EXPECTATIONS OR MACROECONOMIC INNOVATIONS: WHAT DRIVES THE STAKEHOLDERS' DECISIONS? EVIDENCE FROM THE EURO AREA

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Abstract

This study brings new evidence supporting the existence of the linkage between equity market and macroeconomic variables in the Euro area. Using the monthly data from January 1999 to September 2014 we show empirical relationship between stock returns and interest rate in the 19 countries using the euro. The results confirm that in Euro Area stock markets, the stockowners decisions are significantly influenced by the macroeconomic expectations, particularly the long run interest rate.

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1. Introduction

The Euro area[16] faces an atypical situation. While struggling with the consequences of the financial crisis started in 2008, it has to manage public debt issues in a difficult stagflation conjuncture within an area characterised by strong macroeconomic divergent economies. The interest rate in the Euro area, which is mainly determined by the Governing Council of the European Central Bank (ECB), has been at its historic lows at the moment, while the equity markets are signalling uncertainty. This leads to an important question of what drives the stock holders trading trends in EU19 markets. Literature is evident on the relationship between macroeconomic variables and the stock prices (Gan et al., 2006; Gay, 2008; Pilinkus, 2009, Moss and Moss, 2010), however, to our knowledge no significant effort has been made so far to study this question in EU19 economies.

The study of macroeconomic variables and their impact on stocks is an area of intense interest to practitioners, academics, the stock holders and regulators in both the public and private sectors. This issue also has implications for the implementation of monetary policy; risk management practices and valuation of a wide range of financial securities. However, despite the accumulated research effort in this area it remains a research question that is largely unsettled. Stock prices are directly dependent on the supply and demand forces in the market, and these are the owners and potential owners of stocks that ultimately decide the price trends in any particular stock thus affecting the overall indices. On the other hand, most of the macroeconomics variables, particularly the exogenous ones, are determined through different policies of the central bank and the government.

Whereas the stock market indices reflect the overall health of the economy through the capital market movements and the investment situation condition in any economy, interest rate fluctuations signal towards the future course of monetary policy. Interest rate being the cost of capital, is the price of credit (borrowing rate) and for a lender, and is the fee charged for lending money (lending rate), is one of the important macroeconomic variables, which is directly linked to economic growth. In this way both the variables are two different sides of the same coin. While borrowing is one of the major source of finance for the corporations, any deceleration in the interest rates would reduce their cost of borrowing and provide with an incentive for expansion, which may lead to an increase in their stock prices. Maysami, Howe and Hamzah (2004) elucidates, when stocks are purchased through borrowing, a rise in interest rate would make stock transaction more costly. Another channel through which the stock prices could be affected by the interest rate movements is the lending channel. Where a decrease in the interest rate makes the bank savings less attractive for the potential savers and the tendency of placing the saving in the equity market may lead to high stock prices in turn. In this way, it could be established that macroeconomic

[16] 19 countries in January 2015 use the euro: Austria, Belgium, Cyprus, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Portugal, Slovakia, Spain, Sweden.

innovation, in particular interest rate movements, play a key role in the investments decisions of the owner and the potential owners of stocks.

Stakeholders need to have a strong knowledge of the macroeconomic environment and its main trends. According to Oxelheim and Wihlborg (2008), two types of information are required: first, information of predictive value to assess firms' prospects and risks; second, information allowing for control, taxation and evaluation *ex post* (Oxelheim and Wihlborg, 2008:198). In this regard, interest rates which reflect relative prices can play a significant role in stakeholders' decision.

This study empirically investigates the impact of interest rate on the share price in the Euro area over the period 1999-2014. This issue has been largely covered in the literature; however, surprisingly no significant effort has so far been made to explore this question in the EU19 markets. This paper is an attempt to better understand an aspect of the functioning of the Euro Area. We investigate the bidirectional relationship between interest rate and stock prices through error correction model (ECM).

The rest of the paper is organised as follows. First, we briefly review the existing literature on the relationship between interest rate and stock prices. In the following section, we present the methodology. We end with the discussion of the main results, before concluding.

2. Literature Review

There is a wide investigation in macroeconomic literature of the relationship between interest rates and stock prices. Examples can be found among studies which investigate the short-term and long-term relationships between several macroeconomics factors as inflation, money supply, exchange rate, oil prices and interest rate, and the stock returns (Islam and Watanapalachaikul, 2003; Maysami et al., 2004; Gan et al., 2006; Gay, 2008; Pilinkus, 2009, Moss and Moss, 2010). While results can vary from one study to another, most of the researchers have found that the role of macroeconomic variables especially of interest rate and stock returns can be significant on the long run and drive stockowners decisions. Islam and Watanapalachaikul (2003) suggest that interest rate have a long term relationship with stock market performance in Thaïland for 1999-2001. Maysami, Howe and Hamzah (2004), while studying the relationship between macroeconomic variables and Singapore stock market index (SMI), found that the Singapore SMI is cointegrated with short and long term interest rates, besides industrial production, price levels, money supply and the exchange rate. Gan et al. (2006) found that the New-Zealand stock market is impacted by interest rates, besides money supply and GDP for the period 1990-2000. More recently, Pilinkus (2009) confirmed that most macroeconomic variables and stock market returns have a long term relationship, through the focus on the Lithuanian SMI during the period 1999-2008.

Studies focusing their attention to the relationship between interest rate and stock prices for European countries are few (Peiro, 1996 for three European countries; Ansotegui and Esteban, 2002 for Spain; Tsoukalas, 2003 for Cyprus) and to our knowledge studies are very rare at a European level (Dritsaki and Adamopoulos, 2005). Ansotegui and Esteban (2002) investigate the relationship between the Spanish stock market and three macroeconomic fundamentals, which are industrial production, inflation and interest rates. The authors find a negative relationship between the stock market and the interest rate, as correspond to its role of discount rate. More interestingly regarding to our preoccupation, Dritsaki and Adamopoulos (2005) for the European Union (EU) for the period 1970-2000 using cointegration show that a long term equilibrium relationship exists between money supply, interest rate, output, exchange rate and price levels. Specifically, interest rate is in reverse direction relatively with money supply, direct output and exchange rate but is directed by price levels. This paper brings new light regarding the Euro Area level by focusing its attention to the relationship between interest rates and stock prices which are potential drivers of stockowners decisions.

3. Data & methodology

This study covers the period from 1999M01 to 2014M09. For this purpose, we collected the data on relative inflation, exchange rate to the U.S dollar monthly average, short run and long run interest rates, and interbank rate for the Euro Area. In addition, we use a broad and a narrow money supply variable as well. Our main dependant variable is the stock prices in the Euro Area. We use the Dow Jones EURO STOXX Index, which is a broad based index comprising 320-plus companies in the Euro Area. It covers common stocks traded in Euros or other European currencies.

This is a daily index calculated using the Laspeyres formula and is weighted by market capitalisation. As per OECD library, the non-euro stock prices are converted using the latest available mid-currency rates. The previous day's closing prices are used for any stock exchange on holiday. Data are period averages.

4. Estimation

Although, meagre studies are available on the issue of expectations driven stock prices volatility in the Euro area, a wide range of studies are available on the subject for various other regions and economies as already presented in the literature review. As a convention, we use a multivariate Vector Error Correction Model (VECM) to estimate the speed of

correction between our macro-variable shocks and stock prices. For the level non-stationary series in temporal data analysis, it is always advisable to look for if the variables are stationary at first difference, usually represented by I(1): integrated to the order 1. For this reason, we start our analysis by applying different tests of non-stationarity to our data (see table 1).

Table 1. Individual Unit Root Tests at First Difference

Variables	Method	t-Statistic	Prob.
SP - Stock Prices	*Augmented Dickey-Fuller test*	-10.71	0.000
	Phillips-Perron test	-10.77	0.000
LRI - Long run interest	*Augmented Dickey-Fuller test*	-06.87	0.000
	Phillips-Perron test	-06.85	0.000
SRI - Short run interest	*Augmented Dickey-Fuller test*	-05.35	0.000
	Phillips-Perron test	-09.36	0.000
IBR - Interbank rate	*Augmented Dickey-Fuller test*	-03.09	0.002
	Phillips-Perron test	-06.91	0.000

Once established the stationarity and I (1) condition of the variables in our model, we proceed with the estimation methodology. Starting with the basic autoregressive model:

$$x_t = x_{t-1} + \epsilon_t \quad (1)$$

As most empirical studies of such nature analyze bivariate/multivariate systems, so do we. Consider a VAR with p lags:

$$y_t = v + A_1 y_{t-1} + A_2 y_{t-2} + \cdots + A_p y_{t-p} + Bx_t + \epsilon_t \quad (2)$$

where y_t is a K×1 vector of endogenous variable, Bx_t is K×1 vector of exogenous variable, v is a K×1 vector of parameters, A_1-A_p are K×K matrices of parameters, and ϵ_t is a K×1 vector of disturbances. ϵ_t has mean 0, has covariance matrix $\sum$, and is independently and identically distributed (i.i.d) normal over time. One of the advantages of using VECM is that in this system only lagged values of the endogenous variables appear on the right-hand side of the equation, thus avoiding the issue of simultaneity, leading towards consistent estimates through OLS. Moreover, even though the innovations may contemporaneously be correlated, OLS is efficient and equivalent to GLS since all equations have identical regressors. This VAR_p can be reduced as a VECM as follows:

$$\Delta y_t = v + \prod y_{t-1} + \sum_{i=1}^{p-1} Þ_i \Delta y_{t-1} + \epsilon_t \quad (3)$$

Where $\prod = \sum_{j=1}^{j=p} A_j - I_k$ and $Þ_i = -\sum_{j=i+1}^{j=p} A_j$. The v and ϵ_t in equations 2 and 3 are identical.

The simple cointegration equation in our model can be written as:

$$y_t = \beta x_t \quad (4)$$

Table 2. Lag Order Selection

Time lag (monthly)	Sequential Modified LR test Statistics	Final Prediction Error	Akaike information Criterion	Schwarz information Criterion	Hannan-Quinn Information Criterion
T	NA	615.3918	12.09801	12.13336	12.11234
t-1	25.26908*	558.0802*	12.00025*	12.10628*	12.04324*
t-2	2.767270	574.2131	12.02873	12.20544	12.10037
t-3	7.434556	575.0869	12.03020	12.27760	12.13050
t-4	4.167372	586.7379	12.05017	12.36825	12.17913
t-5	5.679661	593.1831	12.06096	12.44972	12.21857
t-6	7.699290	592.3327	12.05933	12.51878	12.24560
t-7	5.021942	600.8115	12.07327	12.60341	12.28820
t-8	1.103032	623.9703	12.11075	12.71157	12.35433

* indicates lag order selected by the criterion

Fitting a cointegrating VECM requires to specify the number of lags to be included. Therefore, as a next step, we identify the number of lags to be included in regression analysis using different standard lag selection criteria (Tsay 1984, Nielsen 2001). Table 2 documents different tests to identify the appropriate lags to be included in analysis. Majority of the tests – LR, FPE, AIC, and HQ – approve selection of the first lag for to be considered in the analysis (see table 2).

Thus our bivariate VECM appears finally as:

$$\Delta SP_t = \lambda_0(\beta_i i_{t-1} - sp_{t-1}) + \sum_{i=1}^{p} \gamma_i \Delta sp_{t-i} + \sum_{i=1}^{p} \delta_i \Delta i_{t-i} + v + \in_t \quad 5$$

Where SP is the stock price variable, and i represents different measures of interest rates. Here in the equation 3 we exclude the existence of quadratic trend at the levels of the data and we restrict the cointegrating equations to be stationary around constant means. The $\lambda_0(\beta_i i_{t-1} - sp_{t-1})$ is the error correction term.

5. Results

In order to test the impact of selected macroeconomic variables on stock prices, we estimate the following VECM after the Johansen cointegration test identifying at least one cointegrating equation (see table 2). In the following equation, ΔSP is the change in EU19 stock price index and ΔLRI is the change in long run interest rates over the same period.

Overall, the output of our model indicates a good fit. At first instance, we find the existence of long run causality between the interest rate and stock price variations. The speed term shows that although the interest rate innovations would affect the stock holders' decisions, the prices would tend back towards equilibrium and 32 percent of the variation is corrected within lag of one month. The coefficient on stock price index in the cointegrating equation is statistically significant, as are the adjustment parameters. The adjustment parameters reveal that the estimates have the correct signs and imply rapid adjustment towards equilibrium. While confirming the earlier results indicating a pass-though effect from the macroeconomic variables to the stock prices, we bring new evidence on this question in the context of Euro area economies. Our results establish that over a period of one month

after a macroeconomic shock the stock price index tends to move back to the equilibrium position. Besides that the relationship between interest rates and portfolio returns has been established, we found the long run interest rate more effective as compared to the short run interest rate to result an impact on the stock returns. In this regard, it could be assumed that the Euro Area capital market is mainly expectations driven market where the stockowners pay rather more attention to the long run interest rates.

Table 3. Specific EC models for the macroeconomic impact on portfolio returns

Dependent variable	Autoregressive variables	Independent variables	Error-correction mechanism	R^2 (F-Stats.)
SP	SP(t-1)*	Interbank rate (t-1)**	ECM (t-1)***	38%
				34.7
SP	SP (t-1)***	Long term rate (t-1)***	ECM (t-1)***	30%
	SP (t-2)***	Long term rate (t-2)**		15.2
SP	SP (t-1)***	Short Run Interest (t-1)***	ECM (t-1)***	24%

All the coefficient values being confirmed through Wald coefficient restriction test, under linearity restriction

Breusch-Godfrey Serial Correlation LM Test confirms no serial correlation, however, weak serial correlation was observed in the lagged dependent variable. 187 observations, data period 1999M1 - 2015M1.

White Heteroscedasticity Test confirms homoscedasticity, where its value centres around 1.8.

** denotes 10%; ** denotes 5%; *** denotes 1% level of significance.*

Table 3 shows highly significant values of the estimated coefficients of differenced lagged dependent variable. It implies that the differenced values of the stock prices are affected by its previous performance. In addition, the differences lagged independent variables reflect the significant relationship between the stock prices and interest rate, where it could be interpreted in a way that interest rate variations would be translated in the stock performance with a lag of one month.

6. Conclusion

This paper investigated the nature of relationship between some macroeconomic variables particularly different interest rates and stock price in the Euro area, using error correction technique. We found evidence supporting long run causality running from interest rates to stock prices but not vice versa. We establish a strong and significant impact of long term interest rate on the stock prices. The results show that this relationship is significant at less than 1% for the first lag of interest rate being the independent variable. This suggests that, although the short run monetary policy changes are meant to place an impact on different financial markets to ultimately alter affect inflation in the EU economies, expectations play rather a more vital role in stakeholders' decision as compared to the short run interest rate. In other words, the investors in the EU19 markets pay less attention to the temporary innovations in the short run interest rate, but more to the long run interest rates while making investment decisions.

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