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Multifactor consumption based asset pricing models using the US stock market as a reference: Evidence from a panel of developed economies ☆

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ABSTRACT

This article considers a panel framework to test consumption based asset pricing models driven by a US stock market reference for a number of developed economies. Specifically, we focus on a linearized form of what might be seen as a consumption-based capital asset pricing model in a pooled cross section panel with two-way error components. The empirical findings of this multifactor model using a range of specifications indicate that there is a significant unobserved heterogeneity captured by cross-country fixed effects when consumption growth is treated as a common factor. However, the cross-sectional impact of home consumption growth can vary over the countries, where unobserved heterogeneity in the rate of risk aversion can also be addressed by random effects.

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1. Introduction

There is evidence from empirical studies that shows that the conditional covariances between the Intertemporal Marginal Rate of Substitution (IMRS) in consumption and returns cannot satisfy the equilibrium restrictions imposed by the representative agent Consumption-based Capital Asset Pricing Model (C-CAPM) for a range different countries (Kocherlakota, 1996). This has led to a great deal of interest in the capacity of the C-CAPM to take account of heterogeneity and idiosyncratic risk (Lund and Engsted, 1996). The issue of heterogeneous risk in asset pricing was first addressed by Miller (1977), and then revisited by Constantinides and Duffie (1996) and Jacobs and Wang (2004). It has been concluded that heterogeneous risk has a better chance of explaining the data than standard representative-agent C-CAPM models (Jacobs and Wang, 2004).

Gregoriou et al. (2009) using monthly data for the US and Hunter and Wu (2009) using similar data for the UK find that via some form of augmentation, consumption growth can be seen as one of the drivers of the riskier component of asset valuation. Gregoriou et al. (2009) develop a fully formulated Vector Autoregressive (VAR) model of US asset prices where excess returns are simultaneously explained by consumption growth, real money growth and inflation with income growth as a single exogenous variable. The results across the system are controlled where appropriate for Autoregressive Conditional Heteroscedasticity (ARCH) and the major financial shocks to the economy. A key explanatory variable in the VAR is US consumption growth. Hunter and Wu (2009) address the importance for the UK market of simultaneous heterogeneity proxied by a US stock market reference. The analysis in Hunter and Wu (2009) considered similar monthly data for the UK in a limited information context and found that UK excess returns were explained by two primary factors consumption growth and US excess returns. The second factor in the case of the UK study appears to capture the volatility in the return series and once this feature of the data is captured then consumption growth captures the underlying fundamental feature driving the UK stock market. The multifactor form of this model implies that financial risk as computed by the excess return, derives from two primary sources, aggregate consumption growth and US excess returns that are a measure of the state of the global market.

This would still appear pertinent in the light of the financial crisis that stemmed from the failure of Lehman Brothers in the Autumn of 2008. The primary role of Lehman Brothers in the credit default swap market and the resulting impact on the counterparties to this risk sent a shock wave across the world's financial markets. This suggests that home stock prices are driven by the world view on asset prices and local fundamentals as represented by a measure of growth either income, consumption or output. Some recent empirical evidence provides further support for the notion that stock prices are inter-related (see Bekaert et al., 2009; D'Ecclesia and Costantini, 2006; Rua ad Nunes, 2009).

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In this article, a similar approach is applied to data on excess stock returns for a number of developed economies to see whether the primary multifactor nature of the explanation of economies' assets extends beyond the economies based on the Anglo Saxon financial model. The wealth reference is important to improve the explanation of systematic risk in pricing countries' assets. US excess returns are used in a number of different specifications of a two-way error component panel model to study whether there is any measurable heterogeneity or idiosyncratic risk related to excess returns and consumption growth either across countries or over time.

The rest of this article is organized as follows. A brief review of the literature is given in Section 2. Sections 3 and 4 describe the data properties and the methodology applied in this paper, respectively. Section 5 reports the empirical results. Finally, Section 6 contains some concluding remarks.

2. The consumption CAPM literature

In the last three decades, the poor performance of the standard C-CAPM has been well examined in a time series context. Within the C-CAPM framework, the performance of these models have improved by applying different pricing kernels to incorporate different types of heterogeneity that have been neglected by the standard C-CAPM. In the context of preferences related to the power utility function see Abel (1990), Constantinides (1990), Ferson and Constantinides (1991), Heaton (1995), and Epstein and Zin (1991). While Constantinides and Duffie (1996), Heaton and Lucas (1997), Mankiw (1986), and Storesletten, Telmer, and Yaron (2005) consider complete asset market systems. Mankiw and Zeldes (1991) consider the problem in terms of limited market participation, and He and Modest (1995), Margueering and Verbeek (1999), and Gregoriou and Ioannidis (2007) find evidence for market frictions.

Constantinides and Duffie (1996) provide a theoretical framework for assessing the effects of market incompleteness on financial market equilibrium, under which the conditional covariances between returns and the Intertemporal Marginal Rate of Substitution (IMRS) in consumption mean that it is not possible to attain a full equilibrium. They derive a pricing kernel for an economy where individuals with isoelastic preferences are subject to idiosyncratic income shocks. The pricing kernel depends on aggregate consumption growth as well as the cross-sectional variance of per-capita log consumption growth. If this variance is negatively correlated with equity returns, the heterogeneous economy has a higher equity premium and lower risk-free rate than the standard model predicts. Thus, there is the potential for this type of model to resolve the asset-pricing puzzles.

Following the theoretical intuition of Constantinides and Duffie, several papers have investigated empirically the role of heterogeneity induced by market incompleteness. However, the results are mixed. For example, Jacobs (1999) uses the US Panel Study of Income Dynamics (PSID) data on food consumption to estimate individual Euler equations for the 1974–1987 period, and find that joint tests on the risky and riskless asset strongly reject the model. While Cogley (2002) generalizes the pricing kernel of Constantinides and Duffie (1996) to test the approach using data from the US Consumption Expenditure Survey (CEX) for the 1980–1994 period. However, these findings indicate that measures of the cross-sectional dispersion of log consumption growth are only weakly correlated with stock returns, and that pricing kernels depending on these cross-sectional measures generate unrealistically small equity premia for preference specifications with low degrees of risk aversion. With the same CEX data set, Brav, Constantinides, and Geczy (2002) test a pricing kernel obtained from the aggregation of the IMRS models. By permitting heterogeneity, this kernel can help reconcile the problems that arise with consumption-based models as their models suggest coefficients of risk aversion between 3 and 4 that are more consistent with what might be anticipated from theory.

More recently, Jacobs and Wang (2004), Semenov (2003) and Balduzzi and Yao (2007) also investigate idiosyncratic consumption risk within the cross-sectional C-CAPM. Jacobs and Wang (2004) compare the traditional CAPM with a two-factor C-CAPM that is related to cross-sectional consumption variation that captures the possibility of idiosyncratic risk. They demonstrate that consumption risk described by cross-sectional consumption variation can contribute to the cross-sectional average returns of stocks, and the performance is similar to the consumption surplus ratio of the conditional C-CAPM of Campbell and Cochrane (2000). Also, Semenov (2003) develops an appropriate equilibrium factor model using the cross-moments of asset returns and the cross-sectional moments of individual consumption, aggregated by a dummy variable for risk signs. He finds that the model explains the observed equity premium with realistic values of risk aversion. Instead of using the cross-sectional variance of log consumption growth. Constantinides and Duffie (1996), and Balduzzi and Yao (2007) employ the growth of the cross-sectional variance of log consumption and develop a new heterogeneous-agent pricing kernel based upon the cross-sectional aggregation of marginal utilities. With reasonable coefficients of relative risk aversion, their model can explain the US risk premium by the consumption of asset holders.

It can be seen from the above discussion that although the debate over the specific pattern of heterogeneity in either consumption or returns has not reached a conclusion, the approach has a capacity to solve both of the puzzles. Hunter and Wu (2009) suggest a C-CAPM framework that includes a US wealth reference as an alternative to the home consumption habit to reconcile different volatilities between returns and consumption growth data for the UK. The introduction of this new risk factor can appropriately mimic the cross-country heterogeneity in both returns and consumption when they exist. They find that for the UK model, the US stock market is the primary source of the low correlation between UK returns and consumption growth rates, since effects resulting from the external market are much stronger than the UK consumption habit. Therefore, the integration of stock markets can at least alter the investors' expectations of risk returns and account for the disequilibrium of the conditional covariances between risk premia and consumption for the UK C-CAPM model. This would seem reasonable for a market that for more than a century has had a regard for the influence of global returns and where more recently stocks have been cross listed and since financial liberalization that followed in 1986 significant waves of cross Atlantic merger activity have taken place.

However, it can be argued whether imperfect asset diversification across international securities markets is also the primary source of low cross-country correlation of consumption growth rates and whether high cross-country correlation of excess returns is supported by evidence from other countries, or unique only to the UK. Today, the international integration of financial markets is a central characteristic of the globalization process and a potential force for driving changes in the institutions of corporate governance. For example, cross-border portfolio investment funds have expanded dramatically. Also, the number of foreign companies listed on the two major US stock markets has increased significantly, though there is still evidence for a home bias in investors' portfolio decisions (Opoku, 2007).[1] These trends indicate a convergence in the institutions of corporate governance at national levels to the US system and the standards of US institutional investors.

[1] We would like to thank an anonymous referee who suggested that emphasis is placed on the limitations of the traditional C-CAPM by the addition of factors, such as the US market. The latter extends this definition giving rise to a time varying risk factor that might be justified by the incomplete nature of diversification and as considered above the issue of home bias. This occurs in portfolio selection of assets even within relatively developed and supposedly globalized domestic equity markets. A result that may reflect the different composition of the domestic indices, relative to the world index or the facility by which a significant aspect of the world market portfolio can be obtained by investing in a well diversified US portfolio.

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