditional Variance Model Including a Size Factor

Loughran (1997), Daniel and Titman (1997), Davis, Fama and French (2000), and Fama and French (2005) report that the post-1963 value premium is greater for small capitalization stocks than for

[5] In addition, we carry out a series of ARCH LM test for the residuals of Models 2 to 7 for the value, growth and HML portfolios and find that the test statistics are statistically insignificant, suggesting that there is no evidence of ARCH effects in the errors after using GARCH (1, 1) specifications.

large capitalization stocks. Their results raise a question whether the size effect can explain the post-1963 value premium. We examine this hypothesis by adding a Fama and French (1993)-style size factor into Models 2 to 7 described above. This leads to:

$$r_{Pt} = \alpha + \beta_m \left(R_{Mt} - R_{ft}\right) + \beta_{SMB} SMB_t + \delta\sigma_{Pt} + \nu\sigma_{Pt}^2 + \varepsilon_{Pt}$$
$$\sigma_{Pt}^2 = \omega + \gamma\varepsilon_{Pt-1}^2 + \eta I_{t-1}\varepsilon_{Pt-1}^2 + \theta\sigma_{Pt-1}^2 \qquad (10)$$

where $\varepsilon_{Pt} \sim N\left(0, \sigma_{Pt}^2\right)$, SMB_t is the Fama and French (1993) size factor and β_{SMB} measures portfolio loadings on *SMB*. All other notation is as described above with either $\delta = 0$, $\nu = 0$ or $\delta = \nu = 0$.

Table 4 presents estimates of this model for the value, growth and HML portfolios. Panels A, B and C report the results for the B/M, C/P and E/P portfolios, respectively. Irrespective of the firm characteristics used, the size loadings on the value portfolios are positive at the 1% level and exceed those of the growth portfolios, suggesting that value stocks are smaller than growth stocks. As a result, the B/M HML portfolios load positively on SMB at the 1% level. β_{SMB} is positive too for the E/P and C/P HML portfolios in Panels B and C, albeit insignificant. With only a few exceptions, the AIC criterions in Table 4 tend to favor the models with SMB over the models that exclude the size premium in Table 3. This suggests that the size effect may explain part of the value effect. However, the α coefficients of Models 2 and 3 are significant at the 5% level in all three panels, suggesting that the specification of the CAPM that includes the size premium does not capture the post-1963 B/M, C/P and E/P value premium. Like in Lakonishok, Shleifer and Vishny (1994), the size effect cannot fully explain the value premium.

Interestingly, the evidence on time-varying total risk from Table 3 seems to hold in Table 4 when the size factor is added to the CAPM with a (GJR)-GARCH-M specification. In particular and with only two exceptions[6], the α coefficients of Models 4 to 7 for the HML portfolios are zero in statistical terms in Table 4 and the time-varying risk premia (δ and ν) associated with the value-minus-growth portfolios are positive and, for the most part, significant at the 10% level or better. This tells us that the difference in time-varying total risk explains the difference in abnormal returns that was observed in Table 2. To put it differently, irrespectively of whether size is treated as a risk factor, the value premium is a compensation for the additional time-varying risks that is borne on value stocks.

4. UK Evidence

Using US data, we showed above that the 1963-2006 value premium can be fully explained by a conditional model incorporating a GARCH-in-mean specification. However, in order to ensure that these results are not an artifact unique to this market, in this section we conduct a comparison in which we reapply the models to the UK market.

Table 5, Panel A reports summary statistics for monthly returns on the UK value, growth and HML portfolios and tests the ability of the standard CAPM to explain the value premium. Consistent with the US evidence, we find that the value premia in returns are 0.5%, 0.42% and 0.36% per month for the B/M, C/P and E/P HML portfolios respectively. They are statistically significant at the 10% level. The average unconditional standard deviation of the value portfolio is similar to that of the growth portfolio. For instance, the average standard deviation equals 5.22% per month for the B/M value portfolio and 5.26% per month for the B/M growth portfolio. Thus the UK results again confirm that the value premium is not a compensation for total unconditional risk.

OLS estimates of the static CAPM for the UK B/M, C/P and E/P portfolios are presented in Table 5,

[6] The exceptions are for the alphas of the E/P HML portfolios measured from models 4 and 5, which happened to be negative.

Panel B. The alpha estimates for the B/M, C/P and E/P HML portfolios are 0.52%, 0.77% and 0.60% per month respectively; all of these are significant at the 5% level. These results provide comparative evidence that the static CAPM is also rejected for the UK value premium. The CAPM betas of the HML portfolios are also statistically insignificant. In order to examine the statistical validity of the static CAPM for UK data, Table 5, Panel B also reports the ARCH-LM statistics and their associated *p*-values. The results show that all the UK value, growth and HML portfolios, whether they are sorted on B/M, C/P or E/P, have ARCH effects in their errors since the LM statistics are statistically significant at the 5% level or better in all cases. Therefore, using the static CAPM to explain the returns on the value, growth and HML portfolios could lead to misleading inferences.

Table 6 presents the parameter estimates for Models 2 to 7 for the UK value, growth and HML portfolios. Overall, the UK results fully support the conclusions from the US data. The CAPM betas of the value and growth portfolios are almost the same; both of them are positive and significant at the 1% level, confirming that beta plays an important role in explaining the temporal returns on the individual value and growth portfolios. However, it cannot explain the value premium since the betas of the HML portfolios are statistically insignificant at the 5% level. The risk premium coefficients, δ and v, of Models 4 to 7 are positive for the value portfolio and negative for the growth portfolio, suggesting that the value portfolio is more risky than the growth portfolio. The most interesting result is that the GARCH-in-mean models with either the standard deviation or the variance specifications (Models 4 to 7) are able to capture the temporal variation in returns on the value and growth portfolios. The models are also able to explain the value premium since with only one exception (the B/M value portfolio from Model 4), the hypothesis that $\alpha = 0$ is uniformly supported at the 5% level for the value, growth and HML portfolios whatever method is used for defining value. The *AIC* results show that the CAPM with GJR-GARCH (1, 1) - M (SD) specification is the preferred model for the B/M HML portfolio and the CAPM with (GJR-) GARCH (1, 1)-M (V) specification should be chosen for the C/P and E/P HML portfolios.

5. Analysis of Results

How can the result that time-varying measures of total risk fully explain the value premium be rationalized? A tempting first response would be to suggest that the time-varying total risks are related to the business cycle, as Zhang (2005) proposed. The intuition behind his assertion is that the risk premium is counter-cyclical – that is, it is higher when the economy is in recession, and also that reversing existing investments in capital by firms is costly. Therefore, in bad states of the economy, value firms will be burdened by more capital than they need but face large costs if they wish to reduce capacity. Growth firms, on the other hand, hold options to expand but will not have such excess capacity when demand falls. The time-varying nature of the risk premium implies that the relatively high cost of this capital for value firms will be most severe exactly when it is least productive. The implication is then that value firms are indeed more risky than growth firms when risk is thought of as the possibility that the firm will be stuck with excess capacity that it cannot use or sell off. However, given our definition of value and growth firms, this explanation was essentially ruled out in the early paper by Lakonishok, Schleifer and Vishny (1994), since value strategies tend to outperform in all states of the business cycle.

An alternative explanation of the value premium relates to the literature on idiosyncratic risk. There is a considerable debate about whether this source of risk is priced in financial asset markets (see, for example, Goyal and Santa-Clara, 2003; Bali, Cakici, Yan and Zhang, 2005; Hirt and Pandher, 2005; Ghysels, Santa-Clara and Valkanov, 2005; Diavatopoulos, Doran and Peterson, 2006; Jiang and Lee, 2007; Bali and Cakici, 2007). If indeed it is, it may be the case that the HML premium is a compensation for the time-varying idiosyncratic risk inherent in the value-minus-growth portfolio. Thus, while the CAPM in both its conditional and unconditional forms provided insufficient explanatory power, this may have arisen because it embodies the wrong measure of risk, and it is in fact unsystematic rather than systematic risk that holds the key. This explanation follows from viewing the firm's equity as a call option on the value of its assets (Merton, 1974). Applying Merton's theory of the firm to our present setting helps us understand the positive relationship that we identified between the idiosyncratic risk of value stocks and their average returns. Since value stocks present characteristics that one naturally would associate with financial distress (Chen and Zhang, 1998), one can argue that value managers, who own a call option on the value of the firm, may select risky projects with excessive idiosyncratic risk in an attempt to resurrect their companies. Indeed, if the high risk projects turn out to be successes, shareholders will enjoy the profits. However, in case of distress, the shareholders can invoke their limited liability and thus will not bear the downside risks. This could legitimate our finding that the premium on value stocks is a compensation for excessive time-varying idiosyncratic risk. Along the same lines, since growth companies face a lower probability of default (Chen and Zhang, 1998), growth shareholders have contingent claims on the firm's assets that are relatively less valuable than their value peers. As a result and in line with our finding, they are less likely to excessively increase the idiosyncratic risk of the firm by undertaking projects with high earning risks and consequently demand a lower premium on their equity claim.

Relatedly, it may be that while the value and growth portfolios comprise sufficiently large numbers of stocks that most academics and market practitioners would consider them well diversified, the compositions are not proportionately stratified from an industrial perspective. It is widely known that value portfolios tend to attach disproportionately large weights to utilities, mining, and basic manufacturing companies whereas growth portfolios imply disproportionately large bets on technology, software, advertising and pharmaceutical companies, for example. To the extent that the compositions of the value and growth portfolios have changed over time, an increasing polarization in the nature of value and growth companies may have occurred in a way that is unrelated to the CAPM beta, leading to a non-trivial level of unsystematic risk in these two portfolios that has not been fully diversified away, and which is thus priced in the market.

6. Conclusions

The puzzle that the static CAPM fails to capture the post-1963 value premium, variously defined, has been a concern in the financial literature for over a decade. This paper examines the value premium by assuming that the conditional variance of portfolio returns follows a GARCH-M process. Our results show that this specification can fully explain the value premium and hence the premium can be viewed as a compensation for time-varying risk. These findings are robust to different characteristics of value and growth stocks and to the use of data from the US and UK stock markets. Our results confirm that the size effect can explain part of the value premium when it is defined using B/M, but it does not account for the value premium defined by C/P and E/P.

After taking account of total time-varying risk, the value portfolio does not have higher market risk than the growth, although the CAPM beta still has strong explanatory power for the returns on the individual value and growth portfolios. This appears to support the finding of the previous studies (see for example Jagannathan and Wang, 1996; Lettau and Ludvigson, 2001; and Adrian and Franzoni, 2005) that a conditional model with time-varying risk performs well in explaining cross-sectional expected returns. On the other hand, our results show that the market betas are negative or insignificant for the HML portfolios. Therefore, even after allowing betas to vary over time, Lewellen and Nagel (2006), Fama and French (2005), and Petkova and Zhang (2005) find that the conditional CAPM still fails to explain asset-pricing anomalies. We conjecture that the importance of time-varying total risk in explaining the value premium may arise from its ability to capture the unsystematic risk present in the value and growth portfolios. Our results are indeed consistent with the idea that, because value stocks are more distressed than their growth counterparts, value managers are more likely to gamble for survival by undertaking projects with high earning risks. This could translate as in our setting into higher conditional idiosyncratic risks, and thus into a higher risk premium on value stocks.

Fama and French (1996) conjectured that the value premium is priced as a risk factor because it is related to investment opportunities, a suggestion that was given credence empirically by Hahn and Lee (2006) and Petkova (2006) using financial variables that can capture such opportunities. Our primary finding that the value premium is highly positively correlated with its time-varying volatility is also consistent with this notion.

Finally, our analysis focuses on the time-series relation between the value premium and time-varying unsystematic risk. We do not attempt here to explain the cross-sectional pricing of size and value sorted portfolios within a (GJR)-GARCH-M model. Given recent finding on the cross-sectional pricing of idiosyncratic risk (Fu, 2005), we see this topic as an interesting avenue for future research.

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Table 1
Summary Statistics for Monthly Returns on US Value, Growth and HML Portfolios

This table reports the monthly mean returns (%), standard deviations (Std Dev, %) and *t*-statistics for the significance of the mean for the value-weighted portfolios. At the end of June each year during the sample period, all stocks listed on NYSE, AMEX and Nasdaq are ranked into 10-decile portfolios based on the ratios of B/M, C/P and E/P. B/M is the ratio of the book value of equity to market value of equity, C/P is the ratio of cash flow to market value of equity, E/P is the ratio of earnings to market value of equity. *High* represents a value portfolio containing stocks in the top 10% by each ratio. *Low* represents a growth portfolio containing stocks in the bottom 10%. *HML* (high minus low) is a portfolio that is long value and short growth. The full sample period for B/M portfolios runs from July 1926 to June 2006, and two sub-sample periods run from July 1926 to June 1963 and from July 1963 to June 2006. The sample period for C/P and E/P portfolios runs from July 1963 to June 2006. The *t*-statistics in parentheses are based on Newey-West standard errors.

	B/M Portfolio			**C/P Portfolio**			**E/P Portfolio**		
	High	*Low*	*HML*	*High*	*Low*	*HML*	*High*	*Low*	*HML*
7/1926-6/2006				*7/1963-6/2006*			*7/1963-6/2006*		
Mean (%)	1.40	0.87	0.54	1.33	0.84	0.49	1.42	0.82	0.60
t-statistic	(4.63)	(4.65)	(2.49)	(6.03)	(3.42)	(2.58)	(6.12)	(3.24)	(2.96)
Std Dev (%)	9.40	5.77	6.69	5.01	5.58	4.30	5.27	5.74	4.60
7/1926-6/1963									
Mean (%)	1.43	0.93	0.50						
t-statistic	(2.39)	(3.05)	(1.23)						
Std Dev (%)	12.57	6.39	8.55						
7/1963-6/2006									
Mean (%)	1.39	0.81	0.57						
t-statistic	(5.90)	(3.58)	(2.88)						
Std Dev (%)	5.34	5.18	4.52						

Table 2
Estimates of the Static CAPM for US Value, Growth and HML Portfolios

The table reports coefficient estimates of the static CAPM, given by

$$r_{Pt} = \alpha + \beta(R_{Mt} - R_{ft}) + \varepsilon_{Pt}$$

where r_{Pt} is either the excess returns on the value and growth portfolios or the return on the high-minus-low portfolio, R_{Mt} is the value-weighted return on the market portfolio of all assets, R_{ft} is the three-month Treasury bill rate. α (%) measures the abnormal performance of the portfolio, β measures the market risk of the portfolio. R^2 is used to compare the goodness-to-fit of the model. At the end of June each year during the sample period, all stocks listed on NYSE, AMEX and Nasdaq are ranked into 10-decile portfolios based on the ratios of B/M, C/P and E/P. *High* represents a value portfolio containing stocks in the top 10% by each ratio. *Low* represents a growth portfolio containing stocks in the bottom 10%. *HML* (high minus low) is a portfolio that is long value and short growth. White's heteroscedasticity robust *t*-statistics are in parentheses. *LM* are autoregressive conditional heteroskedasticity (ARCH) Lagrange Multiplier test statistics for the null hypothesis that there is no ARCH up to order 5 in ε_{Pt}. Associated *p*-values are in brackets.

	B/M Portfolio			C/P Portfolio			E/P Portfolio		
	High	*Low*	*HML*	*High*	*Low*	*HML*	*High*	*Low*	*HML*
7/1926-6/2006				*7/1963-6/2006*			*7/1963-6/2006*		
α (%)	0.17	-0.09	0.25	0.41	-0.18	0.59	0.48	-0.21	0.69
	(1.11)	(-1.45)	(1.36)	(3.48)	(-1.97)	(3.22)	(3.73)	(-2.04)	(3.45)
β_M	1.45	1.00	0.44	0.96	1.18	-0.22	1.00	1.20	-0.19
	(17.06)	(58.62)	(4.51)	(22.34)	(46.60)	(-3.45)	(22.51)	(39.84)	(-2.84)
R^2	0.70	0.90	0.13	0.71	0.86	0.05	0.70	0.84	0.03
LM	23.01	26.43	23.84	27.82	12.70	26.07	82.72	25.91	70.15
	[0.00]	[0.00]	[0.00]	[0.00]	[0.03]	[0.00]	[0.00]	[0.00]	[0.00]
7/1926-6/1963									
α (%)	-0.14	0.00	-0.13						
	(-0.51)	(-0.04)	(-0.43)						
β_M	1.70	0.96	0.74						
	(15.63)	(47.28)	(5.95)						
R^2	0.76	0.94	0.31						
LM	4.51	8.45	3.58						
	[0.21]	[0.13]	[0.31]						
7/1963-6/2006									
α (%)	0.46	-0.16	0.62						
	(3.31)	(-1.87)	(3.15)						
β_M	0.98	1.09	-0.11						
	(21.10)	(44.64)	(-1.69)						
R^2	0.65	0.86	0.01						
LM	27.24	10.94	19.26						
	[0.00]	[0.05]	[0.00]						

Table 3
Estimates of the Conditional Model with GARCH-M Specifications for the US Value Premium

The table reports coefficient estimates for Models 2 through 7 for value, growth and HML portfolios. The models are defined by:

$$r_{Pt} = \alpha + \beta_M \left(R_{Mt} - R_{ft}\right) + \delta\sigma_{Pt} + \nu\sigma_{Pt}^2 + \varepsilon_{Pt}$$
$$\sigma_{Pt}^2 = \omega + \gamma\varepsilon_{Pt-1}^2 + \eta I_{t-1}\varepsilon_{Pt-1}^2 + \theta\sigma_{Pt-1}^2$$

where $\varepsilon_{Pt} \sim \left(0, \sigma_{Pt}^2\right)$, where r_{Pt} is either the excess returns on the value and growth portfolios or the return on the high-minus-low portfolio, R_{Mt} is the value-weighted return on the market portfolio of all assets, R_{ft} is the three-month Treasury bill rate. α (%) measures the abnormal performance of the portfolio, β_M measures the market risk of the portfolio, $\delta\sigma_{Pt}$ and $\nu\sigma_{Pt}^2$ (with either $\delta = 0$ or $\nu = 0$) are the two competing estimates of the risk premium, ω, γ, η and θ are estimated parameters and $\omega > 0$, $0 \le \gamma < 1$, $0 \le \theta < 1$, $\gamma + \eta/2 + \theta < 1$, I_{t-1} takes a value of 1, when ε_{t-1} is negative and a value of 0, otherwise. At end of June each year during the sample period, all stocks listed on NYSE, AMEX and Nasdaq are ranked into 10-decile portfolios based on the ratios of B/M, C/P and E/P. B/M is the ratio of book value of equity to market value of equity, C/P is the ratio of cash flow to market value of equity, E/P is the ratio of earnings to market value of equity. *High* represents a value portfolio containing stocks in the top 10% by each ratio. *Low* represents a growth portfolio containing stocks in the bottom 10%. *HML* (high minus low) is a portfolio that is long value and short growth. The sample period runs from July 1963 to June 2006. Akaike's information criterion (*AIC*) is based on the maximized value of the log-likelihood function and is used to select the preferred model, which will have the lowest value. Bollerslev-Wooldridge robust *t*-statistics are in parentheses.

Panel A: B/M Portfolios

	High						*Low*						*HML*					
	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
α (%)	0.46	0.41	-0.49	-0.48	0.08	0.07	-0.12	-0.11	0.45	0.30	0.27	0.18	0.52	0.46	-1.51	-1.39	-0.45	-0.44
	(3.51)	(3.34)	(-1.12)	(-1.11)	(0.37)	(0.31)	(-1.45)	(-1.37)	(1.58)	(1.20)	(1.43)	(1.08)	(2.97)	(2.60)	(-1.81)	(-1.76)	(-1.07)	(-1.12)
β_M	0.96	0.96	0.96	0.96	0.96	0.96	1.09	1.10	1.09	1.09	1.09	1.09	-0.07	-0.08	-0.07	-0.08	-0.07	-0.08
	(28.04)	(28.26)	(28.20)	(28.40)	(27.88)	(28.14)	(48.91)	(46.54)	(49.36)	(47.11)	(49.42)	(47.41)	(-1.50)	(-1.64)	(-1.45)	(-1.60)	(-1.44)	(-1.59)
δ			0.35	0.33					-0.32	-0.23					0.50	0.46		
			(2.16)	(2.07)					(-2.04)	(-1.69)					(2.46)	(2.36)		
ν					4.68	4.29					-11.30	-8.64					5.63	5.28
					(1.88)	(1.79)					(-2.21)	(-1.83)					(2.48)	(2.46)
ω (%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
	(1.48)	(1.33)	(1.55)	(1.54)	(1.55)	(1.54)	(1.95)	(1.68)	(1.81)	(1.73)	(2.57)	(2.31)	(1.66)	(1.36)	(1.70)	(1.70)	(1.71)	(1.72)
γ	0.13	0.10	0.13	0.10	0.13	0.10	0.04	0.04	0.04	0.04	0.04	0.04	0.10	0.06	0.09	0.06	0.10	0.06
	(3.53)	(2.43)	(3.77)	(2.61)	(3.65)	(2.60)	(2.45)	(2.42)	(2.73)	(2.58)	(2.72)	(2.64)	(3.43)	(2.18)	(3.57)	(2.29)	(3.57)	(2.37)
η		0.07		0.06		0.06		-0.05		-0.04		-0.04		0.07		0.05		0.05
		(1.01)		(0.95)		(0.96)		(-1.98)		(-1.84)		(-1.78)		(1.58)		(1.31)		(1.34)
θ	0.85	0.85	0.85	0.85	0.85	0.85	0.94	0.96	0.94	0.96	0.94	0.96	0.87	0.88	0.88	0.89	0.88	0.89
	(18.84)	(19.39)	(21.93)	(22.49)	(20.81)	(21.27)	(44.35)	(59.51)	(43.52)	(59.18)	(51.25)	(66.59)	(22.33)	(26.70)	(25.93)	(30.41)	(26.27)	(31.22)
$\gamma+\eta/2+\theta$	0.977	0.982	0.981	0.981	0.979	0.980	0.974	0.983	0.977	0.982	0.978	0.981	0.971	0.981	0.972	0.975	0.973	0.976
AIC	-4.177	-4.178	-4.181	-4.181	-4.179	-4.180	-5.040	-5.046	-5.043	-5.045	-5.045	-5.046	-3.433	-3.435	-3.440	-3.440	-3.441	-3.441

Panel B: C/P Portfolios

	High						*Low*						*HML*					
	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
α (%)	0.28	0.30	-0.27	-0.27	-0.02	0.00	-0.14	-0.13	0.50	0.40	0.23	0.19	0.46	0.43	-0.66	-0.61	-0.18	-0.19
	(2.30)	(2.78)	(-0.61)	(-0.63)	(-0.07)	(0.01)	(-1.80)	(-1.57)	(1.63)	(1.34)	(1.36)	(1.14)	(2.78)	(2.67)	(-0.98)	(-0.91)	(-0.50)	(-0.53)
β_M	0.97	0.98	0.98	0.98	0.98	0.98	1.17	1.17	1.17	1.17	1.17	1.17	-0.19	-0.19	-0.18	-0.18	-0.18	-0.18
	(32.13)	(32.97)	(31.71)	(32.62)	(31.90)	(32.77)	(55.20)	(55.68)	(54.44)	(54.83)	(54.32)	(54.72)	(-4.01)	(-3.93)	(-3.74)	(-3.73)	(-3.75)	(-3.73)
δ			0.24	0.25					-0.34	-0.29					0.31	0.29		
			(1.24)	(1.35)					(-2.06)	(-1.77)					(1.68)	(1.61)		
ν					5.17	5.27					-10.13	-8.82					4.52	4.40
					(1.46)	(1.55)					(-2.21)	(-1.97)					(1.95)	(1.93)
ω (%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	(2.27)	(2.28)	(2.31)	(2.24)	(2.29)	(2.20)	(2.39)	(2.11)	(2.26)	(2.25)	(2.71)	(2.64)	(2.33)	(2.14)	(2.30)	(2.34)	(2.29)	(2.35)
γ	0.08	0.11	0.08	0.11	0.08	0.11	0.07	0.08	0.07	0.08	0.07	0.08	0.08	0.05	0.08	0.06	0.08	0.06
	(2.99)	(2.46)	(3.16)	(2.64)	(3.17)	(2.63)	(3.05)	(2.94)	(3.12)	(2.89)	(3.16)	(2.93)	(2.91)	(1.57)	(3.05)	(1.74)	(3.08)	(1.73)
η		-0.04		-0.04		-0.04		-0.04		-0.03		-0.03		0.04		0.03		0.03
		(-0.50)		(-0.62)		(-0.61)		(-1.21)		(-0.95)		(-0.93)		(0.86)		(0.71)		(0.71)
θ	0.89	0.88	0.89	0.89	0.89	0.89	0.90	0.92	0.91	0.91	0.91	0.92	0.90	0.91	0.89	0.90	0.90	0.90
	(26.81)	(27.62)	(28.35)	(28.40)	(29.01)	(28.86)	(32.89)	(34.57)	(33.74)	(35.35)	(36.51)	(38.10)	(30.45)	(32.45)	(31.17)	(33.44)	(32.52)	(34.90)
$\gamma+\eta/2+\theta$	0.974	0.973	0.974	0.976	0.975	0.977	0.971	0.979	0.973	0.976	0.974	0.976	0.978	0.981	0.977	0.977	0.978	0.978
AIC	-4.484	-4.482	-4.484	-4.483	-4.485	-4.484	-4.975	-4.976	-4.978	-4.977	-4.980	-4.978	-3.593	-3.592	-3.595	-3.593	-3.598	-3.595

Panel C: E/P Portfolios

	High						*Low*						*HML*					
	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
□ (%)	0.37	0.33	-0.88	-0.86	-0.18	-0.22	-0.10	-0.09	0.66	0.66	0.28	0.28	0.39	0.35	-1.54	-1.47	-0.43	-0.43
	(3.22)	(2.94)	(-1.58)	(-1.51)	(-0.71)	(-0.84)	(-1.12)	(-1.00)	(1.96)	(1.99)	(1.56)	(1.60)	(2.38)	(2.08)	(-2.28)	(-2.23)	(-1.30)	(-1.34)
β_M	1.04	1.03	1.04	1.03	1.04	1.03	1.15	1.16	1.15	1.15	1.15	1.15	-0.08	-0.10	-0.08	-0.09	-0.08	-0.09
	(33.41)	(31.91)	(33.42)	(32.39)	(33.37)	(32.22)	(47.40)	(47.26)	(47.78)	(47.73)	(48.00)	(48.02)	(-1.72)	(-1.89)	(-1.58)	(-1.73)	(-1.61)	(-1.78)
δ			0.51	0.49					-0.38	-0.37					0.51	0.49		
			(2.28)	(2.19)					(-2.23)	(-2.24)					(2.91)	(2.84)		
ν					8.83	9.02					-8.71	-8.58					5.44	5.26
					(2.32)	(2.36)					(-2.22)	(-2.22)					(2.78)	(2.81)
□ (%)	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.01	0.01	0.01
	(2.38)	(1.97)	(2.40)	(2.31)	(2.45)	(2.36)	(2.16)	(2.00)	(2.01)	(2.04)	(2.05)	(2.08)	(2.55)	(2.27)	(2.51)	(2.59)	(2.58)	(2.63)
γ	0.11	0.06	0.11	0.06	0.11	0.06	0.09	0.10	0.08	0.09	0.08	0.09	0.10	0.07	0.10	0.08	0.10	0.07
	(2.43)	(1.65)	(2.61)	(1.80)	(2.55)	(1.71)	(3.63)	(3.07)	(3.57)	(3.10)	(3.61)	(3.11)	(2.91)	(1.93)	(3.23)	(2.30)	(3.19)	(2.24)
η		0.09		0.08		0.08		-0.03		-0.02		-0.02		0.07		0.05		0.05
		(1.38)		(1.56)		(1.68)		(-0.67)		(-0.53)		(-0.48)		(1.47)		(1.19)		(1.30)
θ	0.83	0.84	0.83	0.83	0.83	0.83	0.89	0.89	0.90	0.90	0.90	0.90	0.87	0.88	0.86	0.87	0.87	0.87
	(15.43)	(16.18)	(16.28)	(16.99)	(16.06)	(16.99)	(31.89)	(32.21)	(33.19)	(33.55)	(34.33)	(34.69)	(26.26)	(27.42)	(27.09)	(27.92)	(28.13)	(29.25)
$\gamma+\eta/2+\theta$	0.935	0.947	0.937	0.937	0.936	0.935	0.976	0.979	0.977	0.977	0.978	0.978	0.971	0.980	0.969	0.969	0.971	0.970
AIC	-4.421	-4.423	-4.429	-4.430	-4.430	-4.432	-4.769	-4.766	-4.775	-4.771	-4.775	-4.771	-3.514	-3.515	-3.527	-3.526	-3.528	-3.527

Table 4

Estimates of the Conditional Model with GARCH-M Specifications Including Size Factor for the US Value Premium

The table reports coefficient estimates for models with an added Fama and French (1993) Size factor in Models 2 through 7 for value, growth and HML portfolios. The models are defined by:

$$r_{Pt} = \alpha + \beta_M \left(R_{Mt} - R_{ft}\right) + \beta_{SMB} SMB_t + \delta\sigma_{Pt} + \nu\sigma^2_{Pt} + \varepsilon_{Pt}$$

$$\sigma^2_{Pt} = \omega + \gamma\varepsilon^2_{Pt-1} + \eta I_{t-1}\varepsilon^2_{Pt-1} + \theta\sigma^2_{Pt-1}$$

where $\varepsilon_{Pt} \sim \left(0, \sigma^2_{Pt}\right)$, r_{Pt} is either the excess returns on value, growth portfolios or the return on the HML portfolio, $R_{M,t}$ is the value-weighted return on the market portfolio of all assets, R_{ft} is the three-month Treasury bill rate, SMB_t is the Fama and French (1993) size factor, which is the difference between the average returns on a small market capitalization portfolio and the average returns on a big market capitalization portfolio. α (%) measures the abnormal performance of the portfolio, β_M measures the market risk of the portfolio, β_{SMB} measures the portfolio loadings on the size factor. $\delta\sigma_{Pt}$ and $\nu\sigma^2_{Pt}$ are the time-varying risk premium, ω, γ, η and θ are estimated parameters and $\omega > 0$, $0 < \gamma < 1$, $0 \le \theta < 1$, $\gamma + \eta/2 + \theta < 1$, I_{t-1} takes a value of 1, when ε_{t-1} is negative and a value of 0, otherwise. At end of June each year during the sample period, all stocks listed on NYSE, AMEX and Nasdaq are ranked into 10-decile portfolios based on the ratios of B/M, C/P and E/P. B/M is the ratio of the book value of equity to market value of equity, C/P is the ratio of cash flow to market value of equity, E/P is the ratio of earnings to market value of equity. *High* represents a value portfolio containing stocks in the top 10% by each ratio. *Low* represents a growth portfolio containing stocks in the bottom 10%. *HML* (high minus low) is a portfolio with the average returns on the value portfolio minus those on the growth portfolio. The sample period runs from July 1963 to June 2006. Akaike's information criterion (*AIC*) is based on the maximized value of the log-likelihood functions and is used to select the preferred model, which will be the one with the lowest value. Bollerslev-Wooldridge robust *t*-statistics are in parentheses.

Panel A: B/M Portfolios

High

	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
α (%)	0.43	0.38	-0.21	-0.17	0.18	0.18
	(3.57)	(3.27)	(-0.42)	(-0.35)	(0.78)	(0.82)
β_M	0.94	0.93	0.94	0.93	0.94	0.93
	(25.41)	(25.38)	(25.04)	(25.06)	(24.97)	(24.99)
β_{SMB}	0.26	0.26	0.25	0.26	0.26	0.26
	(5.25)	(5.42)	(5.06)	(5.22)	(5.08)	(5.23)
δ			0.24	0.21		
			(1.29)	(1.15)		
ν					3.25	2.75
					(1.17)	(1.03)
ω (%)	0.00	0.00	0.00	0.00	0.00	0.00
	(1.43)	(1.30)	(1.44)	(1.38)	(1.44)	(1.37)
γ	0.12	0.09	0.12	0.09	0.12	0.09
	(3.37)	(2.29)	(3.41)	(2.32)	(3.37)	(2.32)
η		0.07		0.06		0.06
		(1.09)		(1.03)		(1.04)
θ	0.84	0.84	0.85	0.85	0.85	0.84
	(15.96)	(15.63)	(17.22)	(16.55)	(16.71)	(16.04)
$\gamma+\eta/2+\theta$	0.965	0.970	0.968	0.969	0.967	0.968
AIC	-4.235	-4.236	-4.235	-4.235	-4.234	-4.234

Low

	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
α (%)	-0.12	-0.11	0.37	0.26	0.23	0.16
	(-1.48)	(-1.40)	(1.33)	(1.01)	(1.22)	(0.97)
β_M	1.10	1.11	1.10	1.10	1.10	1.10
	(49.37)	(47.90)	(49.21)	(48.00)	(49.22)	(48.25)
β_{SMB}	-0.06	-0.05	-0.06	-0.05	-0.06	-0.05
	(-2.11)	(-1.79)	(-1.88)	(-1.66)	(-1.86)	(-1.68)
δ			-0.28	-0.21		
			(-1.78)	(-1.45)		
ν					-10.15	-8.06
					(-1.98)	(-1.69)
ω (%)	0.00	0.00	0.00	0.00	0.00	0.00
	(1.89)	(1.68)	(1.77)	(1.70)	(2.51)	(2.59)
γ	0.04	0.04	0.04	0.04	0.04	0.04
	(2.54)	(2.35)	(2.73)	(2.49)	(2.75)	(2.52)
η		-0.04		-0.04		-0.04
		(-1.82)		(-1.69)		(-1.64)
θ	0.93	0.96	0.93	0.96	0.94	0.96
	(41.56)	(57.40)	(41.22)	(56.68)	(49.84)	(66.59)
$\gamma+\eta/2+\theta$	0.973	0.981	0.976	0.980	0.976	0.980
AIC	-5.045	-5.049	-5.046	-5.048	-5.048	-5.048

HML

	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
α (%)	0.51	0.45	-1.13	-0.94	-0.29	-0.22
	(2.96)	(2.58)	(-1.32)	(-1.17)	(-0.68)	(-0.57)
β_M	-0.12	-0.13	-0.11	-0.12	-0.11	-0.12
	(-2.29)	(-2.45)	(-2.15)	(-2.31)	(-2.14)	(-2.28)
β_{SMB}	0.30	0.30	0.29	0.29	0.29	0.29
	(4.36)	(4.44)	(4.03)	(4.13)	(4.04)	(4.11)
δ			0.41	0.35		
			(1.93)	(1.75)		
ν					4.76	4.11
					(2.01)	(1.87)
ω (%)	0.01	0.01	0.01	0.01	0.01	0.01
	(1.66)	(1.41)	(1.66)	(1.64)	(1.68)	(1.65)
γ	0.10	0.06	0.09	0.06	0.09	0.06
	(3.55)	(2.14)	(3.54)	(2.19)	(3.57)	(2.26)
η		0.07		0.06		0.05
		(1.75)		(1.51)		(1.47)
θ	0.87	0.89	0.88	0.89	0.88	0.89
	(22.95)	(26.81)	(25.77)	(29.22)	(26.10)	(29.25)
$\gamma+\eta/2+\theta$	0.969	0.979	0.970	0.974	0.971	0.974
AIC	-3.469	-3.472	-3.472	-3.473	-3.473	-3.473

Panel B: C/P Portfolios																		
	High						*Low*						*HML*					
	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
α (%)	0.31	0.31	-0.16	-0.16	0.04	0.04	-0.14	-0.12	0.55	0.45	0.24	0.20	0.47	0.44	-0.63	-0.57	-0.17	-0.18
	(2.52)	(2.88)	(-0.32)	(-0.33)	(0.16)	(0.18)	(-1.82)	(-1.52)	(1.97)	(1.65)	(1.58)	(1.26)	(2.81)	(2.69)	(-0.91)	(-0.82)	(-0.47)	(-0.50)
β_M	0.95	0.95	0.95	0.95	0.95	0.95	1.16	1.16	1.15	1.16	1.15	1.16	-0.20	-0.20	-0.19	-0.20	-0.19	-0.19
	(29.77)	(29.16)	(29.42)	(29.33)	(29.64)	(29.64)	(53.90)	(54.81)	(52.71)	(53.41)	(52.67)	(53.14)	(-4.03)	(-3.89)	(-3.73)	(-3.69)	(-3.73)	(-3.68)
β_{SMB}	0.16	0.16	0.16	0.16	0.16	0.15	0.07	0.07	0.08	0.08	0.08	0.08	0.07	0.08	0.06	0.07	0.06	0.07
	(3.84)	(3.57)	(3.71)	(3.43)	(3.71)	(3.43)	(2.32)	(2.52)	(2.58)	(2.67)	(2.52)	(2.62)	(1.11)	(1.26)	(0.94)	(1.10)	(0.94)	(1.09)
δ			0.20	0.20					-0.38	-0.32					0.30	0.27		
			(0.97)	(1.00)					(-2.43)	(-2.10)					(1.59)	(1.49)		
ν					4.64	4.66					-10.62	-9.12					4.50	4.35
					(1.22)	(1.24)					(-2.50)	(-2.18)					(1.87)	(1.84)
ω (%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	(2.35)	(2.32)	(2.34)	(2.34)	(2.35)	(2.34)	(2.29)	(1.95)	(2.16)	(2.16)	(2.60)	(2.30)	(2.32)	(2.15)	(2.30)	(2.36)	(2.29)	(2.37)
γ	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.10	0.08	0.09	0.07	0.09	0.08	0.05	0.08	0.05	0.08	0.05
	(2.60)	(1.79)	(2.69)	(1.96)	(2.72)	(1.98)	(3.24)	(3.14)	(3.36)	(3.13)	(3.39)	(3.18)	(2.86)	(1.36)	(2.98)	(1.52)	(3.01)	(1.51)
η		0.00		-0.01		-0.01		-0.05		-0.04		-0.04		0.05		0.04		0.04
		(-0.02)		(-0.08)		(-0.09)		(-1.38)		(-1.05)		(-1.06)		(0.95)		(0.82)		(0.82)
θ	0.89	0.89	0.89	0.89	0.89	0.89	0.90	0.91	0.90	0.91	0.90	0.91	0.90	0.91	0.89	0.90	0.90	0.91
	(24.12)	(26.79)	(24.78)	(26.46)	(25.55)	(26.93)	(32.86)	(33.62)	(33.91)	(34.94)	(36.72)	(36.65)	(30.38)	(32.60)	(30.98)	(33.54)	(32.37)	(34.99)
$\gamma+\eta/2+\theta$	0.967	0.968	0.968	0.969	0.969	0.970	0.975	0.984	0.978	0.980	0.978	0.980	0.976	0.980	0.975	0.976	0.977	0.976
AIC	-4.507	-4.503	-4.505	-4.501	-4.507	-4.503	-4.981	-4.983	-4.987	-4.986	-4.987	-4.986	-3.591	-3.591	-3.593	-3.591	-3.595	-3.594

Panel C: E/P Portfolios

	High						*Low*						*HML*					
	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
α (%)	0.35	0.29	-0.61	-0.58	-0.06	-0.14	-0.09	-0.08	0.75	0.75	0.31	0.31	0.38	0.34	-1.49	-1.43	-0.41	-0.41
	(3.22)	(2.74)	(-1.15)	(-1.08)	(-0.24)	(-0.61)	(-1.11)	(-0.90)	(2.44)	(2.50)	(1.92)	(1.98)	(2.29)	(2.01)	(-2.16)	(-2.10)	(-1.22)	(-1.25)
β_M	1.00	0.98	1.00	0.98	1.00	0.98	1.13	1.13	1.12	1.13	1.12	1.13	-0.10	-0.12	-0.09	-0.10	-0.10	-0.11
	(32.74)	(27.28)	(32.33)	(27.42)	(32.23)	(26.22)	(43.82)	(43.72)	(43.19)	(43.19)	(43.37)	(43.46)	(-1.96)	(-2.11)	(-1.77)	(-1.90)	(-1.80)	(-1.93)
β_{SMB}	0.26	0.27	0.25	0.26	0.25	0.26	0.12	0.12	0.13	0.13	0.13	0.13	0.12	0.12	0.11	0.11	0.11	0.11
	(6.27)	(6.21)	(6.01)	(6.00)	(6.03)	(5.86)	(3.70)	(3.81)	(3.86)	(3.93)	(3.83)	(3.89)	(1.89)	(1.92)	(1.65)	(1.68)	(1.68)	(1.67)
δ			0.41	0.38					-0.43	-0.42					0.50	0.48		
			(1.87)	(1.70)					(-2.72)	(-2.73)					(2.77)	(2.70)		
ν					6.99	7.65					-9.62	-9.37					5.28	5.10
					(1.91)	(2.18)					(-2.67)	(-2.67)					(2.66)	(2.65)
ω (%)	0.01	0.00	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
	(2.58)	(2.27)	(2.51)	(2.63)	(2.55)	(2.98)	(1.96)	(1.67)	(1.88)	(1.91)	(1.91)	(1.92)	(2.56)	(2.29)	(2.55)	(2.65)	(2.60)	(2.68)
γ	0.13	0.02	0.13	0.02	0.13	0.00	0.10	0.12	0.09	0.11	0.09	0.10	0.10	0.06	0.10	0.07	0.10	0.07
	(2.53)	(0.75)	(2.64)	(0.65)	(2.61)	(0.19)	(4.23)	(3.44)	(4.12)	(3.53)	(4.17)	(3.57)	(2.94)	(1.84)	(3.21)	(2.21)	(3.18)	(2.16)
η		0.16		0.15		0.17		-0.04		-0.03		-0.03		0.07		0.05		0.05
		(2.32)		(2.46)		(2.70)		(-0.97)		(-0.80)		(-0.74)		(1.45)		(1.17)		(1.24)
θ	0.80	0.85	0.80	0.84	0.80	0.83	0.88	0.89	0.89	0.89	0.89	0.90	0.87	0.88	0.86	0.87	0.87	0.87
	(14.50)	(18.82)	(14.50)	(18.14)	(14.75)	(19.37)	(34.34)	(34.81)	(36.14)	(36.44)	(37.61)	(37.94)	(27.05)	(27.69)	(27.44)	(28.11)	(28.57)	(29.36)
$\gamma+\eta/2+\theta$	0.928	0.949	0.926	0.928	0.927	0.918	0.982	0.987	0.983	0.983	0.983	0.984	0.971	0.978	0.969	0.968	0.970	0.969
AIC	-4.482	-4.497	-4.486	-4.500	-4.488	-4.504	-4.788	-4.786	-4.799	-4.796	-4.798	-4.796	-3.516	-3.516	-3.529	-3.527	-3.529	-3.528

Table 5
Summary Statistics and Estimate of the Static CAPM for UK Value, Growth and HML Portfolios

Panel A reports the monthly mean returns (%), standard deviations (Std Dev, %) and *t*-statistics with Newey-West standard errors for the significance of the mean for the UK value-weighted portfolios. B/M is the ratio of the book value of equity to market value of equity, C/P is the ratio of cash flow to market value of equity, E/P is the ratio of earnings to market value of equity. At the end of December each year, all stocks listed on the UK stock market are ranked into 3 groups based on the ratios of B/M, C/P and E/P. For the B/M (C/P and E/P) portfolios, *High* represents a value portfolio containing stocks in the top 40% (30%) of a ratio. *Low* represents a growth portfolio containing stocks in the bottom 40% (30%) of a ratio. *HML* (high minus low) is a portfolio that is long value and short growth. The sample period for B/M portfolios runs from January 1963 to December 2001 and for C/P and E/P portfolios it runs from January 1975 to December 2002. Panel B reports coefficient estimates of the static CAPM. α (%) measures the abnormal performance of the portfolio, β measures the market risk of the portfolio. R^2 is used to compare the goodness-to-fit of the model. *LM* are autoregressive conditional heteroskedasticity (ARCH) Lagrange Multiplier test statistics for the null hypothesis that there is no ARCH up to order 5 in ε_{Pt}. Associated *p*-values are in brackets.

	B/M Portfolio			**C/P Portfolio**			**E/P Portfolio**		
	High	*Low*	*HML*	*High*	*Low*	*HML*	*High*	*Low*	*HML*
Panel A: Summary statistics									
Mean (%)	1.65	1.15	0.50	1.83	1.41	0.42	1.79	1.43	0.36
	(6.86)	(4.74)	(4.92)	(5.10)	(4.17)	(1.89)	(5.12)	(4.21)	(1.90)
Std Dev (%)	5.22	5.26	2.21	6.58	6.14	4.10	6.42	6.16	3.55
Panel B: CAPM									
α (%)	0.45	-0.07	0.52	0.44	-0.34	0.77	0.41	-0.19	0.60
	(4.57)	(-0.90)	(5.09)	(1.97)	(-2.28)	(2.39)	(2.05)	(-1.55)	(2.09)
β_M	0.87	0.91	-0.03	1.02	0.97	0.05	1.02	0.99	0.03
	(47.60)	(45.45)	(-1.71)	(55.26)	(66.96)	(1.64)	(54.05)	(77.95)	(1.15)
R^2	0.84	0.89	0.01	0.86	0.92	0.01	0.89	0.95	0.00
LM	20.76	163.58	71.99	21.30	13.64	11.76	32.28	12.20	14.25
	[0.00]	[0.00]	[0.00]	[0.00]	[0.02]	[0.04]	[0.00]	[0.03]	[0.01]

Table 6
Estimates of the Conditional Model with GARCH Specifications for the UK Value Premium

The table reports coefficient estimates for Models 2 through 7 for value, growth and HML portfolios. The models are defined by:

$$r_{Pt} = \alpha + \beta_M \left(R_{Mt} - R_{ft}\right) + \delta\sigma_{Pt} + \nu\sigma^2_{Pt} + \varepsilon_{Pt}$$
$$\sigma^2_{Pt} = \omega + \gamma\varepsilon^2_{Pt-1} + \eta I_{t-1}\varepsilon^2_{Pt-1} + \theta\sigma^2_{Pt-1}$$

where $\varepsilon_{Pt} \sim \left(0, \sigma^2_{Pt}\right)$, r_{Pt} is either the excess returns for value, growth portfolios or the return on the HML portfolio, R_{Mt} is the value-weighted return on the market portfolio of all assets, R_{ft} is the three-month Treasury bill rate. α (%) measures the abnormal performance of the portfolio, β_M measures the market risk of the portfolio, $\delta\sigma_{Pt}$ and $\nu\sigma^2_{Pt}$ (with either $\delta = 0$ or $\nu = 0$) are the competing measures of time-varying risk, ω, γ, η and θ are estimated parameters and $\omega > 0$, $0 < \gamma < 1$, $0 \leq \theta < 1$, $\gamma + \eta / 2 + \theta < 1$, I_{t-1} takes a value of 1, when ε_{t-1} is negative and a value of 0 otherwise. At end of December each year, all stocks listed on the UK stock market are ranked into 3 groups based on the ratios of B/M, C/P and E/P. B/M is the ratio of the book value of equity to market value of equity, C/P is the ratio of cash flow to market value of equity, E/P is the ratio of earnings to market value of equity. For the B/M (C/P and E/P) portfolios, *High* represents a value portfolio containing stocks in the top 40% (30%) of a ratio. *Low* represents a growth portfolio containing stocks in the bottom 40% (30%) of a ratio. *HML* (high minus low) is a portfolio that is long value and short growth. The sample period for B/M portfolios runs from January 1963 to December 2001 and for C/P and E/P portfolios it runs from January 1975 to December 2002. Akaike's information criterion (*AIC*) is based on the maximized value of the log-likelihood functions and is used to select the preferred model, which will be the one with the lowest value. Bollerslev-Wooldridge robust *t*-statistics are in parentheses.

Panel A: B/M Portfolios

	High						*Low*						*HML*					
	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
α (%)	0.38	0.35	-1.01	-0.60	-0.22	-0.04	-0.04	-0.03	0.18	0.16	0.06	0.05	0.47	0.45	-0.41	-0.11	0.08	0.24
	(4.87)	(4.27)	(-2.37)	(-1.65)	(-1.09)	(-0.23)	(-0.76)	(-0.49)	(0.76)	(0.67)	(0.52)	(0.50)	(6.12)	(5.62)	(-1.47)	(-0.34)	(0.56)	(1.93)
β_M	0.88	0.89	0.88	0.89	0.88	0.89	0.90	0.89	0.89	0.89	0.89	0.89	-0.02	-0.02	-0.03	-0.03	-0.03	-0.02
	(54.19)	(53.44)	(54.80)	(54.77)	(54.28)	(54.45)	(64.29)	(63.30)	(64.60)	(63.73)	(64.57)	(63.77)	(-1.60)	(-1.56)	(-1.64)	(-1.65)	(-1.61)	(-1.59)
δ			0.71	0.50					-0.16	-0.14					0.51	0.33		
			(3.23)	(2.54)					(-0.97)	(-0.81)					(3.15)	(1.78)		
v					15.27	10.03					-4.76	-4.11					10.13	6.02
					(2.91)	(2.27)					(-1.04)	(-0.88)					(2.62)	(1.77)
ω (%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	(1.44)	(1.16)	(1.47)	(1.38)	(1.42)	(1.36)	(1.93)	(1.83)	(1.87)	(1.84)	(1.86)	(1.83)	(1.74)	(1.75)	(1.81)	(1.91)	(1.77)	(1.88)
γ	0.13	0.05	0.11	0.07	0.11	0.06	0.12	0.13	0.11	0.12	0.11	0.12	0.16	0.02	0.15	0.05	0.15	0.03
	(3.12)	(1.56)	(3.42)	(1.85)	(3.34)	(1.75)	(2.62)	(2.18)	(2.58)	(2.12)	(2.57)	(2.13)	(2.74)	(0.75)	(2.89)	(1.68)	(2.77)	(1.25)
η		0.11		0.08		0.08		-0.03		-0.03		-0.02		0.15		0.12		0.13
		(2.18)		(1.70)		(1.82)		(-0.51)		(-0.43)		(-0.41)		(2.27)		(2.06)		(2.11)
θ	0.82	0.87	0.85	0.86	0.85	0.86	0.85	0.86	0.86	0.87	0.86	0.87	0.80	0.87	0.83	0.86	0.83	0.86
	(11.14)	(16.15)	(15.95)	(15.70)	(15.29)	(16.10)	(16.00)	(17.49)	(17.28)	(18.41)	(17.31)	(18.33)	(12.15)	(17.73)	(16.44)	(18.31)	(15.19)	(18.60)
$\gamma+\eta/2+\theta$	0.947	0.981	0.960	0.968	0.959	0.970	0.969	0.973	0.974	0.975	0.974	0.975	0.969	0.968	0.979	0.966	0.977	0.965
AIC	-4.952	-4.968	-4.968	-4.972	-4.966	-4.972	-5.400	-5.497	-5.497	-5.494	-5.498	-5.495	-5.104	-5.134	-5.121	-5.135	-5.115	-5.133

Panel B: C/P Portfolios

	High						*Low*						*HML*					
	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
α (%)	0.14	0.10	-0.48	-0.41	-0.13	-0.11	-0.27	-0.25	0.52	0.40	0.13	0.09	0.32	0.30	-1.43	-1.33	-0.43	-0.39
	(0.87)	(0.63)	(-1.43)	(-1.34)	(-0.66)	(-0.60)	(-2.45)	(-2.09)	(0.98)	(0.81)	(0.49)	(0.34)	(1.30)	(1.14)	(-1.63)	(-1.61)	(-0.96)	(-0.90)
β_M	0.99	1.00	0.99	0.99	0.99	0.99	0.98	0.97	0.98	0.98	0.98	0.98	0.01	0.01	0.00	0.00	0.00	0.01
	(58.35)	(60.78)	(54.68)	(57.56)	(54.89)	(57.65)	(88.17)	(82.16)	(79.52)	(75.46)	(81.78)	(77.21)	(0.39)	(0.48)	(-0.00)	(0.10)	(0.07)	(0.19)
δ			0.29	0.25					-0.45	-0.37					0.50	0.46		
			(1.95)	(1.76)					(-1.45)	(-1.27)					(2.13)	(2.08)		
v					5.23	4.39					-12.88	-11.06					5.73	5.26
					(2.04)	(1.82)					(-1.55)	(-1.40)					(2.03)	(1.98)
ω (%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00
	(1.30)	(1.02)	(1.31)	(1.35)	(1.29)	(1.31)	(1.41)	(1.27)	(1.27)	(1.42)	(1.52)	(1.70)	(1.24)	(1.16)	(1.23)	(1.33)	(1.20)	(1.30)
γ	0.20	0.09	0.16	0.08	0.17	0.08	0.07	0.09	0.07	0.09	0.07	0.09	0.13	0.07	0.11	0.07	0.11	0.07
	(3.60)	(1.83)	(3.75)	(1.64)	(3.72)	(1.76)	(2.20)	(1.91)	(2.39)	(2.19)	(2.39)	(2.22)	(2.34)	(1.40)	(2.40)	(1.39)	(2.37)	(1.44)
η		0.13		0.13		0.13		-0.05		-0.05		-0.05		0.08		0.06		0.06
		(2.26)		(2.13)		(2.07)		(-0.88)		(-0.92)		(-0.94)		(1.11)		(1.13)		(1.09)
θ	0.80	0.85	0.83	0.86	0.82	0.85	0.90	0.92	0.90	0.91	0.90	0.91	0.84	0.88	0.87	0.88	0.87	0.88
	(14.51)	(22.99)	(19.29)	(26.12)	(17.92)	(24.71)	(18.62)	(21.34)	(19.06)	(24.28)	(20.56)	(25.97)	(13.18)	(17.67)	(18.16)	(20.63)	(17.06)	(19.81)
$\gamma+\eta/2+\theta$	0.997	0.999	0.992	0.999	0.993	0.999	0.965	0.978	0.969	0.976	0.970	0.975	0.969	0.984	0.978	0.979	0.977	0.978
AIC	-4.556	-4.561	-4.558	-4.562	-4.559	-4.562	-5.200	-5.202	-5.201	-5.202	-5.203	-5.203	-3.704	-3.703	-3.712	-3.711	-3.713	-3.712

Panel C: E/P Portfolios

	High						*Low*						*HML*					
	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
α (%)	0.33	0.26	-0.03	-0.15	0.15	0.07	-0.12	-0.11	0.25	0.20	0.06	0.04	0.50	0.41	-0.32	-0.42	0.11	0.06
	(2.07)	(1.67)	(-0.08)	(-0.36)	(0.68)	(0.32)	(-1.01)	(-0.92)	(0.49)	(0.40)	(0.24)	(0.14)	(1.94)	(1.64)	(-0.39)	(-0.53)	(0.25)	(0.13)
β_M	1.01	1.01	1.01	1.01	1.01	1.01	1.00	0.99	1.00	0.99	1.00	0.99	0.02	0.02	0.02	0.02	0.02	0.02
	(68.71)	(71.21)	(70.01)	(72.79)	(70.13)	(72.67)	(80.91)	(82.46)	(79.40)	(81.79)	(79.51)	(81.94)	(0.94)	(0.85)	(0.99)	(0.97)	(1.00)	(0.98)
δ			0.19	0.21					-0.27	-0.23					0.27	0.29		
			(0.93)	(1.08)					(-0.81)	(-0.69)					(1.09)	(1.17)		
ν					4.34	4.90					-9.50	-7.85					4.06	3.99
					(1.06)	(1.19)					(-0.88)	(-0.73)					(1.15)	(1.16)
ω (%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	(1.31)	(0.95)	(1.33)	(1.19)	(1.31)	(1.20)	(1.27)	(1.21)	(1.32)	(1.32)	(1.58)	(1.32)	(1.18)	(1.00)	(1.17)	(1.21)	(1.16)	(1.20)
γ	0.11	0.07	0.11	0.06	0.11	0.06	0.08	0.11	0.08	0.11	0.08	0.11	0.09	0.05	0.09	0.05	0.08	0.05
	(3.26)	(1.42)	(3.31)	(1.36)	(3.31)	(1.37)	(2.37)	(2.43)	(2.49)	(2.51)	(2.38)	(2.50)	(3.00)	(1.38)	(3.02)	(1.34)	(3.03)	(1.39)
η		0.08		0.09		0.09		-0.05		-0.05		-0.04		0.07		0.07		0.06
		(1.39)		(1.46)		(1.45)		(-0.87)		(-0.82)		(-0.81)		(1.19)		(1.27)		(1.23)
θ	0.87	0.88	0.87	0.88	0.88	0.88	0.86	0.87	0.86	0.86	0.86	0.86	0.89	0.90	0.89	0.90	0.89	0.90
	(19.60)	(18.77)	(20.91)	(21.48)	(21.14)	(21.80)	(13.74)	(12.49)	(14.16)	(13.22)	(14.51)	(13.05)	(19.97)	(21.84)	(20.93)	(24.22)	(21.02)	(24.13)
$\gamma+\eta/2+\theta$	0.982	0.990	0.983	0.986	0.983	0.986	0.947	0.948	0.946	0.945	0.946	0.945	0.974	0.985	0.976	0.980	0.976	0.980
AIC	-4.781	-4.783	-4.782	-4.784	-4.783	-4.784	-5.642	-5.639	-5.643	-5.641	-5.644	-5.641	-3.952	-3.952	-3.952	-3.953	-3.952	-3.954