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Macroeconomic shocks, forward-looking dynamics, and the behavior of hedge funds

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ABSTRACT

We investigate how hedge funds' strategies react, as a group, to macroeconomic risk and uncertainty. Adopting the methodology of Beaudry et al. (2001), we track the behavior of the cross-sectional dispersions of hedge fund strategies' returns, market betas and alphas over the business cycle. The pattern of strategies' betas supports Beaudry et al.'s conjecture: hedge funds reduce their risk-taking (betas) during times of macroeconomic uncertainty, which makes their strategies more homogeneous and thus contributes to increased systemic risk in the financial system. However, the cyclical behavior of the cross-sectional dispersions of strategies' returns and strategies' alphas is not in line with Beaudry et al.'s conjecture. These dispersions tend to increase during episodes of rising macroeconomic uncertainty, which suggests the prevalence of the Black's (1976) leverage effect during financial turmoil and the fact that the exposure of hedge fund strategies to risk factors is quite different from each other. Finally, although remaining important, procyclicality seems to have declined through time in the hedge fund industry, which suggests that a learning process is at play.

1. Introduction

Co-movements between macroeconomic variables and financial institutions' performance may be an important source of systemic risk[1] (Fama and French, 1989; Chen, 1991; Beaudry et al., 2001; Boyson et al., 2010; Veronesi, 2010; Cochrane, 2011). In this respect, informational problems and agency costs are generally more severe during slow growth episodes and especially during financial crises, when financial institutions are most exposed to moral hazard and adverse selection (Bernanke and Gertler, 1989; Kiyotaki and Moore, 1997; Vennet et al., 2004). During these periods, the behavior of financial institutions tends to become more homogeneous, which magnifies the amplitude of the crisis. Indeed, to restore the health of their balance sheet, financial institutions get involved in a deleveraging process which leads to fire sales of assets (Acharya, 2009; Shleifer and Vishny, 2010). These forced sales give rise to negative externalities across the financial system, an obvious source of systemic risk. Moreover, diversification in the financial sector also induces intermediaries to adopt a more homogeneous behavior, especially in crisis (Wagner, 2007, 2008, 2010). These more homogeneous patterns, which are driven by co-movements between macroeconomic variables and financial institutions' performance, threaten the resiliency of the financial system.

In this paper, using a framework developed by Beaudry et al. (2001) and Baum et al. (2002, 2004, 2009), we study the co-movements between macroeconomic risk and uncertainty, on the one hand, and three measures of cross-sectional dispersion in the hedge fund industry: the cross-sectional dispersions of strategies'

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[1] For instance, the covariance between GDP growth and expected returns is negative—i.e., expected returns increase when GDP growth decreases, because risk aversion increases when business conditions worsen (Veronesi, 2010).

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returns, market betas[2] and alphas. Indeed, in the current context of depressed interest rates and relatively lower real returns on stocks,[3] portfolio diversification relying on hedge fund strategies may be a way opened to financial investors to enhance their return. Low interest rates are particularly problematic for pension funds whose liabilities are bloated by depressed long-term interest rates.

In this study, our main finding is that the behavior of the cross-sectional dispersion of hedge fund strategies' market betas is in line with Beaudry et al.'s conjecture. This dispersion is procyclical and tends to decrease with the rise in macroeconomic uncertainty. Indeed, hedge fund managers reduce their risk-taking when macroeconomic uncertainty increases, which leads to a decrease in the cross-sectional dispersion of their betas.

However, in contrast to the results obtained on investment project data or banking data (Beaudry et al., 2001; Baum et al., 2002, 2004, 2009; Quagliariello, 2007, 2008, 2009; Calmès and Théoret, 2014), the cross-sectional dispersion of hedge fund strategies' returns increases with a rise in macroeconomic uncertainty. This behavior may be explained by the increased volatility of financial markets when business conditions worsen—i.e., the Black's (1976) leverage effect. Finally, the behavior of the cross-sectional dispersion of strategies' alphas is more akin to the pattern of their cross-sectional dispersion of returns. Interestingly, the cross-sectional dispersion of alphas tends to increase with macroeconomic uncertainty, suggesting that some strategies benefit from financial turmoil.

This paper is organized as follows. Section 2 presents the literature review and the benchmark model used to analyze the links between macroeconomic risk and uncertainty and our cross-sectional dispersion measures—defined in terms of strategies' returns, alphas and market betas. This section is also concerned with the estimation methods used in this paper, namely the Kalman filter—used to build the cross-sectional dispersions of alphas and betas—and the generalized method of moments (GMM) which deals with the endogeneity embedded in our measures of macroeconomic uncertainty (Racicot and Théoret, 2014b). Section 3 discusses the data and some key stylized facts related to our cross-sectional dispersion measures. In Section 4, we report our main results before concluding in Section 5.

2. Methodology

2.1. Literature review

To analyse hedge fund systemic risk, we rely on a theoretical underpinning based on a signal extraction problem à la Lucas (1973). This framework was refined by Beaudry et al. (2001) who also found an empirical counterpart to this model. Baum et al. (2002, 2004, 2009) contributed to the transposition of this setting to financial institutions.

Assume that the portfolio of an investor designated by i—i.e., hedge fund strategies in our setting—is composed of two categories of assets—a security (risk-free) asset and a risky asset (ra). The returns on the two categories of assets which are included in the representative investor's portfolio are given by the following equations:

$$\forall i, \quad \forall t, \quad r_{i,t}^{S} = r_f \tag{1}$$

$$\forall i, \quad \forall t, \quad r_{i,t}^{ra} = r_f + \rho + \varepsilon_{i,t} \tag{2}$$

where $r_{i,t}^{S}$ is the return on the security for investor i at time t; r_f is the return on a risk-free asset and $r_{i,t}^{ra}$ is the return on the risky asset. The expected return on the risky asset is equal to $r_f + \rho$, where ρ is the expected risk premium assumed to be fixed. The idiosyncratic risk is represented by the random variable $\varepsilon_{i,t}\tilde{N}(0, \sigma_{\varepsilon,t}^2)$.

At time t, when an investor determines the optimal allocation of his portfolio between the risk-free and risky assets, he is confronted to uncertainty, $\varepsilon_{i,t}$ (Eq. (2)). Assume that at time t each investor observes an imperfect signal $S_{i,t}$ which enables him to formulate a forecast of the value of $\varepsilon_{i,t}$: $S_{i,t} = \varepsilon_{i,t} + \upsilon_t$, with $\upsilon_t \sim N(0, \sigma_{\upsilon,t}^2)$ and $E(\varepsilon_{it}, \upsilon_t) = 0$. Assume that $\sigma_{\upsilon,t}^2$ is driven by macroeconomic uncertainty so that when uncertainty rises, the noise incorporated in the signal rises concomitantly with $\sigma_{\upsilon,t}^2$ and it becomes increasingly difficult to determine the true value of $\varepsilon_{i,t}$ and the optimal return on the risky asset. The best way to predict the return on the risky asset is then to estimate $E[\varepsilon_{i,t}|S_{i,t}]$, the expected value of the idiosyncratic noise conditional on the signal. Baum et al. (2002, 2004, 2009) assume that the conditional expectation of $\varepsilon_{i,t}$ is equal to a proportion λ_t of the signal:

$$\forall i, \quad \forall t, \quad E[\varepsilon_{i,t}|S_{i,t}] = \lambda_t[\varepsilon_{i,t} + \upsilon_t] \tag{3}$$

with

$$\forall t, \quad \lambda_t = \frac{\sigma_{\varepsilon,t}^2}{\sigma_{\varepsilon,t}^2 + \sigma_{\upsilon,t}^2} \tag{4}$$

Baum et al. (2002,2004, 2009) then compute w_{it}^{ra}, the optimal share of the risky asset in the bank portfolio using a model which maximizes the expected utility of a representative investor subject to portfolio risk. They obtain the following expression for w_{it}^{ra}:

$$\forall i, \quad \forall t, \quad w_{it}^{ra} = \frac{\rho + \lambda_t S_{i,t}}{\varphi \lambda_t \sigma_{\upsilon,t}^2} \tag{5}$$

where φ measures the representative investor's degree of risk aversion. They then compute the variance of w_{it}^{ra}—i.e., the cross-sectional dispersion of the shares of risky assets in the investors' portfolios:

$$\forall i, \quad \forall t, \quad Var(w_{it}^{ra}) = \frac{\sigma_{\varepsilon,t}^2 + \sigma_{\upsilon,t}^2}{\varphi^2 \sigma_{\upsilon,t}^4} \tag{6}$$

Its derivative with respect to macroeconomic uncertainty $\sigma_{\upsilon,t}^2$ is thus:

$$\forall i, \quad \forall t, \quad \frac{\partial Var(w_{it}^{ra})}{\partial \sigma_{\upsilon,t}^2} = -\frac{1}{\varphi^2}\left[\frac{2\sigma_{\varepsilon,t}^2}{\sigma_{\upsilon,t}^6} + \frac{1}{\sigma_{\upsilon,t}^4}\right] < 0 \tag{7}$$

Beaudry et al. (2001), who are concerned with the distribution of firms' investment rates of return, also obtain a theoretical negative relationship between their source of macroeconomic uncertainty—i.e., monetary instability—and the cross-sectional dispersion of returns.

Eq. (7) is the assumption we examine in this study. It asserts that the behavior of investors become more homogenous in times of rising macroeconomic uncertainty—i.e., the more macroeconomic uncertainty increases, the more financial institutions' portfolios become similar in terms of asset allocation. Regarding hedge funds, we may thus postulate that the cross-sectional dispersions of strategies' financial leverages and market betas are reduced with an increase in macroeconomic uncertainty. Indeed, an increase in uncertainty leads to closer shares of risky assets held by various strategies: strategies' leverages and market betas thus also get closer. Macroeconomic shocks can thus distort the behavior of hedge funds.

In this study, we follow the empirical methodology of Beaudry et al. (2001), Baum et al. (2002, 2004, 2009), Quagliariello (2007,

[2] When we talk about the beta of a strategy, we refer to the beta computed from the excess market return—i.e., the spread between the S&P500 return and the risk-free rate.

[3] See IMF, 2014, chapter 3.