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The value premium, aggregate risk innovations, and average stock returns

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ABSTRACT

We test whether innovations in aggregate risk, interpolated from a vector autoregressive system that contains the Chen et al. (1986) five factors as in Petkova (2006), are common factors in cross-sectional stock returns. We provide direct evidence that innovation in industrial production growth, a classical business-cycle variable that summarizes the state of the economy, is associated with the cross-sectional return predictability of individual stocks. We conclude that the role of innovation in aggregate risk is not random, and furthermore that it provides guidance concerning an important source of nonfinancial market-based risk in asset returns.

1. Introduction

In this paper we evaluate the pervasive role of aggregate risk factors in changes in a given investment opportunity set. We investigate whether innovations in state variables are important for explaining asset pricing anomalies related to market capitalization and book-to-market equity. Our goal is to explore a number of aggregate state variables that can potentially influence cross-sectional return variability in our testing assets. We demonstrate that at the individual firm-level, aggregate risk innovation is a more important determinant of average cross-sectional returns than has previously been shown.

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Specifically, we investigate whether the size effect and the value effect, which are often associated with market equity (*ME*) and book-to-market ratio (*BE*/*ME*) respectively, are related to the surprise component of aggregate risk factors. The size and value effects show that certain portfolios of stocks tend to have higher returns than others. Since the anomalous nature of stock returns goes against the predictions of various models asserting that firm-level characteristics should not influence the cross-section of stock returns, the size and value effects have faced intense scrutiny in academic research.[1]

In order to explain asset returns with business-cycle fundamentals, we follow the widely cited unconditional approach of Chen, Roll, and Ross (CRR, 1986), and choose their set of five relevant aggregate factors. Similar to Petkova (2006), we use a multivariate vector autoregressive (VAR) model to extract innovations from the raw aggregate factors. We focus on variables such as the growth rate of industrial production (GIP), which summarizes the state of the economy, and relate the innovations to average returns for a set of well-known Fama and French (1993) portfolios two-way sorted on market equity and book-to-market ratio. One simple result emerges: Innovation in GIP is revealed to be a significant priced risk factor and is related to cross-sectional return predictability. We conclude that the relationship between expected return and the component of aggregate risk related to innovation in GIP is positive and not flat. We also perform an individual firm-level analysis to evaluate the role of GIP innovation risk for individual stocks. The results demonstrate that the spread between value and growth portfolios becomes much weaker once we control for GIP innovation. Furthermore, we perform a Fama and MacBeth (1973) cross-sectional regression for individual stocks, using firm-level characteristics and the loadings on the innovations. No previous study provides such a breakdown of the cross-sectional variability of individual stocks in the presence of innovation in GIP.

Our paper is closely related to the recent work of Cooper and Priestley (2009), who suggest that the output gap, a prime business cycle indicator, predicts aggregate stock and bond market returns. However, in contrast to our GIP innovation, Cooper and Priestley (2009) measure the output gap by the deviations of the log of IP from trend that incorporate both a linear and a quadratic component. Furthermore, unlike Cooper and Priestley (2009), who analyze stock returns on the CRSP value-weighted index and the S&P 500 index, we focus on portfolios and individual stocks sorted by well-known firm-level characteristics that have implications for equity allocation. Finally, our primary focus is the cross-sectional role of GIP innovation in our testing assets. Our approach is therefore complementary, and the contributions of this paper are limited by the robustness of the current results.

The rest of the paper is organized as follows. Section 2 reviews the prior literature and explains what motivates our idea. Section 3 briefly describes the methodology and models of performance measurement used throughout the paper. Section 4 presents our main empirical results. In Section 5 we conclude with some brief comments.

2. Motivation and prior literature

The key insight of Merton's (1973) intertemporal capital asset pricing model (ICAPM) is that the equilibrium pricing kernel depends on the state variables of the return generating process. Thus, in equilibrium we have the following relationship between expected return and risk:

$$E_t(R_{i,t+1}) = \delta \cdot Cov_t(R_{i,t+1}, R_{M,t+1}) + \Delta' \cdot Cov_t(R_{i,t+1}, Q_{t+1}) \tag{1}$$

where $R_{i,t+1}$ is the return of asset i in excess of the risk-free rate at time $t+1$, $R_{M,t+1}$ is the excess market return at time $t+1$, Q_{t+1} is a vector of k state variables that shift the investment opportunity set, δ is a scalar, Δ is a $k \times 1$ vector that prices all assets, and subscript t denotes the conditionality of information available at time t. Recent empirical literature suggests that macroeconomic risk might proxy for Q_{t+1}, which describes the variability in the investment opportunity set. There is a large body of work

[1] The relation between average stock returns and firm characteristics such as *ME* and *BE*/*ME* has already been investigated in numerous studies. Recent work by Fama and French (2012) and Asness et al. (2013) suggest that there are value premiums in average stocks returns that, except for Japan, decrease with size. In a related paper, Novy-Marx (2013) uses gross profitability as a measure of profitability and shows that the value premium is not driven by unprofitable stocks. Hwang and Rubesam (2013) provide a behavioral explanation of the value-growth anomaly based on time-varying return reversals. Choi (2013) argues that the dynamic interaction between asset risk and leverage drives the value premium.