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Firm size, economic risks, and the cross-section of international stock returns

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ABSTRACT

Recent empirical evidence from developed markets indicates a negative relation between value premium and firm size. We find that the value premium in small stocks is consistently priced in the cross-section of international returns, whereas the value premium in big stocks is not. Based on US data, we show that the small-stock value premium is associated with business cycle news and reflects changes in macroeconomic, especially credit market related risks. Our results hold true for regional and global equity markets and remain valid after controlling for firm characteristics and prominent profitability and investment factors.

1. Introduction

Numerous papers document inconsistency of the capital asset pricing model (CAPM) of Sharpe (1964) and Lintner (1965) with several regularities of asset pricing data. Perhaps most notably, the CAPM fails to explain the well documented value and size premiums in equity returns, i.e. higher returns on stocks with relatively high book-to-market equity ratios and higher returns on stocks with relatively low market equity, respectively. In response to this deficit, Fama and French (1993) develop a three-factor model with factors mimicking the returns on the aggregate stock market, firm size, and book-to-market equity:

$$E\left(R^{i,e}\right) = \lambda_0 + \lambda_m \beta^i_m + \lambda_{smb} \beta^i_{smb} + \lambda_{hml} \beta^i_{hml} + e^i. \quad (1)$$

In cross-sectional regression (1), $E\left(R^{i,e}\right)$ is the expected return on asset i in excess of the risk-free rate, β^i_m is the sensitivity of asset i to the market excess return, β^i_{smb} is the sensitivity of asset i to the aggregate size premium, β^i_{hml} is the sensitivity of asset i to the aggregate value premium, and lambdas are the associated factor risk premiums. In this model, the aggregate size premium *SMB* is measured by the difference between the returns on diversified portfolios of small and big stocks (small-minus-big), and the aggregate value premium *HML* is measured by the difference between the returns on diversified portfolios of high and low book-to-market stocks (high-minus-low).

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While the model in Eq. (1) captures patterns in the post-1962 US average returns better than the CAPM, its overall performance leaves substantial room for improvements. For example, when confronted with high average returns on international micro-caps, the specification in Eq. (1) generates a significant pricing error. Relatedly, the three-factor model fails to rationalize the documented size effect in value premium, i.e. the negative relation between the value premium and firm size. Fama and French (2012) find these shortcomings for global equity markets and for local equity returns at a regional level. Cakici and Tan (2014) verify this empirical evidence for developed capital markets at a country level.

Against this background the contribution of our paper is twofold. First, we show that the value premium in small stocks tends to be associated with macroeconomic news. The analogous evidence for the value premium in big stocks turns out much weaker in our sample. We document this difference between small-stock and big-stock value premiums by evaluating a simple empirical approximation of Merton's (1973) intertemporal capital asset pricing model (ICAPM). Our analysis suggests that the profitability of small value firms is related to macroeconomic, especially credit market related risks. If small firms are badly collateralized and have limited excess to external financing (Gertler & Gilchrist, 1994) and high book-to-market firms are highly leveraged and suffer from cash flow problems (Fama & French, 1995), then the credit market situation should have a direct impact on the profitability of value firms with low market equity.

Secondly, we show that the exposure to the small-stock value factor is priced in average international stock returns. By contrast, we find no feedback from the big-stock value factor on stock performance. We gain this insight from a modified version of the three-factor Fama–French model which decomposes the aggregate value factor in the small-stock value premium and the big-stock value premium:

$$E\left(R^{i,e}\right) = \lambda_0 + \lambda_m\beta^i_m + \lambda_{smb}\beta^i_{smb} + \lambda_{hmls}\beta^i_{hmls} + \lambda_{hmlb}\beta^i_{hmlb} + e^i. \tag{2}$$

In cross-sectional regression (2), β^i_{hmls} is the sensitivity of asset i to the small-stock value premium and β^i_{hmlb} is the sensitivity of asset i to the big-stock value premium. We measure the small-stock value premium *HMLS* by the difference between the returns on diversified portfolios of small stocks with high and low book-to-market ratios (high-minus-low small), and the big-stock value premium *HMLB* by the difference between the returns on diversified portfolios of big stocks with high and low book-to-market ratios (high-minus-low big).

From a technical perspective, the representation in Eq. (2) emerges as a natural response to the observed patterns in the data. Recent studies document a negative relation between value premium and firm size. Fama and French (2012) find larger value premiums for small market capitalization stocks and smaller value premiums for big market capitalization stocks in North America, Europe, and Asia Pacific. Cakici and Tan (2014) derive similar conclusions for country-specific portfolios of stocks in 23 developed international equity markets.

In economic terms, *HMLB* and *HMLS* could be motivated by differences in the return-generating mechanisms for large capitalization and small capitalization firms. For instance, Hou and Van Dijk (2012) find that small firms experience large negative profitability shocks after the early 1980s, while big firms experience large positive cash-flow shocks. Alternatively, Eun, Huang, and Lai (2008) argue that returns on large-cap firms are driven by common factors, whereas returns on small-cap firms primarily response to idiosyncratic factors. While the current intensification in comovement of large-caps mitigates their benefits for cross-border diversification, small and locally oriented stocks become increasingly important as a vehicle in international portfolio diversification.

In contrast to the evidence for the UK in Gregory, Tharyan, and Christidis (2013), we find significant differences in risk prices associated with small-stock and big-stock value factors. Our results show that *HMLS* captures cross-sectional variation in returns and commands a significant premium in the US, regional and global stock returns. By contrast, there is no premium for *HMLB* risk exposures. Interestingly, the pricing error is typically insignificant in Eq. (2) as opposed to Eq. (1). Lewellen, Nagel, and Shanken (2010) warn against a false treatment of the slopes in cross-sectional regressions such as (1) and (2). When we follow their recommendation and impose a risk-free rate restriction, we find that the specification in Eq. (2) can double the adjusted $\overline{R^2}$ measure of the original three-factor model.

We guard against the possibility that the model in Eq. (2) is misspecified since it does not contain the prominent profitability and investment factors (see among others Hou, Xue, & Zhang, 2015). In particular, we employ US and international data and evaluate a recently proposed five-factor model of Fama and French (2015):

$$E\left(R^{i,e}\right) = \lambda_0 + \lambda_m\beta^i_m + \lambda_{smb}\beta^i_{smb} + \lambda_{rmw}\beta^i_{rmw} + \lambda_{cma}\beta^i_{cma} + \lambda_{hml}\beta^i_{hml} + e^i \tag{3}$$

and its modified version with small-stock and big-stock value factors:

$$E\left(R^{i,e}\right) = \lambda_0 + \lambda_m\beta^i_m + \lambda_{smb}\beta^i_{smb} + \lambda_{rmw}\beta^i_{rmw} + \lambda_{cma}\beta^i_{cma} + \lambda_{hmls}\beta^i_{hmls} + \lambda_{hmlb}\beta^i_{hmlb} + e^i. \tag{4}$$

In Eqs. (3) and (4), β^i_{rmw} denotes the sensitivity of asset i to the aggregate profitability and β^i_{cma} measures the sensitivity of asset i to the aggregate investment. In these representations, *RMW* is the difference between the returns on diversified portfolios of stocks with robust and weak profitability (robust-minus-weak), and *CMA* is the difference between the returns on diversified portfolios of the stocks of low and high investment firms (conservative-minus-aggressive). All results remain valid after controlling for firm characteristics and prominent momentum, profitability and investment factors, and hold true for regional and global equity markets. Our tests indicate that the small-stock value premium mimics credit market related