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Conditional beta: Evidence from Asian emerging markets ☆

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ABSTRACT

Pettengill, Sundaram, and Mathur (1995) respond to the *prima facie* failure of the standard CAPM and propose a conditional beta model by segmenting the market into two states – up markets (where the market excess return $r_m - r_f$ is positive) and down markets (where $r_m - r_f$ is negative). We examine this model in eleven Pacific Basin emerging markets using a range of variants: a model where betas are calculated using *local* excess returns, a model where betas are calculated using *world* excess returns, a model using *both* local *and* world excess returns and a model using *both* local *and* world excess returns where local returns are orthogonal to world returns. Only in the last of these formulations is there some evidence supporting the conditional beta model.

1. Introduction

A central tenet of standard finance theory is the positive relationship between risk and expected return. The Capital Asset Pricing Model (CAPM) (Black, 1972; Lintner, 1965; Sharpe, 1964) argues that systematic risk, measured by beta, is the only relevant risk measure. Early empirical evidence supported the validity of CAPM (see, for example, Black, Jensen, & Scholes, 1972; Fama & MacBeth, 1973). However, following the seminal work of Fama and French (1992), there has been mounting evidence suggesting that beta is an incomplete measure of risk or even that it bears no relationship to returns (see Fama & French, 2004, for useful background).

The CAPM is a theoretically elegant and tractable model that, almost twenty years after the publication of Fama and French (1992), is still used in empirical research and industry applications. Proponents of the CAPM have been reluctant to accept its death and a number of theoretical and empirical counterblasts

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have been proposed.[1] One response to the *prima facie* empirical failure of the CAPM is provided by Pettengill et al. (1995) (hereafter PSM). PSM propose a modified CAPM to explicitly recognize the impact of using realized returns as a proxy for expected returns. PSM argue for a conditional relationship between beta and realized returns: a positive relationship between beta and realized returns in up markets (where the realized market return exceeds the risk-free rate of interest), and a negative relationship between beta and realized returns in down markets (where the realized market excess return is negative). PSM test their hypothesis and find a significant and systematic relationship between conditional beta and returns for the US market.

PSM's approach has recently captured the attention of a number of academic studies. Fletcher (1997) examines the UK stock market for the period 1975–1994 and finds a significant relationship between beta and returns, although the estimated up-market and down-market risk premiums differ in magnitude. Fraser, Hamelink, Hoesli, and MacGregor (2004) and Hung, Shackleton, and Xu (2004) also examine the UK stock market; Isakov (1999) the Swiss stock market; Elsas, El-Shaer, and Theissen (2003) the German stock market; Theriou, Maditinos, and Aggelides (2004, 2007) the Greek market; Karacabey and Karatepe (2004) the Turkish market; and Sandoval and Saens (2004) the markets of Argentina, Brazil, Chile and Mexico. All these studies report a significant relationship between beta and returns using the PSM approach. Instead of using portfolio returns, Fletcher (2000) and Tang and Shum (2003a,b) employ aggregate indices data on international markets and also find evidence supportive of the PSM hypothesis.[2] Evidence against the conditional beta model may be found in Lilti and Montagner's (1998) examination of the French market.

There are five papers that test the PSM hypothesis using either a single or a pair of Asian emerging countries. They all find evidence suggesting that the conditional beta model is useful in explaining returns. Faff (2001) examines the Australian market using portfolios based on industries and finds some, but not full, support for PSM: it is primarily industrial stocks, in contrast to the resources sector, which drive his findings. Early research for Hong Kong finds support for PSM using an analysis based on ten portfolios formed by ranking on beta (Lam, 2001). Tang and Shum analyse Singapore (Tang & Shum, 2004), Hong Kong[3] (Tang & Shum, 2006) and Taiwan and Korea (Tang & Shum, 2007) using portfolios based on beta (and in their paper on Taiwan and Korea, they also sort on size, as we do[4]). Given the pioneering nature of Tang and Shum's papers, they can only examine a relatively short time period (1992 to 1998) compared to the periods studied in this paper.[5] Generally, their results are supportive of PSM's model but they also add other variables to the model and find these variables to be statistically significant. That additional variables that are significant should be of concern to proponents of the CAPM; like a jealous lover, the CAPM does not allow any "rivals".[6]

We analyse PSM's model using data from eleven emerging markets from Asia using ten size-based portfolios (updated annually) for each market. Analyzing a large number of markets will perhaps allow us to consider not only whether the model is applicable in these markets but also to consider whether examination of the model may be warranted in other markets. Given that emerging markets are believed to experience higher levels of risk, we also believe that such markets provide excellent experimental settings to test a model that has the return to risk trade-off at its core.

Size-based portfolios may also present a greater challenge to PSM's model if size represents a persistent anomaly within the CAPM framework (as Banz, 1981, would suggest). Visual inspection of the data, included in the appendix to this paper, suggests that size-based portfolios may pose a considerable challenge to the CAPM or PSM's variation of it. In the appendix, we plot the excess returns, $R_p - R_f$, and the market

[1] Estrada and Serra (2005) categorize CAPM's competitors into three streams: the traditional family that uses systematic risk and total risk to measure risk; the factor family where the factors include book-to-market, size, and momentum; and the downside risk family with variables such as downside beta and total downside risk.

[2] Employing national indices in asset pricing tests is rather unusual. In this paper, we form deciles of stocks from each market and, in doing so, conform to the usual practice in asset pricing tests.

[3] By way of background, it is interesting to note that Ho, Strange, and Piesse (2000) replicate Fama and French (1992) for the Hong Kong market and do not find a role for what we denote as "unconditional" beta.

[4] By way of contrast with this paper, however, Tang and Shum's portfolio formation approach is more static. They form their portfolios once, whereas we rebalance annually in January.

[5] They form portfolios based on betas closely following the approach in Fama and MacBeth (1973) and data from the early years of their study period is "chewed up" in the portfolio formation methodology they use.

[6] If we take this line strictly, perhaps PSM have also moved too far from the CAPM to "save" the model; they may have "thrown the baby out with the bathwater". We leave this question open for the moment but we will return to it in footnote 11 below.