

Risk sharing and counter-cyclical variation in market correlations

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Abstract

I present a consumption-based dynamic asset pricing model in which international market correlations vary counter-cyclically over time. The driving force in the model is the time-varying effective risk aversion induced by external habit formation. Market returns are driven by fundamental outputs and discount rates. When risk aversion is high, the effect of discount rates on market returns rises with the market price of risk. To the extent that countries share risk, the cross-country correlation of discount rates exceeds the cross-country correlation of fundamental outputs. In bad times, market correlations rise as returns are mostly driven by discount rates. Thus, consistent with the empirical evidence, periods of high risk aversion are associated with high market correlations and high market volatility. After calibration, my model is consistent with the observed variation in market correlations, as well as other features of asset prices including the equity premium and market volatility.

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1. Introduction

International stock market correlations vary substantially over time. Market correlations depend on the phase of the business cycle: they are high when countries are simultaneously in recession. Market correlations also increase in periods of high stock

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market volatility. The dynamic behavior of market correlations is an important input to international investment decisions. Investors may diversify their portfolios more efficiently if they know the economic forces driving the market correlations up during recessions. Policymakers need to know how the dynamics of market correlations are related to economic fundamentals and international risk sharing to evaluate the welfare gains from financial liberalization. What economic forces drive the dynamics of market correlations and lead to high market correlations during recessions, however, remains an open question.

I explore the dynamics of market correlations in an international dynamic asset pricing model with time-varying risk aversion. In my model, counter-cyclical variation in risk aversion leads to counter-cyclical variation in both market volatility and market correlations when there is international risk sharing. When the model is calibrated to international production data and to several moments of observed asset prices, the amount of variation in market correlations is consistent with the observed variation in the data. The level of market correlations significantly increases with the level of international risk sharing. While increased correlations could imply low benefits to risk sharing in a partial equilibrium setting due to decreased diversification benefits, my calibrated general equilibrium model implies that significant welfare gains can be achieved through risk sharing.

In my model, the key elements driving the counter-cyclical variation in market correlations are risk sharing and time-varying risk aversion. Using the Clark–Ocone Theorem from Malliavin calculus, I characterize the individual impacts of fundamental output shocks and discount rate volatility on market returns. To the extent that countries share risk, the cross-country correlation of discount rates exceed the cross-country correlation of fundamental outputs. In bad times, the conditional volatility of discount rates rises with the increasing market price of risk. As discount rates become more volatile and dominate outputs in driving market returns, market correlations increase due to the high correlation of discount rates across countries induced by international risk sharing. Through risk sharing, time-varying risk aversion becomes a global economic force driving both market volatility and market correlations counter-cyclically over time.

The amount of variation in market correlations is related to the endogenous level of risk sharing between countries. In the benchmark case with frictionless markets, perfect risk sharing obtains and discount rates are perfectly correlated across countries. With perfect risk sharing, market correlations are close to 1.00 in all states of the world and show significant counter-cyclical variation.¹ With segmented financial markets, there is no international risk sharing. Such a lack of risk sharing equates the market correlations to the correlation of outputs. Since the correlation of outputs is constant over time, market correlations show no counter-cyclical variation when there is no risk sharing.

The amount of variation in market correlations is non-monotonically related to the level of risk sharing. To give role for partial risk sharing in my model, I impose restrictions on foreign investment. In particular, agents are allowed to invest in a fixed and limited share

¹While market correlations can be quite high due to risk sharing, individual firm's stock correlations can be significantly lower due to idiosyncratic shocks to their fundamentals which get diversified away at the aggregate level. The average correlation of monthly returns between four US stocks, Ford, GM, IBM, and Walmart has been 0.36 from 1985 to 2007. For the same period, the average correlation between US (SP500) and UK (FTSE100) markets is 0.76 and between US (SP500) and Japanese (Nikkei225) markets is 0.41.

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