Feedback trading and Long-term volatility links: Evidence from Real Estate Markets of USA, BeLux and Switzerland

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Abstract

This paper investigates the feedback trading strategies in the real estate markets of USA, BELUX and Switzerland, linking strategies with long-term volatility. The results are in favour of a positive feedback trading strategy which influences negatively investors' risk-return position on real estate markets.

Keywords: Positive Feedback Trading, Long-term volatility, FIGARCH
GEL Classification:

1. Introduction

Positive feedback trading consists of two groups, risk averse utility maximizers, along the lines of CAPM, and positive feedback traders. Risk averse utility maximizers respond rationally to expected returns subject to their wealth limitation. Both groups provide the rational for serial correlation in return series and the importance of volatility for the return autocorrelation behaviors.

Feedback traders base their decisions on the reaction to price changes. They are based on the history of past returns than expected fundamentals. The reverse relationship between volatility and autocorrelation is due to positive feedback trading strategies. This sign reversal in stock return autocorrelation is consistent with the fact that traders follow feedback strategies. They buy (sell) when the prices rise (fall). Thus, feedback trading produces **negative first order autocorrelation** in stock returns. This impact rises as the level of volatility rises.

In line with the findings of Sentana and Wadhwani (1992) **positive feedback trading** is an important determination of short-term movements for the USA market. Koutmos (1997) reports similar findings for the developed, as well as, emerging stock markets. In contrast, DeLong et al. (1990) find that positive feedback trading is associated with **positive return autocorrelation**, because traders move stock prices away from their fundamental values in the short run. Previous studies, such as Shiller, 1989, point out that positive feedback trading produce negative return autocorrelation and agree with the finding of Sentana and Wadwhwani (1992) and Koutmos (1997).

The return autocorrelation may vary over the time and the impact of positive feedback trading in turn should be a function of return volatility. To introduce a volatility term in mean equation of PFT, we use the FIGARCH (1,d,1) methodology proposed by Baillie et al. (1996). The focus of this investigation is the interaction between volatility and autocorrelation.

The main objective of this paper is to investigate whether or not the facts that found in stock markets are also present in Real estate markets. Our contribution is based on the debate on the role of real estate markets on examining the hypothesis of positive feedback trading in 3 Real Estate markets. Consideration has been given to the link between positive feedback trading and long-term volatility memory through a fractionally integrated GARCH approach. The implication of this study would be to find not similar results across the national real estate markets. Thus, the FIGARCH model will show us whether the shocks in Real Estate markets die away slowly in the long run. Furthermore, the results will show whether the real estate markets are stationary or mean reverting through the degree of fractional integration which captures the long memory features of volatility. A recent study of Cotter and Stevenson (2008) found strong evidence for long memory in REIT volatility. Thus, there is evidence that REITs exhibit high persistence in their volatility and the autocorrelation exists over long lags. Following that, we examine the impact of long-memory volatility on Positive feedback trading strategies in Real Estate Markets.

2. Methodology

2.1. Positive feedback Trading

The PFT model proposed by Sentana and Wadhwani (1992) has the following form:

$$r_t = \beta_0 + \beta_1\sigma_t^2 + (\beta_2 + \beta_3\sigma_t^2)r_{t-1} + \varepsilon_t$$

Where, β_2 pickups the possibility to be present constant autocorrelation in the model, β_3 should be both negative and statistically significant for the presence of positive feedback trading, The term $\beta_1\sigma_t^2$ is equal to $-\beta_3\sigma_t^2$ and implies that there is positive feedback trading and negative autocorrelation in returns.

The advantage of this model is that can capture not only the feedback trading strategies followed by two types of investors, but also the relation between autocorrelation and long-memory volatility. It is expected that real estate markets will exhibit high degrees of integration. As risk increases, the larger impact of $\beta_1\sigma_t^2$ compared to β_2 implies negative autocorrelation in stock returns due to the strength of positive feedback trading.

2.2. The FIGARCH (1,d,1) approach

The FIGARCH(1,d,1) model best describes the volatility in the Real Estate Markets as found by Cotter and Stevenson (2008). The conditional variance of the FIGARCH (1,d,1) process may be written as:

$$\sigma_t^2 = c + \beta\sigma_{t-1}^2 + [1 - \beta L - (1 - eL)(1 - L)^d]\varepsilon_t^2$$

The FIGARCH (p,d,q) model nests the covariance-stationary GARCH(p,q) model for d=0 and the IGARCH model for d=1. We should allow for values of d between 1 and 0, when modeling long-term dependence in the conditional variance. If, 0<d<0.5, the

series is covariance stationary, and if 0.5<d<1, the series is no longer stationary but it is mean reverting with the effect of shocks die away in the long-run. For the FIGARCH approach, all series can be estimated in terms of I(d) parameter with d lower than 1 and higher than 0. Thus, series are either stationary or mean reverting.
This paper fits a long memory volatility model, Fractional Integrated GARCH (FIGARCH). Baillie et al. (1996) find that the FIAGCRH (p,q) model can capture the long memory of financial volatility for daily equity returns through the fractional differencing parameter (d). As shown in Baillie et al. (1996), for 0<d<1, the conditional volatility $-\sigma_t^2$ will decay at a slow hyperbolic rate which is a characteristic of long memory. Numerous studies (Stevenson 2002; Liow 2009) have shown that the long-run dependence in Real Estate Market volatility is described well by a mean-reverting fractionally heteroskedastic (FIGARCH) process.
Our primary purpose of using this model is to develop a better relationship between real estate volatility and autocorrelation of returns.

3. Empirical Results

The parameters of the model accounting for autocorrelation of the real estate returns are the β_2 and β_3 The constant term of autocorrelation, β_2 , is statistically significant in all 3 markets. The significance of β_2 is due to non-synchronous trading or inefficiencies. It is interesting to see whether β_3 is negative and statistically significant. The implication is whether positive feedback trading is an important determination of long-term movements in real estate markets. Are Real Estate return dynamics similar across national Real Estate Markets?

3.1 The cases of USA, BELUX and SWITZERLAND

In the above three Real Estate markets, the coefficient of β_2 is significantly negative and becomes also significantly negative when volatility is considered. In particular, in the USA the coefficient changed from -0.00017 to -0.0081, in Belux changed from -0.050 to -0.011 and in Switzerland changed from -0.034 to -0.0312
Our results suggest that in the above Real Estate Markets there is enough positive feedback traders to give us negative serial correlation even though non-trading effects would tend to generate positive autocorrelation.
The results of variance equation exhibit different long-memory characteristics for the three above markets, being stationary for Belux (d=0.38) and Switzerland (d=0.34) and mean-reverting for the USA (0.58). These results and differences in long-term volatility are important for investors that need to take account of the persistence and dependence structure of volatility in the Real Estate Markets.
Our results for the USA Real Estate market agree with the findings of Sentana and Wadhwani (1992) for the hourly USA stock price returns during the crash week. In particular, their coefficient changed from -0.09 to -0.45 and became more negative during the crash period.

Table 1: PFT-FIGARCH(1,d,1) results for USA, Belux and Switzerland

$$r_t = \beta_0 + \beta_1\sigma_t^2 + (\beta_2 + \beta_3\sigma_t^2)r_{t-1} + \varepsilon_t$$
$$\sigma_t^2 = c + \beta\sigma_{t-1}^2 + [1 - \beta L - (1 - eL)(1 - L)^d]\varepsilon_t^2$$

Variables	USA	BeLux	Switzerland
β_0	0.022 (0.001)*	0.003 (0.009)	0.027 (0.001)*
β_1	-0.001 (0.001)*	0.006 (0.008)	0.001 (0.001)*
β_2	-0.001 (0.001)*	-0.050 (0.002)*	-0.035 (0.001)*
β_3	-0.008 (0.001)*	-0.01 (0.001)*	-0.031 (0.001)*
c	2.427 (0.001)*	0.075 (0.002)*	0.077 (0.001)*
β	0.268 (0.001)*	0.255 (0.008)*	0.245 (0.005)*
ε	0.228 (0.001)*	0.062 (0.007)*	0.092 (0.001)*
d	0.575 (0.001)*	0.377 (0.008)*	0.333 (0.007)*
Log-likelihood	-11281.38	-9584.55	-9865.32
Skewness	-0.339	-0.084	0.075
Kurtosis	5.874	1.157	2.880
LB(20)	70.312*	17.032	32.238**
LB^2 (20)	4894.756*	34.540**	15.721

5. The Impulse Response Function of the PFT-FIGARCH(1,d,1) process for the Real Estate conditional variance of returns

Following Conrad and Karanasos (2006) and Brunetti and Gilbert (2000) and Baillie et al. (1996) the cumulative impulse response coefficient λ of the FIGARCH (1,d,1) is given by:

$$\lambda(L) = 1 - \{[e(L)(1 - L)^d]/[1 - \beta(\mathrm{L})]\}$$

Taking into account the above equation the conditional variance of the FIGARCH (1,d,1) process may be written alternatively:

$$h_t = \frac{c}{1 - \beta(1)} + \lambda(\mathrm{L})\varepsilon_{\mathrm{t}}^2$$

where, e(L) = 1-eL and β(L) = 1-βL.

Figures 1-3 plot the cumulative impulse response functions of the parameter estimates for the PFT-FIGARCH(1,d,1) model with β, e , and d equal to the values found by the models which presented at Tables 1. While a shock of the past conditional variance to the future one decay at an exponential rate in the ARCH type models, it dies at a slow hyperbolic rate in the FIGARCH model.

Figures 1-3 at the Appendix

6. Conclusions and Implications

The empirical work suggests that volatility is linked negatively to autocorrelation returns in the real estate markets of **US, Belux, and Switzerland.** The results are consistent with the fact that traders follow feedback strategies with the presence of non-synchronous trading to attribute to serial correlation of real estate returns. Although someone would expect a reverse sign in the relation between serial correlation of returns and long-term volatility and returns, respectively this was not present in the series of Real Estate returns. This is due to the fact that positive feedback trading might be followed by price declines.

The long-term volatility results are consistent with the fact that autocorrelation persists over long lags and thus volatility decays at a slow hyperbolic rate. Explanations for risk aversion traders exist in cases where they interact with feedback traders in real estate markets under stress and selling after price declines and volatility increases. Further research would be based on non-synchronous trading in order to explain these findings.

The implications of this study are that Real Estate Markets are not moving in the same direction and interdependencies may vary. Someone should be cautious when they want to measure the level of efficiency or integration in these markets. Investors should diversify their portfolios based on profitable feedback strategies. When, there is a negative serial correlation between portfolio's volatility and stock price return, this financial instrument should be included in their portfolio.

References

Baillie, R.T., Bollerslev, T., Mikkelsen, H.O., 1996. Fractionally integrated generalized autoregressive conditional heteroskedasticity. Journal of Econometrics 74, 3 – 30

Cotter, J. and S. Stevenson, 2008. Modeling long memory in REITs. Real Estate Economics 36(3), 533-554.

Koutmos, G. (1997), „Feedback Trading and the Autocorrelation Pattern in Stock Returns: Further Empirical Evidence", Journal of International Money and Finance 16, 625 – 36.

Sentana, E. and S. Wadhwani (1992), „Feedback Traders and Stock Return Autocorrelations: Evidence from a Century of Daily Data", The Economic Journal 102, 415 – 25.

Appendix

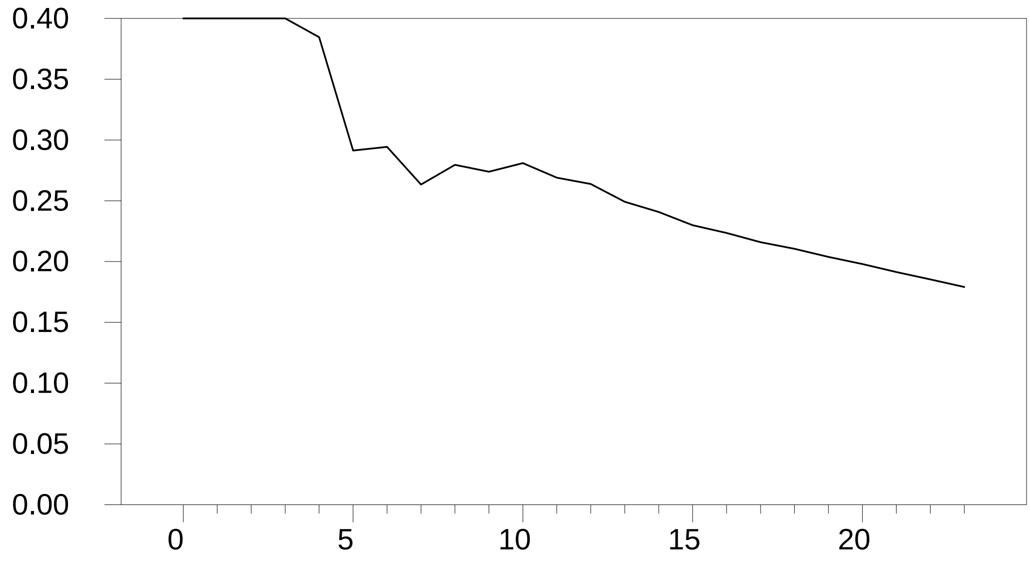

Figure 1: Cumulative Impulse Response Function for Belux

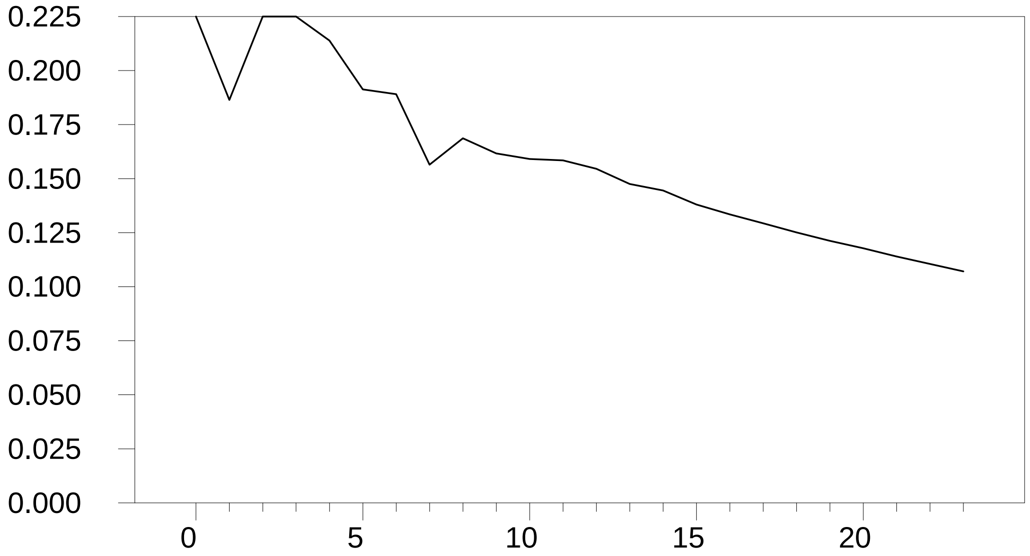

Figure 2: Cumulative Impulse Response Function for Switzerland

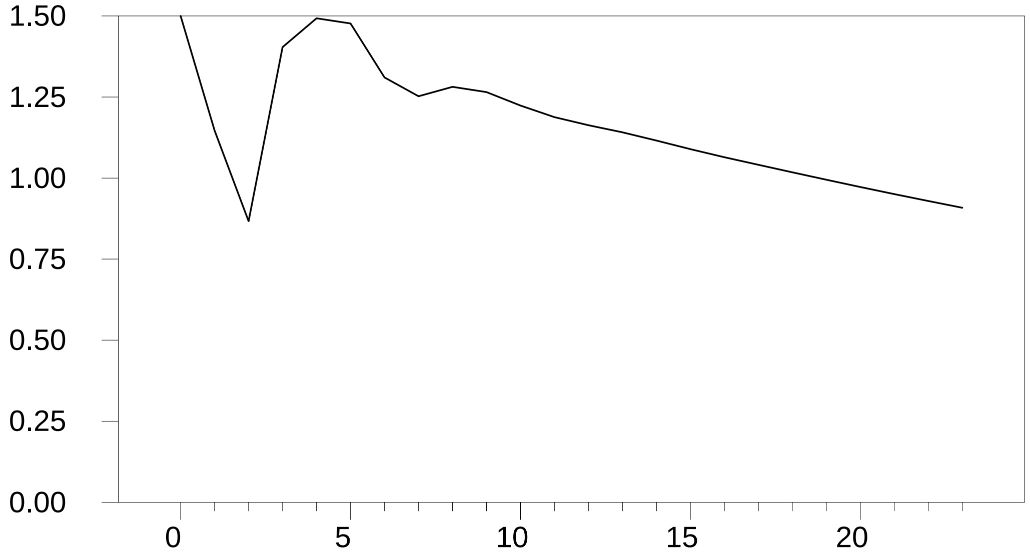

Figure 3: Cumulative Impulse Response Function for the USA