

# Business Cycle Variability, Stock Market Variability, Asymmetries and the Risk Premium

(April-2004)

Peter N.Smith  
Steffen Sørensen\*  
Michael R. Wickens

---

\*Email: [steffen.sorensen@upf.edu](mailto:steffen.sorensen@upf.edu). All University of York, Department of Economics and Related Studies, UK.  
JEL Classification: G12, C32, C51, E44. Key words: Risk premium, conditioning, asymmetries. PLEASE DO NOT QUOTE WITHOUT PERMISSION. Part of this paper was written while Steffen Sørensen was a trainee in the Division of Financial Stability in the ECB and In Universitat Pompeu Fabra as a Marie Curie Fellow - discussions with (and comments from) staff and visitors in both places are much appreciated.

## Abstract

An important topic for policy makers is the interaction between the macroeconomy and financial markets - financial markets could be important because financial variables are forward looking summarising expectations about future development in key economic variables - this motivates a study of the interaction between shocks to economic and financial variables.

We propose a joint multivariate model of the expectation and uncertainty in the stock market and key macroeconomic variables - this involves modelling the conditional expectation of the excess return in the stock market, the risk premium. Assuming the additional factors to be priced in the stock market, affecting the average investor, are macroeconomic we develop a model for the conditional mean of the excess return, including a risk premium, and for key macroeconomic variables. With a consistent estimate of the conditional mean of these variables we can identify the shocks to macroeconomic variables and the stock market return. From the covariance matrix of these shocks we can determine the interaction between macroeconomic- and financial uncertainty (measured by standard deviation or variance) and risk compensation (variance and covariance), the building blocks of the risk premium. The paper argues that any modelling of the time-varying risk premium needs to allow for asymmetries in the conditional covariance matrix. Asymmetries, as will be shown, can simply arise as a consequence of incorrect modelling of the risk premium.

The empirical application uses US stock market return and key macroeconomic variables in the period 1960-2003. We show that the relation between stock market variability and the stock market risk premium varies with the business cycle. Macroeconomic and stock market volatility have a high level of comovement and several covariance asymmetries are present. The asymmetries found depend critically on the modelling of the risk premium but it is shown that negative shocks in the stock market and the macro economy increase the risk premium considerably, in particular during recessions. Most importantly we show that the US stock market compensate investors for macroeconomic risk.

## 1 Introduction

Using the no-arbitrage condition implied by the Stochastic Discount Factor model we obtain a relation between return, the risk-free interest rate and the risk premium on an asset. Assuming asset returns and the Stochastic Discount Factor (SDF) to be jointly log-normally distributed, the risk premium is proportional to the covariance between the logarithmic return and the logarithm of the SDF. Long horizon returns are forecastable - this is consistent with a time-varying