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Stock market informational efficiency in Germany: Granger causality between DAX and selected macroeconomic indicators

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Abstract

This study analyzes relationship between macroeconomic indicators and stock market in Germany. Aim of this paper is to answer the question how stock market reflects economic conditions and if stock market is informational efficient. Toda-Yamamoto (1995) approach is used for testing Granger causality. Bivariate analysis is performed on monthly data from January 1999 to September 2015, and six macroeconomic indicators are examined: industrial production, inflation, money supply, interest rate, trade balance and exchange rate. Analysis applies unit root tests, testing for cointegration using the Johansen methodology and Wald test for linear restriction to check Granger causality.

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Keywords: Germany; macroeconomic indicators; stock market; Granger causality; cointegration.

1. Introduction

The stock market has very important role in the whole economy and is inevitable for good economic performance of the country. This study analyzes relationship between stock market performance and selected macroeconomic indicators in Germany using Toda-Yamamoto (1995) methodology for testing Granger causality. Monthly data from January 1999 to September 2015 are used.

The main goal of this study is to answer the question how stock market reflects economic conditions in Germany. Generally stock market performance should be leading indicator of real economy and this relationship also helps us

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to determine the informational efficiency of the market. This is very important information for macroeconomic policy makers.

We are searching for two the most important outcomes of this study. The first situation is when we prove that stock market is leading indicator of given macroeconomic variable. We are able to predict development of this macroeconomic variable using information from stock market. This means that Efficient market hypothesis (EMH) is not violated and policy makers can use this information to improve implementation of their macroeconomic policies.

The second outcome is the exact opposite situation. Stock market is lagging behind given indicator and this indicator can be used for predicting future stock prices. In this case EMH is violated. As a result, financial resources are not allocated effectively and utility is not maximized. The third situation is also possible when no causal relation is found or there is causality in both directions between stock market and given macroeconomic indicator.

The rest of the paper is organized in five sections. In section 2, there is review of important theory and empirical literature related to this study. Section 3 describes used methodology and data. Analysis and its results are presented in section 4 and the last section 5 contains summary and conclusion.

2. Theory and literature review

One of the main characteristic of the capitalistic economy is business cycle. A lot of researches have been conducted about this topic trying to understand its nature. We are able to predict business cycle to some extent using leading economic indicators which tend to rise and fall in advance of the rest of the economy. On the other hand, stock market is assumed to be forward-looking predictor of future profitability. Is often considered as leading indicator and can be used for predicting economy. But stock prices remain unpredictable, according to Efficient market hypothesis.

Efficient market hypothesis means that stock prices already contain all available information and we can distinguish among weak, semi-strong and strong EMH. These three versions have different meaning of the phrase “all available information”. Weak form of EMH takes into account only common publicly available information about market, past prices, trading volume, etc. The semi-strong form of EMH adds some fundamental data about company such as information about product, management, balance sheet, etc. The last form of EMH called strong contains all the data already mentioned plus information available only to insiders (Bodie et al. 2011).

When we study causal relations between stock prices and macroeconomic indicators, it tells us a lot about informational efficiency of the given market. We usually address only the weak EMH. We can dismiss hypothesis about weak EMH if we are able to find uni-directional Granger causality stemming from macroeconomic variables to stock prices. In this case stock market participants would be able to adopt trading strategy that gives them more than average returns over long term period. In other words, it means that all relevant informations contained in given macroeconomic indicator are not fully reflected in current stock prices.

If we find that stock market performance can be used for predicting macroeconomic variables or presence of bi-directional Granger causality, it is the sign that market is efficient. In case of independent time series, no relationship should be observed and this behavior does not disrupt market efficiency. It just means that selected macroeconomic variable does not contain any useful information about stock market.

But we expect to observe stock market returns as leading indicator of the most macroeconomic variables. According to Ikoku (2010), there exist at least four theoretical approaches supporting hypothesis that stock market is the leading indicator of economic activity: stock prices are aggregators of expectations, there are the cost of raising equity capital, the effect of the financial accelerator and the wealth effect.

Stock prices are often explained by dividend discount model. This valuation method is based on theory that stock is worth the sum of all of its future dividend payments, discounted back to their present value. Investor is therefore considered as forward looking person. If stock prices depend on expected dividends and dividends depend on the profitability of firms, then stock prices should contain investor's expectations about future economic performance.

The second theoretical reason is based on a simple assumption that rising equity prices are lowering cost of equity for firms. This process reduces the weighted average cost of capital and lead to more optimal capital structure of the company, increase of investments, etc., resulting in increased future economic activity.

The financial accelerator is another theory suggesting stock market to be leading indicator of economic activity. The principle of this effect is very simple. Households and firms hold in their balance sheet some financial assets for example stocks. If stock prices are rising, it also improves creditworthiness of these subjects. As a result, they can

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