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Pricing assets with higher moments: Evidence from the Australian and us stock markets

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ABSTRACT

This paper investigates the importance of higher moments of return distributions in capturing the variation of average stock returns for companies listed in the leading S&P US and Australian indices. We find that Australian stocks are more negatively skewed but less leptokurtic than US stocks. As a result, we find that co-skewness plays a more important role in explaining Australian returns while co-kurtosis is consistently influential for US stock returns. We postulate that the differences in results are related to the underlying firm characteristics of the companies in the two indices, where principally the Australian firms are noticeably smaller than their US counterparts and concentrated in a smaller number industry sectors. This implies that for many smaller exchanges around the world higher moment characteristics displayed by the US market may not be applicable. We also show our results are robust to partly explaining average stock returns in the presence of size, value, and momentum effects.

1. Introduction

It has long been well documented that stock returns do not follow a normal distribution. For example, Mandelbrot (1963) and Mandelbrot and Taylor (1967) show that stock returns exhibit excess kurtosis, also commonly referred to as fat tail distributions. Fama (1965) finds that large stock returns tend to be followed by stock returns of similar magnitude but in the opposite direction. This can lead to the volatility clustering effect that is related to how information arrives and is received by the market (see Campell and Hentschel (1992)). This clustering in return volatility has raised a fundamental

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question on whether a mean and variance asset pricing model using only the first two moments of the return distribution is adequate in capturing variation in average stock returns. Subsequent voluminous empirical tests on Sharpe's CAPM (1964) have largely rejected the validity of the model which assumes that an investor's utility function is quadratic and that the co-movement with the market return is the only important factor in pricing stocks (see Campbell et al. (1995) for a comprehensive review).

Given that the empirical stock return distribution is observed to be asymmetric and leptokurtic, a natural extension of the elegant but oversimplified two-moment asset pricing model is to incorporate the co-skewness (third moment) and co-kurtosis (fourth moment) factors. An investor whose utility is non-quadratic and is described by non-increasing absolute risk aversion may prefer positive skewness and less kurtosis in the return distribution. Stocks of negative co-skewness and of larger co-kurtosis with the market should therefore be related to higher risk premia. Therefore, movement of higher co-moments unfavourable to the investors' risk preferences requires compensation in the form of additional returns. This particular approach of characterizing stock pricing behaviour not only can be intuitively appealing but may also improve the explanatory power of a model on the expected stock returns.

In this paper, we examine the importance of co-skewness and co-kurtosis for average stock returns, along with the well documented Fama and French (1993) 3 common risk factors (namely firm size, book-to-market equity (BV/MV), and market returns) and the Jegadeesh and Titman (1993) momentum effect. In particular, we test the presence of higher co-moment effects in the Australian stock market and compare them with those in the US market. Our interest in the behaviour of Australian stocks rests with the glaring absence of any direct studies on the pricing of higher co-moments in the current Australian literature despite some evidence of skewness and kurtosis in the stock return distribution. For instance, Beedles (1986) and Alles and Spowart (1995) find that Australian stocks exhibit significant skewness. Furthermore, Bird and Gallagher (2002) and Brands and Gallagher (2004) document that Australian mutual funds are characterized by a leptokurtic distribution. In particular, they noticed that portfolio returns of larger funds had more negative skewness and larger kurtosis relative to smaller mutual funds. Although they suggest that the non-normal distribution may have implications for diversification benefits, they did not pursue the analysis to directly measure this through these higher moments.

Even for studies on the US, direct examination of higher moments is usually quite limited, and approaches to examining it can be varied. Fang and Lai (1997) examine the importance of co-skewness and co-kurtosis within the four-moment CAPM framework. Dittmar (2002) tests the four moment factors with non-linear pricing kernels to improve the pricing kernel's ability to describe the cross-section of returns. His methodology is linked to the nonparametric models of Bansal and Viswanathan (1993) and Chapman (1997) in which the pricing kernel is non-linear in the market return. On the other hand, Kan and Zhou (2003) and Ando and Hodoshima (2006) examine the robustness of the asymptotic covariance matrix of least square errors (LSE) of alphas and betas in a linear asset pricing model when the joint distribution of the factors and error terms may not be normal or conditionally homoskedastic. In contrast, our approach is more consistent with the spirit of Ross' APT (1976) or Merton's ICAPM (1973) in which additional factors such as size, BV/MV, and momentum may also capture variation in average stock returns. Our approach can therefore be viewed as a more direct test on the presence of higher co-moments.

We draw a comparison of return behaviour between stocks listed as part of the Australian S&P ASX 300 index and the US S&P 500 to highlight the potential different roles that co-skewness and co-kurtosis perform in each market. Since an average Australian firm tends to be smaller and less volatile than in other developed markets, negative skewness could be more dominant than kurtosis in pricing stocks. On the other hand, an average US firm is larger but more volatile (also shown in the descriptive statistics in Tables 1 and 2) such that its variance risk or kurtosis could be a more influential factor. Despite this casual observation on the different stock market characteristics, no studies to our knowledge have addressed the potential differential pricing effect of co-skewness and co-kurtosis. Most studies, especially those in the US, rather focus simply on the skewness of the return distribution, when kurtosis could be equally or more important. Earlier works including Arditti (1967), Kraus and Litzenberger (1976), Friend and Westerfield (1980), Lim (1989), Harvey and Siddique (1999,