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The conditional pricing of systematic and idiosyncratic risk in the UK equity market

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ABSTRACT

We test whether firm idiosyncratic risk is priced in a large cross-section of U.K. stocks. A distinguishing feature of our paper is that our tests allow for a conditional relationship between systematic risk (beta) and returns, i.e., conditional on whether the excess market return is positive or negative. We find strong evidence in support of a conditional beta/return relationship which in turn reveals conditionality in the pricing of idiosyncratic risk. We find that idiosyncratic volatility is significantly negatively priced in stock returns in down-markets. Although perhaps initially counter-intuitive, we describe the theoretical support for such a finding in the literature. Our results also reveal some role for liquidity, size and momentum risk but not value risk in explaining the cross-section of returns.

1. Introduction

Idiosyncratic, or non-systematic, risk arises due to asset price variation that is specific to a security and is not driven by a systematic risk factor common across securities. It is typically estimated using a pricing model of returns with common risk factors and obtained as the residual unexplained variation. In this paper we revisit the question of whether idiosyncratic risk is priced in a large cross-section of U.K. stocks. A distinguishing feature of our paper is that we incorporate a conditional relationship between systematic risk (beta) and return in our tests for which we find strong evidence. This in turn reveals conditionality in the pricing of idiosyncratic risk. We control for other stock risk characteristics such as liquidity (which we decompose into systematic and idiosyncratic liquidity), size, value and momentum risks which may explain some idiosyncratic risk.

The role of idiosyncratic risk in asset pricing is important as investors are exposed to it for a number of reasons, either passively or actively. These include portfolio constraints, transaction costs that need to be considered against portfolio rebalancing needs or belief in possessing superior forecasting skills.[1] Assessing if and how idiosyncratic volatility is priced in the cross-section of stock-returns is relevant in order to determine if compensation is earned from exposure to it. Controlling for systematic risk factors and other stock characteristics, if the expected risk premium for bearing residual risk is positive, it may support holding idiosyncratic difficult-to-diversify stocks and other undiversified portfolio strategies. Conversely, negative pricing of idiosyncratic risk clearly points to increased transaction costs to achieve a more granular level of portfolio diversification to offset it. Idiosyncratic risk is important and large in magnitude, and accounts for a large proportion of total portfolio risk.[2] A better characterization of it will improve the assessment of portfolio risk exposures and the achievement of risk and return objectives.

Traditional pricing frameworks such as the CAPM imply that there should be no compensation for exposure to idiosyncratic risk as it can be diversified away in the market portfolio. However, this result has been challenged both theoretically and empirically. Alternative frameworks relax the assumption that investors are able or willing to hold fully diversified portfolios and posit a required compensation for

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[1] Portfolio constraints include the level of wealth, limits on the maximum number of stocks held or restrictions from holding specific stocks or sectors. Funds with a concentrated style willingly hold a limited number of stocks. Even large institutional portfolios benchmarked to a market index typically hold a subset of stocks and use techniques to minimize non-systematic exposures.

[2] Campbell et al. (2001) for a US sample find firm-level volatility to be on average the largest portion (over 70%) of total volatility, followed by market volatility (16%) and industry-level volatility (12%). Our results are broadly consistent, with the firm-level component accounting on average for over 50% of total variance, with the rest evenly split between the market and industry components.

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idiosyncratic risk. Merton (1987) shows that allowing for incomplete information among agents, expected returns are higher for firms with larger firm-specific variance. Malkiel and Xu (2002) also theorize positive pricing of idiosyncratic risk using a version of the CAPM where investors are unable to fully diversify portfolios due to a variety of structural, informational or behavioral constraints and hence demand a premium for holding stocks with high idiosyncratic volatility. In empirical testing several studies find a significantly positive relation between idiosyncratic volatility and average returns; Lintner (1965) finds that idiosyncratic volatility has a positive coefficient in cross-sectional regressions as does Lehmann (1990) while Malkiel and Xu (2002) similarly find that portfolios with higher idiosyncratic volatility have higher average returns.

However, the direct opposite perspective on the pricing of idiosyncratic risk, that of a negative relation between idiosyncratic volatility and expected returns, has also been theorized and supported by empirical evidence. One theory links the pricing of firm idiosyncratic risk to the pricing of market volatility risk. Chen (2002) builds on Campbell (1993 and 1996) and Merton's (1973) ICAPM to show that the sources of assets' risk premia (risk factors) are the contemporaneous conditional covariances of its return with (i) the market, (ii) changes in the forecasts of future market returns and (iii) changes in the forecasts of future market volatilities. In particular, this third risk factor, which the model predicts has a negative loading, indicates that investors demand higher expected return for the risk that an asset will perform poorly when the future becomes less certain, i.e., higher (conditional) market volatility.[3] Ang, Hodrick, Xing, and Zhang (2006) argue that stocks with high idiosyncratic volatilities may have high exposure to market volatility risk, which lowers their average returns, indicating a negative pricing of idiosyncratic risk in the cross-section. If market volatility risk is a (orthogonal) risk factor, standard models of systematic risk will mis-price portfolios sorted by idiosyncratic volatility due to the absence of factor loadings measuring exposure to market volatility risk. In empirical testing on US data, Ang et al. (2006) find that exposure to aggregate volatility risk accounts for very little of the returns of stocks with high idiosyncratic volatility (controlling for other risk factors) which, they say, remains a puzzling anomaly.[4].

Much like the theoretical predictions concerning the pricing of idiosyncratic risk, empirical findings around the idiosyncratic volatility puzzle (negative relation between idiosyncratic risk and returns) are also quite mixed. For instance, Malkiel and Xu (2002), Chua, Goh, and Zhang (2010), Bali and Cakici (2008) and Fu (2009) find a positive relationship between idiosyncratic volatility and returns, arguing the puzzle does not exist while Ang et al. (2006); Ang, Hodrick, Xing, and Zhang (2009), Li, Miffre, Brooks, and O'Sullivan (2008) and Arena, Haggard, and Yan (2008) find that the puzzle persists, reporting evidence of a negative relationship. Furthermore, a conditional idiosyncratic component of stock return volatility is found to be positively related to returns by Chua et al. (2010) and Fu (2009), while conflicting results are found in Li et al. (2008). Despite the use of a variety of theoretical models of agents' behavior, pricing models and testing techniques, the debate is still open as to whether idiosyncratic risk is a relevant cross-sectional driver of return, and if it is, whether the relationship with returns is a positive or a negative one. The contribution of our paper may be viewed in this context as an attempt to shed further light on these open and persistent questions. There is also evidence that several additional cross-sectional risk factors interact with residual risk effects, such as momentum, size and liquidity suggesting that a large part of it might be systematic rather than idiosyncratic (Malkiel and Xu, 1997, 2002; Campbell, Lettau, Malkiel, and Xu, 2001; Bekaert, Hodrick, and Zhang, 2012; and Ang et al., 2009).

There is a problem when researchers test the CAPM empirically using *ex-post* realized returns in place of *ex-ante* expected returns, upon which the CAPM is based. When realized returns are used Pettengill, Sundaram, and Mathur (1995) argue that a conditional relationship between beta and return should exist in the cross-section of stocks. In periods when the excess market returns is positive (negative) a positive (negative) relation between beta and returns should exist. Pettengill et al. (1995) propose a model with a conditional relationship between beta and return and find strong support for a systematic but conditional relationship. Lewellen and Nagel (2006) show, however, that the conditional CAPM is not a panacea and does not explain pricing anomalies like value and momentum.

We add to this literature by investigating the pricing of idiosyncratic volatility in a large sample of U.K. stocks in conditional market settings and controlling for other risk factors and stock characteristics in the cross-section. Although the majority of empirical work deals with U.S. data, Morelli (2011) examines the conditional relationship between beta and returns in the UK market. The author highlights the importance of this conditionality for only then is beta found to be a significant risk factor. Given the evidence of a conditional beta/return relationship established in the literature, our paper makes a further contribution by incorporating this conditionality in re-examining the pricing of idiosyncratic risk. We focus on a UK dataset while obtaining results of general interest in terms of methodological approach and empirical results.

The paper is set out as follows: Section 2 describes the selection and treatment of data while Section 3 describes our testing methodology. Results are discussed in Section 4 while Section 5 concludes.

2. Data treatment and selection

Our starting universe includes all stocks listed on the London Stock Exchange between January 1990 and December 2009 — a period long enough to capture economic cycles, latterly the 'financial crisis' and alternative risk regimes. We collect monthly prices, total returns, volume, outstanding shares and static classification information from Datastream. We also daily prices in order to compute quoted spread, a liquidity measure, as well as 1-month GBP Libor rates. Serious issues with international equity data have been highlighted in the literature (Ince & Porter, 2006). These include incorrect information, both qualitative (classification information) and quantitative (prices, returns, volume, shares etc), a lack of distinction between the various types of securities traded on equity exchanges, issues of coverage and survivorship bias, incorrect information on stock splits, closing prices and dividend payments, problems with total returns calculation and with the time markers for beginning and ending points of price data and with handling of returns after suspension periods. Ince and Porter (2006) also flag problems caused by rounding of stock prices and with small values of the return index. Most (not all) of the problems identified are concentrated in the smaller size deciles and this issue would significantly impact inferences drawn by studies focusing on cross-sectional stock characteristics. We thus apply great care to mitigate these problems by defining strict data quality filters to improve the reliability of price and volume data and to ensure that results are economically meaningful for investors. First, we review all classification

[3] Conversely, assets with high sensitivities (covariance) to market volatility risk provide hedges against future market uncertainty and will be willingly held by investors, hence reducing the required return.

[4] Jacobs and Wang (2004) develop a consumption-based asset pricing model in which expected returns are a function of cross-sectional (across individuals) average consumption growth and consumption dispersion (the cross-sectional variance of consumption growth). The model predicts (and the evidence supports) a higher expected return the more negatively correlated the stock's return is with consumption dispersion. An intuitive interpretation is that consumption dispersion causes agents to perceive their own individual risk to be higher. Hence a stock which is sensitive to consumption dispersion offers a hedge, will be willingly held and consequently has a lower required return. Stocks with high idiosyncratic volatilities may have high exposure to consumption dispersion, which lowers their average returns, indicating a negative pricing of idiosyncratic risk in the cross-section.