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Equity Fund Flows and Stock Market Returns in the US before and after the Global Financial Crisis: A VAR-GARCH-in-mean Analysis

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Equity Fund Flows and Stock Market Returns in the US before and after the Global Financial Crisis: A VAR-GARCH-in-mean Analysis

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flows-stock market returns relationship in countries other than the US. For instance, both Caporale et al. (2004) and Alexakis et al. (2005) found bi-directional linkages in the case of the Greek market. Oh and Parwada (2007) and Watson and Wickramanayake (2012) reported unidirectional (positive) causality running from stock market returns to mutual fund flows in Korea and Australia respectively. Alexakis et al. (2013) carried out asymmetric cointegration tests and found that in Japan there are two-way effects in periods with rising prices and unidirectional causality from fund flows to stock returns when prices are falling.

The present study is related to those of Warther (1995), Edwards and Zhang (1998), and Ben-Rephael et al. (2012) examining the Investment Company Institute (ICI) data on monthly aggregate flows to US mutual funds, as well as to the literature on the transaction costs of institutional investors. If fund flows exert price pressure, fund managers will buy "high" and sell "low"; Edelen's (1999) showed that in fact mutual fund flows are responsible for their negative market timing. However, the existing literature mainly focuses on first-order causality. The only exception is the study by Cao et al. (2008), who estimated a VAR using daily data and found that daily market volatility is negatively related to contemporaneous and lagged flows; further, their impulse response analysis suggests that shocks to fund flows have a negative impact on market volatility. In their paper volatility is measured first using high-frequency volatility estimators and then included in a bivariate model containing fund flows as well. Our study improves on theirs by modelling endogenously both the conditional mean and variance in the context of a VAR-GARCH(1,1)-in-mean model for which a BEKK representation is adopted given its well-known advantages (see below). Moreover, the chosen specification also allows for possible effects of the second moments of the series on their first moments. Therefore we are able to investigate causality-in-mean, causality-in-variance and GARCH-in-mean effects within the same framew2(t)-17I.6(rikin)-479.n(e)-.9(n002-2(t03(w)31.00236

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some robustness checks. Finally, Section 5 summarises the main findings and offers some concluding remarks.

2 The model

We represent the first and second moments of stock market returns and equity fund flows using a VAR-GARCH(1,1)-in-mean [1] In its most general specification the model takes the following form:

$$y = \alpha + \beta y_{1} + \delta_{1} + u \qquad (1)$$

where y = (Re) and y_{1} is a corresponding vector of lagged variables. The residual vector u = ($_{1}$ $_{2}$) is bivariate and normally distributed u $_{1}$ (0) with its corresponding conditional variance covariance matrix given by:

$$= \begin{bmatrix} _{11} & _{12} \\ _{12} & _{22} \end{bmatrix} \qquad (2)$$

The parameter vectors of the mean return equation (1) correspond to the constant α = ($_{1}$ $_{2}$), the autoregressive term, β = ($_{11}$ $_{12}$ + $_{12}$ $_{21}$ + $_{21}$ $_{22}$), which allows for bi-directional causality effect, and the GARCH-in-mean parameters δ = ($_{12}$ + $_{12}$ $_{21}$ + $_{21}$) which allow for bi-directional effects of volatilities on returns.

We adopt a BEKK representation and theδefore the second mD00e0TDkrameters

The log-likelihood function is:

$$= \sum_{=1} \log \ (y \quad {}_{1}; \ ) \qquad (5)$$

where is the vector of unknown parameters. The standard errors are calculated using the quasi-maximum likelihood method of Bollerslev and Wooldridge (1992), which is robust to the distribution of the underlying residuals.

3 Empirical Analysis

3.1 Data

Monthly data on aggregate equity fund flows have been obtained from the Investment Company Institute (ICI). Following other studies flows are normalised using the previous month's aggregate assets. US stock market returns are proxied by the Wilshire 5000 Total market index over the period 2000:1 - 2015:8, for a total of 188 observations. We construct monthly returns as the logarithmic differences of stock prices and the first differences of fund flows. The descriptive statistics, presented in Table 1, Panel A, show that the 2008 crisis had a noticeable impact on the distribution of both variables. In particular, the volatility of stock returns increased post-September 2008, whereas for equity fund flows the opposite is true. Furthermore, stock returns are higher in the post-September 2008 period, whilst equity flows have been negative during the same period.

Please Insert Table 1 and Figure 1

3.2 Hypotheses Tested

We test for mean and volatility spillovers by imposing restrictions on the relevant parameters; specifically we consider the following three sets of null hypotheses[3] ${}_{0}$:

1. Tests of no mean spillovers between equity fund flows and stock returns

   ${}_{01}$:Equity fund flows on stock returns before the 2008 crisis: ${}_{12} = 0$

   ${}_{02}$:Equity fund flows on stock returns after the 2008 crisis: ${}_{12} = 0$

   ${}_{03}$:Stock returns on equity fund flows before the 2008 crisis: ${}_{21} = 0$

   ${}_{04}$:Stock returns on equity fund fl

$_{11}$:Stock returns volatility on equity fund flows before the 2008 crisis: $_{12}$ = 0
$_{12}$:Stock returns volatility on equity fund flows after the 2008 crisis: $_{12}$ = 0

3.3 Discussion of the Results

In order to assess the adequacy of the models, Ljung–Box portmanteau tests were performed on the standardized and squared residuals. Overall, the results indicate that the VAR-GARCH(1,1) specification captures satisfactorily the persistence in returns and squared returns of both variables. The estimated VAR-GARCH(1,1) model with the associated robust p-values and likelihood function values are presented in Table 2. We select the optimal lag length of the mean equation using the Schwarz information criterion.

The following points are noteworthy. There does not appear to be any significant causality-in-mean at the standard 5% level before the 2008 crisis. In the post-September 2008 period causality running from stock markets returns to equity fund flows is found ($_{12}$ = 0 9478), consistently with the results of Remolona et al. (1997) and Edwards and Zhang (1998). This supports the feedback trading hypothesis that implies that equity fund investors respo-435RTf0-.82ro esu5

[2] Alexakis, C., Dasilas, A., Grose.C. 2013. Asymmetric dynamic relations between stock prices and mutual fund units in Japan. An application of hidden cointegration technique. International Review of Financial Analysis 28 ,1-8.

[3] Baker,S.,Bloom,N., Davis,S.2015. Measuring Economic Policy Uncertainty. NBER Working Paper 21633, Cambridge, MA.

[4] Ben-Rephael, A., Kandel, S.,Wohl,A. 2012. Measuring investor sentiment with mutual fund flows. Journal of Financial Economics 104,363-382.

[5] Ben-Rephael, A., Kandel, S.,Wohl,A. 2011. The Price Pressure of Aggregate Mutual Fund Flows. Journal of Financial and Quantitative Analysis 46, 585-603.

[6] Brown,S.J., Goetzmann,W.N. Hiraki, T. Shirishi, N., Watanabe, M., 2003. Investor Sentiment in Japanese and U.S. Daily Mutual Fund Flows. NBER Working Paper No. 9470.

[18] Oh, N., and Parwada, J., 2007. Relations between mutual fund flows and stock market returns in Korea. Journal of International Financial Markets, Institutions and Money 17, 140–151.

[19] Rakowski, D, Wang, X., 2009. The dynamics of short-term mutual fund flows and re-

TABLE 1: Descriptive Statistics

and ($_{12}$ + $_{12}$) capture the effect on stock return volatilities and mutual funds flow volatilities. The covariance stationarity co322d3(t)-itriori

TABLE 3: Estimated VAR-GARCH(1,1) model with Control Variables

Pre-crisis			Post-crisis		
Parameters	Coefficient	p-values	Parameters	Coefficient	p-values
Conditional Mean Equation					
$_{1}$	−0 0262	(0 4936)			
$_{2}$	0 8955	(0 0936)			
$_{11}$	0 5414	(0 0001)			
$_{12}$	0 3773	(0 6647)			
			$_{12}$	0 1481	(0 0423)
$_{21}$	0 0056	(0 4125)			
			$_{21}$	0 0043	(0 5254)
$_{22}$	−0 1070	(0 1893)			
$_{12}$	0 0355	(0 0031)			
			$_{12}$	−0 0334	(0 0013)
$_{21}$	−1 7205	(0 3181)			
			$_{21}$	2 3514	(0 2038)
Control on Mutual Fund			Control on Stock Returns		
$_{11}$(EPU $_{1}$)	0 0024	(0 0278)	$_{21}$(EPU $_{1}$)	0 0235	(0 2001)
$_{12}$(EMU $_{1}$)	0 0001	(0 3547)	$_{22}$(EMU $_{1}$)	0 0003	(0 3721)
$_{13}$(TBill $_{1}$)	−0 0031	(0 7563)	$_{23}$(TBill $_{1}$)	−0 0215	(0 8677)
$_{14}$(Default $_{1}$)	0 0045	(0 0903)	$_{24}$(Default $_{1}$)	−0 0861	(0 0225)
$_{15}$(TSpread $_{1}$)	0 0011	(0 3159)	$_{25}$(TSpread $_{1}$)	−0 0172	(0 2754)
Conditional Variance Equation					
$_{11}$	−0 1087	(0 0001)			
$_{12}$	0 6351	(0 0081)			
$_{22}$	−0 0001	(0 0009)			
$_{11}$	0 1646	(0 0102)			
$_{21}$	0 0585	(0 0101)			
			$_{21}$	−0 0410	(0 0032)
$_{12}$	0 5992	(0 3725)			
			$_{12}$	−2 8891	(0 1883)
$_{22}$	0 8555	(0 0001)			
$_{11}$	0 9353	(0 0001)			
$_{21}$	−0 0499	(0 0061)			
			$_{21}$	0 0305	(0 0111)
$_{12}$	−2 3773	(0 0162)			
			$_{12}$	6 4028	(0 0083)
$_{22}$	0 5298	(0 0001)			
LogLik	−502 7511				
(10)		10 331	(10)		9 443
(10)		5 169	(10)		3 981

Note: See notes Table 2. EPU, EMU, TBill, TSpread and Default are respectively the US Economic Policy Uncertainty Index, the US Equity market uncertainty index, three months Treasury Bills, Term spread by Moody's Aaa corporate bond yield minus the three-month bill yield and the Default spread by Moody's Baa corporate bond yield minus the Aaa corporate bond yield.

Figure 1: Mutual Fund Flow, Stock Market Returns and Conditional Correlations