Study of Causality between the Base Interest Rate and the Market Return of OECD Countries

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Abstract: The relation between macroeconomic indicators and the capital market is a major problem in the eco-nomic literature. Market return and the base interest rate are two of the main drivers of economic growth, and the global financial crisis has provided additional impetus for research into the relationship between monetary policy and asset prices globally. This study examines the existence of causality be-tween the base interest rate and the market return of the OECD 15 countries for the period 2001 to 2017. Proof of causality in the direction of the BIR (Base Interest Rate) - market return would allow more accurate capital market forecasting as well as the use of interest rate as an impact tool.;

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1. INTRODUCTION

The relationship between market return and interest rates engages the minds of economists, as both indicators play an important role and influence economic development. Understanding the relationship between interest rates and stock prices is important for investors, portfolio managers, corporate managers and politicians, as it is critical for various areas of the national economy such as asset allocation, portfolio management, risk management, and monetary policy. On the capital market investments in long-term assets are managed, assuming that it plays a significant role in the growth and development of the economy. The market is an economic institution that promotes the efficiency, accumulation and distribution of capital. Asset prices are the main instruments by which economic operators express their feelings about the state of the economy. Equity prices have a significant impact on companies' ability to finance their projects, and those with greater market capitalization being in a better position to raise capital [1]. Capital market performance not only reflects the status of the economy but also provides feedback to central banks on private sector expectations for the future course of key macroeconomic variables (indicators). Numerous studies show that macroeconomic indicators have an important effect on the capital market. Gross domestic product, exchange rate, interest rate, money supply and more are among them. [2]. Ioannis points out five channels through which monetary policy can influence the capital market, namely:

- ✓ Interest rates
- ✓ Credit channel

- ✓ The effect of wealth
- ✓ Exchange rate
- ✓ Money channel [3].

One of the main channels through which interest rates affect market returns is their dependence on the cost of financing companies. This means, on one hand, that an increase in interest rates would lead to an increase in the weighted average cost of capital, which reduces the profits and subsequently the stock prices. On the other hand, the basic interest rate and the weighted average cost of capital are among the most commonly used discount rates. As the discount rate rises, the present value of cash flows will decrease, and hence the value of the companies, respectively their stocks. This view actually expresses the traditional Keynesian approach. The second channel through which interest rates affect the capital market is the credit channel. It suggests that raising interest rates would reduce the desire to use debt.

As a consequence, they will reduce investments, respectively, future profits, which will be reflected in stock prices. If the government uses a strict monetary policy, it would result in less credit available, which slows down economic activity. In theory, increased demand for money means that economic agents will sell assets to meet their liquidity needs, but asset sales mean a fall in their prices [4]. Another channel that explains the relationship between interest rates and stock prices is the currency exchange rate. According to it, with increasing interest rates would increase the national currency. The latter would lead to an increase in imports and a decrease in exports, resulting in lower sales of local companies, and hence lower prices. According to Tobin and his Q theory of investment, higher interest rates would lead to a lower stock prices. This is explained by the transfer of a financial resource from the capital market to the bond market (theory allows only these two markets to exist), which would reduce stock prices [5].

Another theory that sheds some light on the problem at hand is the Random walk theory. According to it, stock prices follow an unpredictable model and therefore cannot be predicted by analysis based on their past behaviour. The random walk in question usually happens around the real value of the asset. Interest rate change decisions taken by the central bank represent new macroeconomic information for market participants. The analysis of the effect of the announcement in question is complex. Market participants could successfully anticipate changes and reflect them in their portfolios. If this is fully implemented, the announcement of a change in interest rates will not constitute new information.

According to Fama's hypothesis, an efficient market should immediately reflect an unforeseen change in interest rates, since market participants include all available information in pricing models. Interest rate change announcements could affect the value of the stocks through two channels: (1) the pre-announcement effect or the "calm before the storm" and (2) the announcement effect itself or the "storm" [6]. Lobo examines stock price adjustments around announcing changes in interest rates. The results show that the announcement of interest rates has a significant impact on stock returns. The author notes that the risk deviation increases before announcing the changes, suggesting that the communication conveys new market information [7]. A number of researchers such as (Bae,

Bernanke & Kuttner, Bomfim, Ioannidis & Kontonikas, Thorbecke) have been researching the market response to changes in interest rates at the time of announcement and shortly thereafter. The analysis made shows that when the change in the interest rate is unexpected for the market, a 1% change in the interest rate leads to a 3.2% change in the market return [8]. Probably of particular importance is the moment at which interest rates change in the market cycle, respectively undervaluation or overvaluation of the market. Through this prism, the influence of the interest rate factor would be weakened or enhanced by the concomitant factors influencing this time interval. Basistha concludes that the result of changes in interest rates on stock prices strongly depends on the state of the business cycle and the existence of debt.

The response of stock prices to monetary policy is twice as strong in a recession period than in a calm period [9]. It is possible to look at the relation “interest rates - market return” through the prism of one of the major models in corporate finance, such as the capital asset pricing model (CAPM) and the net present value model (NPVM). If we look at the model of capital asset pricing against the return on the market portfolio (which is expressed by the most representative market index) we will see that it is in direct proportion to the risk-free return. The latter is close to the base interest rate, which implies a one-way relationship between interest rate and market capitalization. The latter claim is supported by the studies of Swiney and Nissim & Penman [10]; [11].

Exactly the opposite dependence will be found through the prism of the model for net present value. The long-term interest rate is directly related to the discount rate. The higher the discount rate, the lower will be the present values of future cash flows and hence the value of the shares.

Interest rates theoretically have a negative impact on the performance of the capital market. Rising interest rates would cause investors not to make high-risk investments in the capital market compared to low-risk ones in the money market. Modern macroeconomics textbooks usually suggest that there is a counter directional relation between interest rates and investment. And investments are in ordinal relation to future cash flows, and hence to stock prices. [12].

2. LITERATURE REVIEW

The literature review provides a comparatively chronological overview of the works of a number of researchers who have worked on the problem under consideration. Earlier works include Zhou's study, which analyses the relationship between interest rates and stock prices using regression analysis. He finds that over the long term, interest rates have a significant effect on stock returns. In addition, the results show that long-term interest rates explain much of the price-dividend ratio fluctuations and lead to the high volatility of the capital market being as-sociated with high bond volatility and may be related to changing forecasts for discount rates [13]. Ologunde uses time series analysis to examine the effect of interest rates on certain variables, including market returns over the 1981-2000 period. Using the least squares method, they find that interest rates have an effect on market returns [14]. Arando finds evidence of a non-linear counter directional relation between Bogota's stock market equity prices and interest rates [15]. Bernanke and Kuttner examine the stock

price response to changes in government securities rates, covering the period 1994-2002. Using a regression analysis, they conclude that a 1% rise in the base interest rate results in a 0.61% decline in stock returns. However, they define the results as statistically insignificant. They explain the latter with the fact that markets are forward-looking and have at present calculated all available information on expected future changes [16]. Mahmudul and Gazi examine the relationship between interest rates and stock prices in fifteen developed and developing countries (Australia, Bangladesh, Canada, Chile, Colombia, Germany, Italy, Jamaica, Japan, Malaysia, Mexico, Philippines, South Africa, Spain and Venezuela). They use monthly data for the period 1988-2003 and summarize that there is a significant counter-relationship between interest rates and stock prices in most countries [17]. In a study, Richard et al. examine the capital market dependencies with macroeconomic varia-bles in Nigeria for the period 1985-2007. The factors that have a strong impact on the capital market are: interest rate, stable macroeconomic environment, appropriate monetary policy, government incentives, etc. Inflation and the exchange rate are cited as factors of less effect [18]. Büyükşalvarcı analyses the effect of some of the macroeconomic variables on the Istanbul Stock Exchange's price index using an arbitrage pricing model. The model contains seven mac-roeconomic variables (consumer price index, interest rate, industrial production index, gold price, oil price, currency exchange rate, and money supply). The dynamics of the seven varia-bles and the index are introduced by multiple regression. In conclusion, the interest rate, the industrial production index, the price of oil, and the currency exchange rate have a counter-directional relation with the stock market index, and there is a unidirectional relationship with money supply. Inflation and the price of gold do not affect the stock market index [19]. Ajagbe, with the help of regression analysis and data for Nigeria in the period 1985-2009, proves that the increase in the interest rate leads to a fall in stock prices [20]. Ioannidis et al. with the help of a regression model of stock returns, prove that in 10 of the 13 countries in the sample there is a statistically significant negative dependence on the interest rate [21]. Bjornland and Lei-temo provide strong evidence for the short-term combined effect of monetary policy changes and returns on US capital markets. On the one hand, rising interest rates have a negative impact on stock returns, and on the other, capital market growth is positively correlated with interest rates [22]. For the United Kingdom, Bredin, Hyde, Nitzsche and O'Reilly have demonstrated statistically significant counter relationship between interest rates and the return on the main stock index [23]. Ferrer, Bolós and Benítez surveyed 10 European markets (Germany, United Kingdom, France, Italy, Spain, Netherlands, Finland, Ireland, Portugal and Greece) in the peri-od 1993 - 2012, looking for a correlation between interest rates and market returns. They find that the relationship in question varies across markets and changes over time. The highest cor-relation is observed in the United Kingdom, followed by major European markets such as Ger-many, France, the Netherlands and Spain. In smaller countries, the correlation is lower. They also find that dependence is strongest between one and two years [24]. Bredin, Hyde, Nitzsche and O'Reilly, on the other hand, they report the lack of impact of the Euro area monetary policy on stock returns in Germany, explaining it with the longer-term nature of the German capital market compared to other European markets [25].

With the worsening economic and financial crisis, nominal interest rates have reached zero in many developed countries as a result of an aggressive quantitative easing policy. This circumstance is combined with the weakened transmission channel due to the financial system being affected by bad credit after 2008. Macroeconomic policy has an important role to play in this situation. At near zero interest rates, public investment can stimulate the stock market [1] (in practice, fiscal policy is more effective at low interest rates due to a higher multiplier [2]), and monetary policy has a far greater impact on the return on equity [3]. In addition, the influence of structural and temporary factors in developed economies keeps the low interest rate environment. The strength of the relationship between interest rates and market returns may have changed before and after the crisis.

3. The relationship between the base interest rate and the market returns of OECD countries

We conducted a study on the relationship between the base interest rate and the market returns of Organisation for Economic Co-operation and Development countries (OECD 15). The survey data are recorded on the World Bank website and cover the period 2001 – 2017 [27, 28]. Expectations for the future performance of assets are traded on the capital market, so it is appropriate to examine the impact of a factor (in this case, the interest rate) after a certain time lag [26]. To do this, we used Granger model, looking for a dependency with a time interval of one to four years. According to the model used, causality exists when the value obtained is less than 0.1. From an econometric point of view, the latter is a regression model in which two quantities are studied, one of which is a dependent variable and the other a factor. The study of the relationship between two or more variables helps to determine whether changes in one variable cause changes in the other and vice versa. Before applying the model, it is necessary to check the stationary nature of the source data and determine from which row they are integrated, because in order to apply the analysis, the data must be integrated from the same row.

Table 1. *Relationship between the base interest rate and the market returns of OECD countries*

Country	***Market Capitalization/Interest Rate 1:4***	***Market Capitalization/Interest Rate 1:3***	***Market Capitalization/Interest Rate 1:2***
AUT	*0.374*	***0.08635***	*0.2673*
BEL	*0.5263*	*0.5755*	*0.3082*
DNK	*0.4258*	*0.1421*	*0.1267*
FIN	*0.4642*	*0.174*	*0.1896*
DEU	*0.6927*	*0.3293*	*0.3108*
GRC	*0.9981*	*0.9608*	*0.9905*
IRL	*0.5274*	*0.5634*	*0.2122*
ITA	*0.7433*	*0.9635*	*0.8033*

LUX	*0.1382*	*0.2557*	*0.2554*
NLD	*0.5252*	*0.1919*	***0.04685***
PRT	*0.954*	*0.9783*	*0.9991*
ESP	*0.62*	*0.9915*	*0.9946*
SWE	*0.5437*	*0.1963*	***0.07988***
FRA	*0.7382*	*0.5344*	*0.3998*
GBR	*0.7048*	*0.5007*	*0.2374*

Source: Own research

The validation of the data was performed using the extended Dickey-Fuller test and showed that there was nonstationary in the initial data for all studied variables. The results are presented in Table 1, where against each of the surveyed markets the value is indicated, reflecting the existence of a dependence between the basic interest rate and the market capitalization.

4. ANALYSIS AND CONCLUSION

Financial markets are complex systems consisting of a huge number of disparate agents with different time horizons ranging from seconds to years. This, as well as a number of other specifications, define market behavior. Through this prism, the relationship between interest rates and stock returns could vary depending on the time horizon of market participants, the number and dynamics of influencing factors. Much of the earlier research provides evidence of a significant negative relationship between interest rates and market returns. However, some recent research shows that this dependence is broken and is not constant over time. The results of the present study are similar. Using the Granger model, the dependence in the direction of the main interest rate-market return is found only in Austria between the first and third study periods, the Netherlands between the first and second study periods and in Sweden between the first and second study periods.

The author realizes that the topic and the studied variables directly or indirectly fall into the focus of many theories, not claiming to have covered all, but only the most significant ones. Although the theoretical arguments are relatively grouped (in the direction of a negative relationship between the interest rate and market return), there are those who share different to completely opposite statements.

The analysis of the model for valuation of capital assets shows the presence of a proportional relationship, that of the model for net present value shows the presence of an inverse relationship and the theory of random wandering states that the share price has no regular relationship with other variables. The empirical research in the direction of the present study is even more diverse than the theories that correspond to the topic. The reasons for the latter are conducting research for different markets at different time intervals with the help of a serious variety of models. It is correct to note that a significant part of the presented empirical results refers to markets other than those studied here.

Against this background, the literary review, together with the theoretical formulation, is relatively modest, but nevertheless dominates its own conclusions. We find the latter

natural, as the study is for a limited number of markets for a limited time interval using a model whose results are not sufficiently definite. In the study and analysis of the relationship between the base interest rate and the market return, a number of concomitant factors have an impact, such as the business cycle, which remain isolated because the model used cannot bind the mutual influence of the variables. It should be noted that conducting the study using different time series (monthly, quarterly or annual) would also lead to different results. We believe that the current work could be upgraded through the use of data for a longer time series, as well as the use of other models. In the presence of data for a significantly longer database, as well as non-annual time intervals, a similar study can be performed for more consecutive series in the considered markets. In this way, different from the established effects could be detected. Using more and different models could lead to more convincing results, especially if more variables are included. Exploring the dependence of the current topic with the help of a longer database and more models we accept as a future challenge.

In conclusion, the results obtained in the present study do not convincingly support the presented theoretical formulation and the significant part of the empirical review. Among the most probable reasons for the latter we assume the relatively short time horizon, disregard for the status, phases and specifics of the studied markets, as well as the emergence of increasingly diverse and dynamic factors that affect in different directions but remain outside the scope of the model used.

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