



# Asymmetric stock market volatility and the cyclical behavior of expected returns<sup>☆</sup>

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## Abstract

Recent explanations of aggregate stock market fluctuations suggest that countercyclical stock market volatility is consistent with rational asset evaluations. In this paper, I develop a framework to study the causes of countercyclical stock market volatility. I find that countercyclical risk premia do not imply countercyclical return volatility. Instead, countercyclical stock volatility occurs if risk premia increase more in bad times than they decrease in good times, thereby inducing price–dividend ratios to fluctuate more in bad times than in good. The business cycle asymmetry in the investors' attitude toward discounting future cash flows plays a novel and critical role in many rational explanations of asset price fluctuations.

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## 1. Introduction

Why does stock market volatility vary over time? Economists have been intrigued by this issue for decades. For example, Schwert (1989b) finds that the volatility of no single macroeconomic variable could help explain low frequency movements of aggregate stock market volatility. Yet stock market volatility is related to the business cycle. A number of empirical studies confirm further findings from Schwert (1989a, b) that the volatility of stock returns is higher in bad times than in good times (see, e.g., Brandt and Kang, 2004, and the additional evidence provided here). This paper addresses an important but still unanswered question: Why is stock market volatility asymmetric over the business cycle?

My central result is that, in economies with rational expectations, return volatility is countercyclical because risk premia (i.e., the compensation investors require to invest in the stock market) change asymmetrically in response to variations in economic conditions. That risk premia are countercyclical has been a widely known empirical fact since the seminal contributions of Fama and French (1989) and Ferson and Harvey (1991). However, the main message of this paper is not a simple statement that risk premia must be countercyclical to generate countercyclical return volatility. Instead, the crucial point is that, to induce countercyclical return volatility, risk premia must increase more in bad times than they decrease in good times, a new hypothesis that I support with substantial empirical evidence.

So why do asymmetric risk premia fluctuations translate into countercyclical return volatility? Consider Fig. 1, in which I assume that the investors' risk-adjusted discount rates are inversely and asymmetrically related to some variable  $y$  that tracks the state of the economy. This asymmetry implies that in good times investors do not significantly alter the discount rates used to evaluate future dividends. Consequently, price–dividend ratios do not fluctuate widely in good times. In bad times, however, the investors' discount rates are extremely sensitive to changes in economic conditions. Therefore, variations in the price–dividend ratios become increasingly volatile as economic conditions deteriorate. The main result of this paper is that these asymmetric movements of the price–dividend ratios occur when the asymmetry in discounting is sufficiently pronounced. I calculate a theoretical lower bound for the asymmetric movements of the risk premia that triggers the

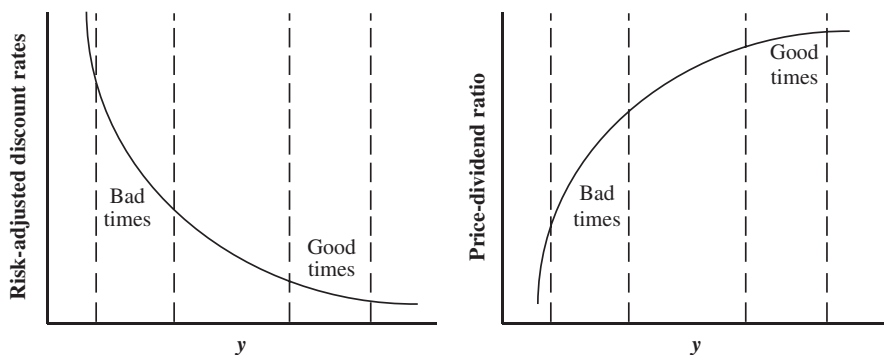


Fig. 1. Countercyclical return volatility. If price–dividend ratios are concave in some state variable  $y$  tracking the state of the economy, then return volatility increases on the downside and is consequently countercyclical. According to the theory in this article, price–dividend ratios are concave in  $y$  if the risk-adjusted discount rates are decreasing and sufficiently convex in  $y$ .

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