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Positive feedback trading in stock index futures: International evidence☆

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ABSTRACT

Using a simple intertemporal asset pricing model with heterogeneous agents, this paper addresses the issue of trend-chasing investor behavior in stock index futures markets. There is strong evidence of positive feedback trading in the majority of 32 emerging and mature markets. Trend-chasing appears most pronounced after price drops during periods of financial crisis. Our empirical findings are of great concern for investors who want to use index futures as an instrument to hedge risk or exploit arbitrage opportunities. They also have implications for the debate on destabilizing effects of futures trading.

1. Introduction

The last three decades have witnessed the inception of stock index futures trading in many financial markets around the world. Stock index futures contracts not only provide an instrument to hedge risk (Anderson & Danthine, 1981; Figlewski, 1984; Brooks, Henry, & Persand, 2002). Due to low transaction costs, inherent leverage and the absence of short-sale restrictions, such derivatives also allow informed agents to bet on market developments without facing spot market frictions or having to buy or sell individual stocks. This gives rise to beneficial effects of futures trading in terms of price discovery and thus market efficiency (Cox, 1976; Grossman, 1977; Stoll & Whaley, 1990; Chan, Chan, & Karolyi, 1991).

Recent literature raises the issue of feedback trading in stock index futures markets (Antoniou, Koutmos, & Pericli, 2005; Antoniou & Koutmos, 2008; Kurov, 2008). Positive feedback or momentum trading implies that market participants buy (sell) futures contracts in response to previous price increases (decreases). Such trading behavior is of considerable interest for rational investors who want to use futures contracts to hedge risk or trade on private information. De Long, Shleifer, Summers and Waldmann (1990) show that trend-chasing by noise traders drives prices away from fundamentals and, together with rational investors' bandwagoning, has potentially destabilizing effects on the market. Thus, by inducing noise into the price formation process, sentiment-driven trading in stock index futures markets may compromise hedging opportunities. Moreover, the presence of irrational traders may create limits to arbitrage in the sense of De Long, Shleifer, Summers and Waldmann (1990). Such noise trader risk may impede arbitrage and cause mispricings to persist over longer horizons (Brunnermeier & Nagel, 2004; Brown & Cliff, 2005). If, for example, smart money investors sell futures contracts in order to bet on price declines, they incur the risk of positive feedback traders driving futures prices further away from fundamental values. To what extent a futures market can perform its hedging or price discovery function will therefore depend on the influence of sentiment-driven feedback traders.

The issue of feedback trading in stock index futures also relates to the debate over the influence of the futures on the spot market. A large body of empirical literature investigates whether the inception of futures trading has an impact on the conditional volatility of the underlying stock index (Antoniou, Holmes, & Priestley, 1998; Gulen & Mayhew, 2000; McKenzie, Brailsford, & Faff, 2001). From a theoretical point of

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view, the interpretation of such effects is subject to substantial controversy. On the one hand, futures trading may destabilize the underlying market by increasing stock market volatility due to the presence of uninformed investors (Cox, 1976; Cagan, 1981; Figlewski, 1981; Stein, 1987; Hart & Kreps, 1986). Attracted by high leverage, badly informed investors induce noise in the index futures market which lowers the information content of prices and can transmit to the underlying spot market via arbitrage links. On the other hand, futures markets may have a stabilizing effect on the underlying spot market because futures trading improves price discovery, enhances market efficiency, increases market depth as well as information flows and contributes to market completion (Danthine, 1978; Bray, 1981; Kyle, 1985; Stoll & Whaley, 1988). If the derivatives market is dominated by rational investors, volatility transmission from futures to spot markets will reflect information flows and thus increased market efficiency (Zhong, Darrat, & Otero, 2004). Therefore, as Antoniou et al. (2005) highlight, conclusions about the stabilizing or destabilizing role of futures trading critically hinge on the presence of sentiment-driven traders in the futures market.

This paper adds to the debate by providing comprehensive international evidence on feedback trading in emerging and mature stock index futures markets. Our empirical approach draws on a simple heterogeneous agents model developed by Sentana and Wadhwani (1992). We find a strong empirical evidence of positive feedback trading in the majority of futures markets under consideration. A large fraction of investors in these markets seem to chase short-term to medium-term trends. The influence of such trading behavior appears to be strongest during market downturns.

Our findings extend previous evidence of feedback trading in four major stock index futures markets documented by Antoniou and Koutmos (2008). Furthermore, Antoniou et al. (2005) show that the inception of futures trading in six mature markets coincides with a reduced influence of feedback trading on the constituents of the underlying stock index. Their results also suggest that trend-chasers do not migrate to futures markets. Kurov (2008) studies feedback trading in a market microstructure setting using high frequency data from the S&P 500 and Nasdaq-100 E-mini futures markets. A vector autoregressive analysis of returns and order flows reveals strong evidence of positive feedback trading. These papers, however, only consider a small subset of mature stock index futures markets, neglecting emerging markets.

The remainder of the text is structured as follows. Section 2 presents our empirical approach and dataset. Empirical results are discussed in Section 3. Section 4 concludes.

2. Empirical approach and dataset

Building on earlier work by Shiller (1984) and Cutler, Poterba and Summers (1991), Sentana and Wadhwani (1992) develop a simple intertemporal asset pricing model with heterogeneous agents. In a nutshell, positive feedback trading by one group of agents induces negative first-order return autocorrelation. Rational investors reduce their asset demand in response to increases in market volatility, enhancing the influence of sentiment-driven trading. Thus the model predicts a negative effect of conditional return volatility on serial correlation due to the presence of positive feedback traders.

These implications can be easily tested within a GARCH-in-Mean modeling framework. Empirical applications include mature (Sentana & Wadhwani, 1992; Koutmos, 1997; Watanabe, 2002; Antoniou et al., 2005) as well as emerging stock markets (Koutmos & Saidi, 2001; Bohl & Siklos, 2008). Recently, Antoniou and Koutmos (2008) show that a similar approach can be used to analyze momentum trading in futures markets.

Consider two types of futures market participants. The first group of market participants are rational smart-money investors who base their investment decisions on risk-return considerations. Following Sentana and Wadhwani (1992) and Antoniou and Koutmos (2008), their net demand for futures S_t can be modeled as

$$S_t = \frac{E_{t-1}(R_{F,t})}{\alpha_t \mathrm{Cov}_t(R_{F,t}, R_{M,t})}, \tag{1}$$

where $E_{t-1}(R_{F,t})$ is the expected return on holding a futures contract in period t. The term in the denominator captures a risk premium in the spirit of the Capital Asset Pricing Model. As $\alpha_t>0$, rational investors' demand is decreasing in the conditional covariance of the futures return with the underlying market return.

By contrast, feedback traders buy or sell futures only in response to past returns. Their demand function is given by

$$M_t = \varphi R_{F,t-1}, \tag{2}$$

where $R_{F,t-1}$ denotes the return in the previous period. Notice that $\varphi>0$ implies that agents go long in futures after price increases that is trade on positive feedback. In equilibrium, markets clear so that $S_t+M_t=1$. This implies

$$E_{t-1}(R_{F,t}) = \alpha_t \mathrm{Cov}_t(R_{F,t},R_{M,t}) - \alpha_t \varphi \mathrm{Cov}_t(R_{F,t},R_{M,t})R_{F,t-1}. \tag{3}$$

Notice that if the market is populated by homogeneous investors of the rational type only, expected futures returns increase in their covariance with the underlying market return. In this case, the model reduces to the standard CAPM. However, the presence of positive feedback traders induces negative serial correlation of returns. This effect is increasing in the level of the conditional covariance of spot and futures returns. Intuitively, higher levels of risk lead rational investors to reduce their net demand for futures so that the market share of sentiment-driven traders increases.

As Antoniou and Koutmos (2008) point out, the cost-of-carry model linking futures and cash prices implies $\mathrm{Corr}_t(R_{F,t},R_{M,t})\approx 1$ and that both return variances are proportional, $\mathrm{Var}_t(R_{F,t}) \propto \mathrm{Var}_t(R_{M,t})$. Assuming rational expectations and a constant parameter $\alpha_t=\alpha$, we obtain a regression equation of the following form

$$R_{F,t} = \gamma_0 + \gamma_1 \mathrm{Var}_t(R_{F,t}) + \gamma_2 \mathrm{Var}_t(R_{F,t})R_{F,t-1} + \gamma_3 R_{F,t-1} + \varepsilon_t, \tag{4}$$

where $\gamma_1=\alpha$, $\gamma_2=-\alpha\varphi$ and γ_0 is a constant term.[1]

Given $\alpha>0$, the model predicts a positive effect of conditional volatility on returns, $\gamma_1>0$. An additional term $\gamma_3 R_{F,t-1}$ allows the level of *unconditional* autocorrelation to be non-zero, irrespective of potential effects of feedback trading on *conditional* autocorrelation captured by γ_2. Factors inducing unconditional serial correlation in daily returns include for example time-varying expected returns (Conrad & Kaul, 1988). Most importantly, a negative parameter γ_2 corresponds to a positive parameter φ in momentum traders' demand for futures. Thus a significantly negative point estimate of γ_2 indicates the presence of positive feedback traders in the futures market.

The GARCH(1,1) model of Bollerslev (1987) provides a parsimonious approach to modeling the conditional variance of futures returns,

$$\mathrm{Var}_t(R_{F,t}) = \omega + \beta_1 \varepsilon_{t-1}^2 + \beta_2 \mathrm{Var}_{t-1}(R_{F,t-1}), \tag{5}$$

[1] Notice that, as Antoniou and Koutmos (2008) highlight, buying a futures contract does not require an investment outlay. Therefore, in contrast to tests of the model on stock returns, the constant in the regression equation does not carry the interpretation of the risk-free rate.