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The long run relationship between stock market capitalization rate and interest rate: co-integration approach

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Abstract

Two critical factors of economic growth are stock exchange and interest rate. This paper investigates the long run relationship between stock market capitalization rate and interest rates in Turkey over the period 1998-2012. Prior to conducting the analysis in a time series, in order to test the stability of the series, a unit root test was initially applied. It is determined that both stock market capitalization rate and interest rate series are not stationary. Long-run relationship is tested by Johansen Co-integration tests. According to the results of the study, there is long-run relationship between stock market capitalization rate and interest rates.

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Keywords: Stock Market Capitalization Rate, Interest rates, Cointegration, VAR;

Introduction

The relationship between stock market capitalization rate (SMCR) and interest rate have preoccupied the minds of economists since they both play important roles in influencing a country's economic development (Aydemir and Demirhan, 2009). Theoretically, interest rates have negative impact on stock market performance. An increase in interest rates would avoid investors making high risk stock market investments comparing to low risk interest bearing security investments such as fixed deposits, savings certificates, treasury bills etc (French et al., 1987). On the other hand, Central Banks usually use interest rates as a tool to dominate inflation in a country. If Central Bank changes interest rates; it would indirectly affect the stock market performance. It eventually would have an impact on overall economic development of the country. Thus, determination of ideal interest rate is a very important policy

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decision that a country has to consider regularly (Pallegedara, 2012).
Objective of this study is to investigate the long run relationship between SMCR and interest rate.

Literature Review

The relationship between stock market and macroeconomic factors has been a key study concern in the literature. For instance, the relationship between inflation and stock market investigated by Fama (1981). In his study, it is argued that expected inflation is negatively correlated with anticipated real activity, which in turn is positively related to returns on the stock market. A negative correlation between stock market returns and expected inflation was introduced. Conversely, On the other hand, the influence of the long-term interest rate on stock prices stems directly from the present value model through the influence of the long-term interest rate on the discount rate.
Zhou (1996) analyzed the relationship between interest rates and stock prices with a regression analysis. He found that over the long run, interest rates have a significant effect on stock returns. In addition, his results point out that long-term interest rates explain a major part of variation in price-dividend ratios and brings up that the high volatility of the stock market is related to the high volatility of long-term bond yields and may be accounted for by changing forecasts of discount rates.
Maysami and Koh (2000) used a VECM model using monthly data between 1988-2003 to examine the long-term equilibrium relationships between selected macroeconomic variables and stock indices of Singapore, Japan and the United States. They found that changes in Singapore's stock market levels cause a co-integrating relationship with changes in price levels, money supply, short- and long-term interest rates, and exchange rate except industrial production and trade. And also they detected that Singapore stock market is significantly and positively co-integrated with stock markets of Japan and the United States.
Gan et al. (2006) examined the relationship between the New Zealand Stock Index and certain macroeconomic variables between 1990-2003. They used monthly data to perform the co-integration tests. They found that the New Zealand Stock Index is consistently determined by the interest rate, money supply and real GDP but no proof could be found whether the New Zealand Stock Index is a leading indicator for changes in macroeconomic variables.
Kurihara (2006) analyzed the relationships between Japan stock index and macroeconomic factors with using daily data Japan among March 2001 and September 2005. His study included various variables such as Japan stock index prices, USA stock index prices, Yen/USD exchange rates, and Japan interest rates. As a result, he found that interest rates have no effect on Japan stock prices but exchange rates and USA stock prices have effects on Japan stock prices.
Ologunde et al. (2006) employed a time series analysis to examine the effect of interest rate on some certain variables such as SMCR and government development stock rate between 1981-2000 years. They used the ordinary least-square (OLS) regression method and used yearly data. They found that interest rates have a positive influence on SMCR and a negative influence on government development stock rate. They also found that government development stock rate has a negative influence on SMCR.
Mahmudul and Gazi (2009) investigated the relationship between interest rate and stock price for 15 developed and developing countries including Australia, Bangladesh, Canada, Chile, Colombia, Germany, Italy, Jamaica, Japan, Malaysia, Mexico, Philippine, S. Africa, Spain, and Venezuela. They used monthly data from 1988 to 2003. They found that interest rates have a significant and negative relationship with share prices for most of the countries. Only six countries -Malaysia, Japan, Bangladesh, Colombia, Italy, and S. Africa are found that changes of interest rates have a significant and negative relationship with changes of share price.
Büyükşalvarcı (2010) analyzed the effects of certain macroeconomic variables on share index by arbitrage pricing model. The model contains seven macroeconomic variables (consumer price index, money market interest rates, industrial production index, gold prices, oil prices, exchange rates, money supply) and Istanbul Stock Exchange 100 Index returns. The dynamics between the seven variables and Istanbul Stock Exchange 100 Index returns are introduced by a multiple regression method. As a conclusion, interest rates, industrial production index, oil prices and exchange rates have negative effects on Istanbul Stock Exchange 100 Index returns, but money supply has a positive effect on Istanbul Stock Exchange 100 Index returns. Inflation rate and gold prices have no significant effect on Istanbul Stock Exchange 100 Index returns.

4. Data, Model and Methodology
In the study, an attempt was made to detect the relationship between the ISE SMCR and interest rate with a VAR

model. Towards this end, quarterly data between 1998:Q1 and 2012:Q3 periods were utilized.
Market Capitalization data is obtained from the website of ISE or at present name Borsa İstanbul. The SMCR is defined market capitalization data divided by GDP. Data for the interest rate was retrieved from the website of the TCMB (Central Bank of Turkey)

4.1. Empirical Result and Analysis

After an observational look, the stationary of each variable were tested by unit root tests to determine their level of stationary. Stationary variables could be used in the model. Then, a VAR model is estimated, granger causality, impulse- response functions and variance decomposition were tested in order to emphasize the dynamic properties of the system.
Stationary of the time series is a salient pre-condition in future estimations. That is related to the fact that if the analysis is conducted with non-stationary time series, spurious regression problem occurs. In such a case, series with no actual interrelationship may seem as if they are interrelated (Özata and Esen, 2010). In this study stationary of the variables are tested by unit root tests of Augmented Dickey-Fuller (ADF), Philips-Peron (PP). None of the series is found to be stationary as a result of ADF and PP test results. All of the series become stationary when their first differences are taken. Therefore, all of the series are first-order integrated I (1). As a consequence, differenced series are used in the analysis. Results of the unit root tests are presented in Table 1.

Table 1: Unit root test results

TEST	***dMCR***	***dINT***
ADF(c)	-7.610268	-5.406468
PP (c)	-8.225866	-14.92046

4.2. Co-integration Test

Unit root tests revealed that the series are stationary at first level, so they are integrated. But, even the series are integrated; it does not guarantee that they behave in the same direction in the long run. Long run relationships between two non-stationary series can be detected by co-integration analysis. There are certain tests to perform co-integration analysis. In this study, long run relationship between the co-integrated series is tested by a Johansen co-integration test (1988). Johansen co-integration test provide us to determine the number of co-integration relationship and the parameters of this relationship (Özata and Esen, 2010).
Prior to the implementation of the Johansen Co-integration Test, the unrestricted Vector Auto regression (VAR) model was applied on the series to determine lagged ratios. Lagged ratio is taken as 2 according to the SC, HQ and LR criteria. The Johansen Co-integration test results, the Trace Test and the Maximum Eigenvalue test results are illustrated in Table 2 and Table 3.

Table 2: Trace Test Results

Hypothesized No. of CE(s)	**Eigenvalue**	**Trace Statistics**	**%5 Critic Value**	**Probability**
None (r=0)	0.430888	49.95243	15.49471	0.0000
At most 1 (r⩽1)	0.291460	18.95016	3.841466	0.0000

Table 3: Maximum Eigenvalue Test Results

Hypothesized No. of CE(s)	**Eigenvalue**	**Maximum Eigenvalue Statistics**	**%5 Critic Value**	**Probability**

None (r=0)	0.430888	31.00227	14.26460	0.0001
At most 1 (r⩽1)	0.291460	18.95016	3.841466	0.0000

Trace test and Maximum Eigenvalue test results shows that we can reject the null hypothesis:
Ho: There is no co-integration,
As a conclusion, we can state that there is a long-run relationship between the variables.

5. Summary and Concluding Remarks

This study examined the long run relationship of interest rates on the SMCR over the period 1998-2012 with VAR model. Time series of the data are found non-stationary so that the long run relationships between the two variables are tested with co-integration analysis.
According the results of the model, there is a long-term relationship between the SMCR and interest. The results showed that, crisis in the stock market are precluded with the control of interest rate in the long term.
The presence of a co-integrating relationship between macroeconomic variables and stock prices brings the conclusions of the efficient market hypothesis in doubt. Principally, the behaviour of stock market may indeed be predicted, contrary to the EMH conclusions and policy-makers may need to re-evaluate their economic policy if affecting the stock market is not something they desire.
While aiming to correct macroeconomic ills such as inflation or unemployment, they may inadvertently depress the stock market, and curtail capital formation which itself would lead to further slowdown of the economy.

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