
**ÇANKAYA UNIVERSITY**

**GRADUATE SCHOOL OF SOCIAL SCIENCES**

**DEPARTMENT OF ECONOMICS**

**MASTERS THESIS**

# THE IMPACT OF FOREIGN EXCHANGE RATES ON STOCK MARKES

**OMRAN ABBAS BIKHTIYAR-ALALAW**

**AGUSTUS 2016**

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# THE IMPACT OF FOREIGN EXCHANGE RATES ON STOCK MARKES

**OMRAN ABBAS BIKHTIYAR-ALALAW**

**AGUSTUS 2016**

Title of the Thesis: **The Impact of Foreign Exchange Rates on Stock Markets**

Submitted by **Omran abbas Bikhtiyar- ALALAW**

Approval of the Graduate School of Social Sciences, Çankaya University.

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I certify that this thesis satisfies all the requirements as a thesis for the degree of Master of Science.

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This is to certify that we have read this thesis and that in our opinion it is fully adequate, in scope and quality, as a thesis for the degree of Master of Science.

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## ÖZET

### DÖVİZ KURLARININ SERMAYE PİYASALARINA ETKİSİ

Omran Abbas, Alalaw

M.Sc., Department of Financial Economics

Supervisor: Doç. Dr. Ece C. AKDOĞAN

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Bu araştırma tezinin başlıca amacı Türk finansal piyasalarında döviz kurlarının hisse senedi piyasasına etkisini araştırmak olup, ayrıca bu iki piyasa arasındaki nedensellik ilişkisini de incelemektir. Bu doğrultuda ilk olarak verinin durağanlığını test edebilmek amacı ile Genişletilmiş Dickey-Fuller Testi uygulanmış, sonrasında döviz kurlarının hisse senedi endekslerine etkilerini araştırmak için Regresyon Analizi , ardından da hisse senedi ve döviz piyasaları arasındaki nedensellik ilişkisinin tespit edilebilmesi için Granger Nedensellik Testi uygulanmıştır. Döviz kuru olarak ABD Doları ve Euro ikullanılırken borsa endeksi olarak Ulusal 100 Endeksi (XU100), Hizmet Endeksi (XUHIZ), Finansal Endeks (XUMAL) ve Endüstri Endeksi (XUSIN) kullanılmıştır. Analizler 1 Nisan 2011 ve 31 Aralık 2015 dönemi kapsamında günlük veri kullanılarak gerçekleştirilmiştir. Araştırmanın bulguları ABD Doları ve Euro'nun hisse senedi piyasasında negatif etkileri olduğunu göstermektedir. Ancak Doların etkisi istatistiksel olarak daha anlamlı ve daha güçlüdür. Ayrıca, Garanger Nedensellik Testi sonuçları Dolar ile XUMAL ve XU100 endeksleri için çift yönlü bir ilişki öngörmektedir. Euro için ise, bir nedensellik ilişkisi tespit edilememiş olup, bu Euro'nun XU100 ve XUMAL Endeksleri üzerinde anlık bir etkisi olduğuna, ama XU-Endekslerini öngörüleme gücü bulunmadığına işaret etmektedir.



**Anahtar Kelimeler:** Döviz kurları, borsa endeksleri, nedensellik.

## ABSTRACT

## THE IMPACT OF FOREIGN EXCHANGE RATES ON STOCK MARKETS

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This research thesis is designed to investigate the impact of exchange rates on stock markets through focusing on Turkey with an additional aim of searching for the causal relationship in-between these two markets. For that purpose, first Augmented Dickey–Fuller Test is used to check for the stationary of data and then regression analysis is applied to examine the impact of exchange rates on Borsa Istanbul while Granger Causality Test is employed to search for the causal relationship in-between these two markets by employing US Dollar and Euro as the foreign exchange rate variables along with the indices of Borsa Istanbul, specifically, the National 100 Index (XU100), the Services Index (XUHIZ), the Financial Index (XUMAL) and the Industrials Index (XUSIN). In the analyses, daily data is utilized for the period between April 1, 2011 and December 31, 2015. The findings indicate that US Dollar and Euro have a significant negative impact on stock indices. However, the impact of US Dollar is found to be more significant. Besides, the results of the Granger Causality Tests show that there is a two way relationship between US Dollar and XUMAL as well as US Dollar and XU100, while no causal relationship could be found between either Euro and XUMAL or Euro and XU100 which can be interpreted as: Euro has an instant effect, but does not have a predictor power on XU-Indices.



**Key Words:** Exchange rates, stock indices, causality.

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## LIST OF ABBREVIATIONS

| | |
|---|---|
| ISE | İstanbul Stock Exchange |
| OLS | Ordinary Least squares |
| USD | United States Dollar |
| EUR | Euro |
| XU100 | Borsa İstanbul (Bist100) İndex |
| XUMAL | Borsa İstanbul (Financial) İndex |
| XUSIN | Borsa İstanbul (İndustrial) İndex |
| XUHIZ | Borsa İstanbul (Services) İndex |
| XYZ | İnterest Rates Deposits |
| PPP | Purchasing Power Parity |
| CIP | Covered İnterest Parity |
| UIP | Un Covered İnterest Parity |
| YTL | Turkish Lira |
| MPC | Marginal Propensity to Consume |
| GNP | Gross National Product |
| VAR | Vector Autoregression |
| ADF | Augmented Dickey-Fuller |
| GDP | Growth Domistic Product |
| ERBS | Exchange Rate Based Stabilization |
| RER | Real Exchange Rate |
| EMU | Economic Monetary Union |

# INTRODUCTION

The impact of foreign exchange rates on the stock markets is an important factor for investment, while longer stability of the currency exchange rates is of the utmost importance to monetary policy standards as an essential factor to attract savings and to maintain price stability. Therefore, governments are working on policies and platforms for actions designed to ensure the stability of their exchange rate and avoid its sharp fluctuations experienced by the currencies from period to period.

Although there are different varieties of floating and fixed exchange rate systems providing a range of alternatives, generally in discussions the distinction is made between fixed and floating exchange rates. As each alternative has its own rules, they all require different levels of central bank intervention to the foreign exchange markets. Nevertheless, the floating exchange rates and their impacts on the financial and economic positions of the countries mainly pertains those who adjust floating exchange rate systems.

There are two main parity conditions that are used in explaining the determination of exchange rates which are the Purchasing Power Parity and Interest Rate Parity. Purchasing Power Parity simply argues that the nominal exchange rate between two countries should be equivalent to the ratio of the two relevant price series (Rogoff, 1996). Actually, Purchasing Power Parity can be expressed in two ways, specifically the Absolute Purchasing Power Parity and the Relative Purchasing Power Parity. While Absolute Purchasing Power Parity supports that the exchange rate between any two currencies will be equal to the price levels ratio of the related two countries, Relative Purchasing Power Parity equates the change in the exchange rate to the difference of the expected inflation rates of those two countries. On the other hand, Interest rate parity argues that the exchange market will only be in balance when the denominated deposits in all available currencies offer the same interest rate when expressed in the same units of measurement and supports that if

the nominal interest rate on domestic currency denominated deposits is higher than the real return on foreign currency denominated deposits, then the home currency is expected to depreciate. However, the investors will be exposed to a foreign exchange risk and thus it is usually referred as Uncovered Interest Parity in the literature. If it is adjusted to cover the foreign exchange risk through hedging techniques (trading in forwards), then it is called Covered Interest Parity which argues that any nominal interest rate gain in say US Dollar denominated deposits over say Euro denominated deposits ($r_{\$} - r_{euro}$) will be wiped out by the depreciation of the US Dollar against Euro, as reflected in the forward premium.

There is an important relationship between Covered and Uncovered Interest Parity involving the concept of efficiency on the foreign exchange market. Fama (1970) defines an efficient market as the one where prices reflect all available information and where there are no untapped profit opportunities. Thus, if the foreign exchange market is efficient, then both the uncovered and the covered interest parity conditions are accepted. Otherwise, they cannot be simultaneously valid.

Many theoretical models have been developed to explain the interaction between the exchange rates and the stock markets. Two basic approaches that explain the relationship between stock prices and exchange rates can be identified. The first approach bases on capital flows and the other bases on trade flows. Trade flow oriented approaches assume that the exchange rate is determined to a large extent on the current account and trade balance performance, and through that, they affect the competitiveness of the economy while capital flow oriented approaches emphasize more on the role capital accounts play in determining the exchange rates and focuses on the impact of capital flows.

There are several ways in which the exchange rates and the stock markets correlate. Firstly, depreciation leads to a decline in stock prices due to inflation expectations. Secondly, exchange rate fluctuations will have a direct consequence on the economy such that an appreciation (depreciation) of local currency will reduce (increase) the company profits through its effect on the competitiveness. Thirdly, at the macroeconomic level, the exchange rate decline is working to strengthen the export industry while decreasing the imports which will positively affect the gross

domestic product, leading to an increase in production which is usually perceived as an indicator of a booming economy thus rendering investors to increase stock prices by buying more shares in that country. Next, as Golaka (2003) argues low stock prices will motivate the investors to sell their shares to avoid the loss. Last but not least, it is also possible to argue a circular flow as well. As Godwin and Joseph (2012) claims the depreciation of the home currency will increase the competitiveness of the domestic companies thus rising exports which will in turn lead to a higher income and an increase in the stock prices while the increases in the stock prices will lead to an appreciation of the home currency.

The relationship between exchange rates and stock prices has been empirically analyzed in many studies. However, the impact of exchange rates on stock prices is still inconclusive due to the conflicting results obtained.

Following the aforementioned arguments, this research thesis is designed to search for the impact of foreign exchange rates on stock markets for Turkish economy through focusing on Borsa Istanbul with an additional concern of investigating the causal relationship in-between these two markets.

The rest of the thesis is organized as follows: Chapter 1 focuses on the fundamentals of exchange rates, reviews the foreign exchange rate regimes and provides a short summary of the evolution of the exchange rate system of Turkey. Chapter 2 reviews the evolution of Turkish stock markets and demonstrates the main characteristics of Borsa Istanbul. Chapter 3 examines the relationship between foreign exchange rates and the stock markets both theoretically and empirically. Chapter 4 explains the data and the methodology, and provides results. Finally, Chapter 5 concludes.

# CHAPTER 1

## EXCHANGE RATES AND EXCHANGE RATE ARRANGEMENTS

### 1.1 Fundamentals of Exchange Rates

The nominal exchange rate is defined as the unit price of a foreign currency in terms of units of local currency which can be exchanged for one unit of foreign currency (William and Alan, 1998, p 821). The definition can be reversed to have the nominal exchange rate expressed by the unit of currency, local paid price for a number of units of foreign currency, as the nominal exchange rate is a measure of a country's currency that can be exchanged for the value of the currency of another country (Ingram and Dunn, 1993, p.278).

As the nominal exchange rate has been defined as an exchange rate of one currency in terms of another currency, the real exchange rate will be equivalent to the nominal exchange that adjusts according to the price differences between the relative levels of domestic prices with rates relative to foreign rates and with the price of the real exchange as the number of units of foreign goods needed to buy one unit of good from the local country. It means that the real exchange rate is a concept that measures the relative prices of two commodities. If we assume that the general price level in home country is P, P* in the foreign country and E denotes the nominal exchange rate, the real exchange rate can be defined as:

$$e = EP^{*}/P$$

The nominal effective exchange rate reflects the actual exchange rates for the index measuring the average change in the currency exchange rate of the country for several currencies of other countries in a certain period of time. Therefore, the exchange rate index equals to the actual average number of bilateral exchange rates and indicates the extent of progress of the exchange rate currency for a range of other currencies**.** The result is a weighted average of bilateral exchange rates between the

local currency and a number of foreign currencies and it uses this average to measure the value of the currency (Eiteman and Stonehill, 2004:138).

The effective exchange rate is a nominal price, because it is the average of several bilateral exchange rates and it is a sign of the competitive direction of the country abroad. Therefore it should be subject to this nominal rate adjustable by removing the effect of relative price changes. As the real effective exchange rate is an effective weighted average of nominal exchange rates adjusted by inflation in the local country by inflation, it measures the weighted average of the different purchasing powers of the local currency compared to the basis of the selected period (Eiteman, Stonehill and Moffet, 2004:138).

Financial flows do not circulate on the forex market in a physical form but in the form of scriptural money through account documents. When a bank buys a foreign currency, form the currency market it is the same as the bank's opening a deposit denominated in that foreign currency. This is an important fact to understand that interest rates are a key factor for the movements of the exchange rate (Tauline, 2008:83).

The demand for a foreign currency denominated deposit is influenced by factors which affect the demand for any other financial asset and the first factor taken into account is the future value of that deposit where nominal interest rates provide important information in this regard (MacDonald and Stein, 2012:47-49). However, the return rates regarding two financial assets can be compared only if they are expressed in the same unit of measurement. The unit for these rates is the currency through which the deposits are expressed. On the other hand, when an investor chooses to invest in a particular foreign currency deposit, say a Euro denominated deposit, he/she will gain a profit if the Euro appreciates and will incur a loss if Euro depreciates.

The future value of a foreign currency-denominated deposit then mainly depends on two factors: (1) the nominal interest rate offered by the deposit in case and (2) the anticipated altering of the value of that particular currency against another currency (Isard, 1995:78).

Additionally, risk and liquidity (the ability of a financial asset to be quickly exchanged and having low expenses regarding the accepted means of payment) are

also among the important factors that can affect the demand for a particular currency. As the risk associated with a currency increases, the demand for that currency decreases and the more liquid the denominated deposits are in a particular currency, the higher the demand is for that currency (Tauline, 2008:152-155).

## 1.2. Basic Parity Conditions

### 1.2.1. Purchasing Power Parity

Purchasing Power Parity (PPP) which is one of the key concepts in international economics is built on the proposition that a common basket of goods should cost the same in both countries if prices are quoted with the same currency. PPP states that the nominal exchange rate between two countries should be equivalent to the ratio of the price series (Rogoff 1996).

$$e_t = s_t = \frac{p_t}{p_t^*}$$

where $e_t$ denotes the nominal exchange rate, $s_t$ represents the real exchange rate, $p_t$ and $p_t^*$ denote the domestic and foreign price level respectively (Cassel, 1918, p. 413).

The building block of PPP is the law of one price which simply states that in the absence of market imperfections such as transportation costs, quotas, tariffs and other trade impediments, the arbitrage opportunities in goods markets will ensure identical price across countries. In fact, PPP occurs due to the arbitrage activities – that is, in its simplest form, buying the same good in the cheaper market and then reselling it in the expensive market– which will continue until the prices among the markets will equate and hence the arbitrage opportunity disappears.

PPP can be expressed in two ways, specifically the Absolute PPP and the Relative PPP.

Absolute PPP posits that the exchange rate between the two currencies will be equal to the price levels ratio of the related two countries while Relative PPP relates the change in the exchange rates to the change in the expected inflation rates of those two countries. Since PPP is based on the equalization of purchasing power and the

inflation makes a reduction in the real purchasing power of the currency of the nation, Relative PPP suggests that countries with higher inflation rates will have a devalued currency. The relative purchasing power parity can be expressed as:

$$\frac{E_{t-}E_{t-1}}{E_{t-1}} = p - p^*$$

where $E_t$ denotes the exchange rate at time t, p is home country's and $p^*$ is the foreign country's inflation rate (Eleftherios, 2010:5).

### 1.2.2. The Interest Rate Parity

This theory supports that the exchange market will only be in balance when the denominated deposits in all available currencies offer the same interest rate when expressed in the same units of measurement. This idea goes back to year 1896 and is attributed to Irving Fisher. The equality condition of interest rates (expressed in the same unit) in any two currencies is called the parity of the interest rates. The relationship makes sense only when the paralleled deposits are perfectly interchangeable, have the same risk and the same maturity. The parity of the interest rates represents a condition of balance which requires that all deposits in different currencies are equally attractive to investors. In other words, in the case of two deposits, one in XYZ and one in Euro, the interest rate on the XYZ deposit must be equal to the interest rate on Euro deposit expressed in XYZ (MacDonald and Stein, 2012:111-114) which can mathematically be shown as:

$$r_{XYZ} = r_{euro} + \Delta(\%)S^e$$

where $r_{XYZ}$ and $r_{Euro}$ denote the nominal interest rates on XYZ and Euro respectively and $\Delta(\%)S^e$ represents the anticipated appreciation or depreciation of the Euro against XYZ during the period of maturity of the deposit.

According to this relationship, the interest rate for XYZ must be higher (or smaller) than the euro rate if a depreciation (or an appreciation) of XYZ against the Euro is anticipated. The reasoning behind the above result is that an investor should be rewarded with a higher interest rate when he/she expects a depreciation of the currency he/she decides to invest in. For a deeper analysis of the logic behind this

relationship, consider an investment horizon of 1 year, and assume that the interest rate on the XYZ deposits ($r_{XYZ}$) is 10%, the interest rate on the Euro deposits ($r_{euro}$) is 3% and the economic agents expect Euro to appreciate by 9% against the XYZ over the next year. The rate of return for the Euro deposits in XYZ is approximately 12%, making Euro deposits more attractive, although their nominal interest rate is lower. In this case, considering that the market agents are rational, no one will choose to invest in XYZ, but in Euros. Then the demand for XYZ will decline and the demand for Euro will increase. Therefore, the currency market is not in balance unless the interest rate parity is not satisfied (MacDonald and Stein, 2012:242).

The parity of interest rates is a condition of balance applying itself on the short term as well as on the long term. The equation has a particular analytical importance, because it underlies the majority of the patterns that attempt to explain how the economy works. This encompasses not only the simplified models present in the literature, but also the theoretical and econometrical models, which have dozens of variables and equations, used by international organizations or bodies responsible with taking monetary and fiscal decision (Isard, 1995:58). To understand this pattern better, it will be beneficial to analyze all the variables that enter into this parity condition. First, the interest rate for the Euro deposits is set in accordance with the market conditions of the Economic and Monetary Union (EMU), without being influenced by the XYZ country's economy. In other words, the rate on the Euro deposits is an exogenous variable when analyzing the EUR/XYZ exchange rate. Similarly, the interest rate on the XYZ deposits is influenced by the monetary policy instruments set by the XYZ Central Bank in accordance with the needs of the economy. Thus, this rate is determined by the monetary market and is an exogenous variable in the relation (Dornbusch, 1991:284). Besides, the anticipations regarding the exchange rates are created in time by using all the available economic data, and based on the projections of macroeconomic indicators over a period of time corresponding to an anticipated horizon. In order to form expectations, market agents can call upon the services of the "forecast" professionals. Regardless of how investors determine their expected level of appreciation/depreciation (using econometric techniques, simple economic models or assumptions), the expectations

cannot be controlled in a direct manner. For this reason, the expectations are exogenous, at least for a short term (Isard, 1995:130-132).

In sum, since the short-term interest rates on XYZ and on Euro are formed by the monetary policies of the related monetary authorities in accordance with the prevailing conditions in the XYZ and the euro zone markets respectively, and expectations regarding the future level of the exchange rate result from various estimation techniques while the spot exchange rate varies, in some cases becoming extremely volatile, the above relation proposed by the Interest Rate Parity explains how to determine the spot exchange rate.

An examination of the above presented Interest Rate Parity condition indicates that the nominal interest rate prevailing in the home country should be equal to the return obtained from a foreign currency denominated deposit which is composed of the nominal interest rate on the related foreign currency plus the expected change in the exchange rate of these two currencies. Otherwise, since the investors will naturally base their decisions regarding in which currency to hold their deposits on the comparison of the total returns they will obtain under each alternative, there will be a shift from one currency to the other. For example, assume that the nominal interest rate on foreign currency is 6%. If the home currency is expected to depreciate by 3% during the related period, then the total return from the foreign currency denominated deposits will be 9% while if the home currency is expected to appreciate by 3% during this period, then the total return from the foreign currency denominated deposits will be 3%. Further assume that the nominal interest rate on the domestic currency denominated deposits is 8% and the home currency is expected to depreciate by 3%. Then, the return on the foreign currency deposits will total to 9% which is higher than the 8% return on the home currency denominated deposits. So, in order to obtain higher returns, the investors will prefer to hold foreign currency denominated deposits. On the other hand, if the nominal interest rate on the home currency denominated deposits is 10%, investors will prefer to hold home currency denominated deposits as now they yield a higher return. In case that the nominal interest rate on home currency denominated deposits is 9%, there will be no incentive to alter the denominating currency of their deposits

as both yields the same return and the equilibrium condition of the interest rate parity holds.

It is also possible to interpret this analysis from the reverse as well. If the nominal interest rate on domestic currency denominated deposits is higher than the nominal interest rate on foreign currency denominated deposits, then the home currency is expected to depreciate. For example, assuming that the nominal interest rates on the home currency and on the foreign currency denominated deposits are 10% and 7% respectively, then the home currency is expected to depreciate by approximately 3% during the related period. On the other hand, if the nominal interest rate on domestic currency denominated deposits is smaller than the nominal interest rate on foreign currency denominated deposits, then the home currency is expected to appreciate. For example, assuming that the nominal interest rates on the home currency and on the foreign currency denominated deposits are 10% and 12% respectively, then the home currency is expected to appreciate by approximately 2% during the related period. Thus, it can be concluded that for a given level of nominal interest rate on foreign currency, the home currency will appreciate (depreciate) if nominal interest rate on home currency falls (rises).

#### 1.2.2.1. The Covered Interest Rate Parity

The process of moving the capital from one market to another to take advantage of the deviations of the Interest Rate Parity is sometimes incorrectly defined as arbitration. In the example above, as no one can be sure about the future value of the foreign exchange rate, the investors are actually exposed to a foreign exchange risk unless he/she covers this risk by using hedging techniques such as contracting on forwards which will enable him/her to fix the future value of the exchange rate from today for the period under consideration.

The relationship expressing the equality between two assets denominated in two different currencies, if the investors are covered against monetary risks, is called the Covered Interest Parity (CIP) and is expressed as follows (Eleftherios, 2010:11):

Of $r_{XYZ} = r_{euro} + f$

where *f* is called the forward premium (or discount) which can be defined as:

$$f = (F - S_0) / S_0$$

where F and $S_0$ are the nominal forward exchange rate and the nominal spot exchange rate between XYZ and Euro.

Thus, CIP shows that any nominal interest rate gain of XYZ denominated deposits over Euro denominated deposits ($r_{XYZ} - r_{euro}$) will be wiped out by the depreciation of the XYZ against Euro, as reflected in the forward premium (*f* ).

### 1.2.2.2. The Relationship between Covered and Uncovered Interest Rate Parity and the Efficiency of Foreign Exchange Market

Between Covered and Uncovered Interest Rate Parities, there is an important relationship involving the concept of efficiency of the foreign exchange market. According to the definition given by Fama (1970), an efficient market is the one where the prices reflect all available information and where there are no untapped profit opportunities.

If the foreign exchange market is efficient, then both the Uncovered and the Covered Interest Parity conditions are accepted. It is obvious from the comparison of the relations proposed by Covered and Uncovered Interest Rate Parities that they cannot be simultaneously valid with the exception of the case $F = S^e$. The assumption is justified when the two parties establish to trade a certain amount of currency at a predetermined future time and at a specified exchange rate agreed today where this forward price will reflect the expectations of the two agents at the present moment. Thus, if $F \neq S^e$, this will imply that some agents will have some information that aren't available to all and are therefore not reflected in the forward price.

Equality between forward and spot rate at time of the forward contract can be seen as a relation of balance. If these two prices are not equal, there will be economic agents who would wish to exploit this difference in order to obtain a profit. Depending on the sign of the difference, they will sell spot and buy forward at the time, or will sell forward and buy spot.

When $F \neq S^e$ it is said that the forward price is a biased estimator of the spot rate and where $F = S^e$ the forward price is an unbiased estimator for the exchange rate.

Due to its very implication the efficiency of the forward exchange market is one of the most intensely discussed topics in the last 20 years. If the foreign exchange market is to be efficient, the expectations regarding the exchange rate should be incorporated and reflected in the forward exchange and anyone who would like to know the future level of the exchange rate could be guided by the forward price, which is observable on the market. In other words, the forward rate should be an unbiased estimator of the spot rate, $F = S^e$. The answer on whether the forex market is efficient or not is given by expert studies, using econometric techniques and data from the real economy (Miller, 2014:27).

The easiest way to test the hypothesis of an efficient foreign exchange market is to estimate the following regression equation:

$$\ln S_t = a + b \cdot \ln F_{t-1} + \varepsilon_t,$$

where $\ln S_t$ is the logarithm of the spot rate at a time *t*, $\ln F_{t-1}$ is the logarithm of the forward rate at a time *t-1* for the period (*t-1*, *t*) and $\varepsilon_t$ is a white-noise variable with a mean of 0.

If the coefficient b is not significantly different than 1 and the constant *a* is not significantly different from zero, we can say that the currency market is efficient.

### 1.3. Types of Exchange Rate Arrangements

There are several types of exchange rate arrangements that can be adopted by countries who are free in choosing what type of exchange rate arrangement to maintain. However, this is, unfortunately, not an easy task since each exchange rate arrangement has different advantages and disadvantages. Besides, a particular regime may be appropriate for a given macroeconomic structure for a certain period of time but no regime choice may be the best option forever due to external and internal shocks (Görmez and Yılmaz 2007). Nevertheless, the main exchange rate arrangements include Exchange Rate Arrangements with No Separate Legal Tender, Currency Board Arrangements, Conventional Peg Arrangements, Stabilized

Arrangement, Crawling Pegs, Crawl-like Arrangements, Pegged Exchange Rates within Horizontal Bands, Exchange Rates within Crawling Bands, Managed Floating and Free Float.

In Exchange Rate Arrangements with No Separate Legal Tender, the country does not maintain a national currency of her own, but instead either the currency of another country circulates as the sole legal tender which is commonly referred as 'Dollarization' or the country belongs to a monetary or currency union in which the member countries use the same legal tender like Euro zone countries.

Currency Board arrangements refers to a monetary system which is based on an explicit legislative commitment to exchange her national currency for a specified foreign currency at a fixed exchange rate. As Aleksandra (2004) argues it is adopted by countries that intend to discipline their Central Banks, as well as solving their external credibility problems by going for institutionally binding arrangements. Besides, as Goldstein (2002) points the absence of the nominal exchange rates in the currency board system as a tool for correcting deviations of the real exchange rate, has a severe impact on the monetary policy as a mechanism that would be able to control and meet asymmetric shocks and the insolvency of financial institutions may precipitate in the appearance of twinning crises.

In Conventional Peg arrangements, the country pegs her currency at a fixed rate to a major currency or a basket of currencies and permits it to fluctuate within a narrow band of less than ±1% around that fixed rate while in Pegged Exchange Rates within Horizontal Bands the band is kept wider. Thus, Horizontal Band Pegs are similar to Conventional Pegs except that horizontal bands let more volatility as the margins are widened.

In Crawling Pegs although the currency is basically fixed, it is adjusted periodically in small amounts at a preannounced fixed rate. It is often used by high inflation countries pegging to low inflation countries to avoid inflation with a downside of providing a target for speculative attacks (Aleksandra 2004). And Crawling Bands is a more flexible version of Crawling Pegs in that the currency is allowed to fluctuate within certain margins around that predetermined fixed rate.

In Managed Floating, although the exchange rates are basically allowed to fluctuate in accordance with the market forces of supply and demand, the central bank intervenes to the foreign exchange market to prevent speculative attacks and short run imbalances of supply and demand without specifying a preannounced path or a target level for the exchange rate.

Free Float describes an exchange rate arrangement in which exchange rates are determined in market by the daily supply and demand with minor or no official intervention (Ghosh, Gulde and Wolf 2002).

It is possible to group the above explained exchange rate arrangements in three categories depending on the degree of their flexibility. The exchange rate arrangements with no separate legal tender such as monetary unions and dollarization regimes as well as currency boards are referred as fixed exchange rate regimes while managed floating and free float constitute floating exchange rate regimes with the remaining grouped as intermediate regimes which actually comprise a hybrid of floating and fixed exchange rate regimes.

As in fixed exchange rate regimes central banks maintain a value of the currency which is bind to another currency, to a currency basket or to an asset such as gold, they provide two main advantages in terms of reduced transaction costs and foreign exchange risk. On contrary, in floating exchange rate regimes, the value of the currency is permitted to fluctuate in accordance with the market conditions. That is, in the floating exchange rate systems, authorities allow market mechanism to determine the exchange rate of the home currency in accordance with the supply and the demand conditions which will indicate that the value of the currency will increase (appreciate) if the demand for it increases and/or the supply for it decreases, and vice versa. In other words, a floating currency floats until the supply and demand function finds the equilibrium exchange rate in the free and competitive market (Harrison, 2004: 303).

Following the above explanations, it is clear that the floating exchange rates and their impacts on the financial and economic positions of the countries mainly

### 1.3.1. A Brief History of Exchange Rate Regimes in Turkey

The evolution of the foreign exchange rate regime choice in Turkey is chronologically summarized in Table 1.

**Table 1:** Evolution of the Foreign Exchange Rate Regime Choice in Turkey

| Period | Exchange Rate Regime |
|---|---|
| 1923-1930 | Free Float |
| 1931-1948 | Fixed |
| 1949-1980 | Adjustable Peg |
| 1980-1994 | Crawling Peg |
| 1994-1999 | Managed Float |
| 1999-2000 | Tablita |
| 2001 Up-to-Date | Free Float |

Source: Görmez and Yılmaz 2007: 300.

As can be followed from the Table 1, the regime of free float is supplanted with the rates that are fixed until 1931. With the consent to the Bretton Woods Agreement, the second shift in the regime happened in 1948 during which adjustable pegs were made applicable until 1980 when the financial liberalization process is started. During this period crawling peg is adopted until the crisis of 1994 after which it was replaced with managed floating where the anchor was the anticipated inflation. But, with the execution of Exchange Rate Based Stabilization (EBRS) Program in 2000, it was replaced with tablita regime which can be referred as a quasi-currency board arrangement. However, with the crises of February 2001 the tablita regime could not last long and since then free float has been prevailing in Turkey.

# CHAPTER 2

# TURKISH STOCK MARKET

## 2.1. A Brief History of Evolution of Turkish Stock Market: From Dersaadet Debenture Stock Exchange to Borsa İstanbul

The first organized securities market was founded during the Ottoman Empire period and dates back to the second half of the nineteenth century. Ottoman Empire, for the first time in her history, needed to borrow internationally to finance the Crimean War which lasted from 1953 to 1956. But, as the issued bonds were soon started to be traded on the over-the-counter market in Istanbul and the boosted speculations raised the need to regulate the markets (Karakaya, 2013), so Dersaadet Debenture Stock Exchange was officially established in-between 1862-1873, though there is no consensus on its exact date (Fertekligil, 1993). Before long, the Bourse turned out to be exceptionally dynamic and contributed significantly to the requirements of the funding for the new enterprises across the nation (Souza, Beato and Parisotto, 2009). However, during 1908 - 1922, the social and economic chaos caused by the war influenced the stock exchange severely and hampered its operation and development (Chambers, 2006).

Following the establishment of the Republic of Turkey, the stock market was reorganized with a new name, "Istanbul Securities and Foreign Exchange" by the Securities and Capital Markets Foreign Exchange Law which was enacted in 1929 (Kartal, 2013). But first the Great Depression of 1929 and then the World War II adversely affected the securities markets.

In 1960s, although the capital market began to pick up speed when the aggregate capital of the stock exchange reached a significant level, the issuance of governmental stocks and corporate shares increased, due to the insufficient regulatory and legal order coupled with the weakness of the capital market to address the issues set upon it, no noteworthy improvement could be accomplished (Chambers, 2006). With the experienced devaluation in 1970, there was an

appearance of new balances in the economy. The global oil crisis during the period of 1973-1974, and 1977-1978 exerted inflationary pressures. In the meantime, with the industrialization process of the 1970s, there was an enormous increase in issues of bonds and securities via bankers, however, their activities were directed altogether outside the stock trade. During this period, as structural economical measures were not taken and due to difficulties in the implementation, the years following 1975, were characterized by a rapidly worsening economic outlook and inflation in particular, increased enormously during the years 1977-1979 (Chambers, 2006) coupled with the bankers-event that marked the years 1979-1982 (Kartal 2013) unequivocally pushed the need to restructure the economy and the capital markets. The main scandal of the bankers showed up in August 1981. In spite of the fact that the scandal of the bankers was to a great extent an affair of the money market, speculators demolished trust in each and every broker and activities within the financial markets. This particular scandal illustrated the need of the legislation of the new capital market so as to protect the small investors. This particular act was intended for encouraging the public for investing the deposits into the securities and stocks resulting into the extensive and effective contribution to national progress of the economy.

Following the January 24 Economic Stability Decisions in 1980 that opened the way to a liberal market economy, the Capital Market Law was enacted in 1981 and the Capital Market Board is established in 1982 while Istanbul Stock Exchange (ISE) which is the main organization in Turkey for securities exchange set up to make a provision of the trading in bonds, equities, bills, private sector bonds, revenue sharing certificates, real estate certificates, foreign securities and private sector bonds (Tatliyer and Yigit, 2016), is founded in 1985. However, on April 5, 2013 Istanbul Stock Exchange is restructured and renamed as Borsa Istanbul (BIST) under which the Istanbul Stock Exchange, the Istanbul Gold Exchange and the Derivatives Exchange of Turkey are combined.

## 2.2. Main Demonstrative Indicators of Borsa Istanbul and The Recent Financial Developments

The main demonstrative indicators of BIST include market capitalization, market capitalization/GDP, traded value per GDP and number of companies listed which are illustrated in Table 2 below.

**Table 2:** Main Indicators of Istanbul Stock Exchange

| Year | Market Capitalization (million USD) | Market capitalization/GDP (%) | Traded value (million USD) | Traded value/GDP (%) | Number of Companies Listed |
|---|---|---|---|---|---|
| 1986 | 938 | 1.03 | 13 | 0.01 | 80 |
| 1987 | 3,125 | 3.17 | 118 | 0.10 | 82 |
| 1988 | 1,128 | 1.18 | 115 | 0.09 | 79 |
| 1989 | 6,756 | 5.09 | 773 | 0.57 | 76 |
| 1990 | 18,737 | 10.45 | 5,854 | 2.90 | 110 |
| 1991 | 15,564 | 9.32 | 8,502 | 4.20 | 134 |
| 1992 | 9,922 | 5.77 | 8,567 | 3.84 | 145 |
| 1993 | 37,824 | 20.51 | 21,770 | 9.60 | 160 |
| 1994 | 21,785 | 16.08 | 23,203 | 12.53 | 176 |
| 1995 | 20,782 | 12.12 | 52,357 | 22.76 | 205 |
| 1996 | 30,797 | 16.49 | 37,737 | 15.31 | 228 |
| 1997 | 61,879 | 32.65 | 58,104 | 23.92 | 258 |
| 1998 | 33,975 | 15.12 | 70,396 | 25.78 | 277 |
| 1999 | 114,271 | 58.45 | 84,034 | 35.28 | 285 |
| 2000 | 69,507 | 28.02 | 181,934 | 66.81 | 315 |
| 2001 | 47,689 | 28.56 | 80,400 | 38.76 | 310 |
| 2002 | 34,402 | 16.08 | 70,756 | 30.33 | 288 |
| 2003 | 69,003 | 21.13 | 100,165 | 32.25 | 285 |
| 2004 | 98,073 | 23.71 | 147,755 | 37.28 | 297 |
| 2005 | 162,814 | 33.64 | 201,763 | 41.60 | 304 |
| 2006 | 163,775 | 30.33 | 229,642 | 42.74 | 316 |
| 2007 | 289,896 | 39.84 | 300,842 | 45.99 | 319 |
| 2008 | 119,698 | 19.15 | 261,274 | 34.99 | 317 |
| 2009 | 235,996 | 36.82 | 316,326 | 49.82 | 315 |
| 2010 | 307,551 | 42.76 | 425,47 | 57.52 | 331 |
| 2011 | 201,924 | 25.75 | 423,584 | 54.26 | 361 |
| Source: www.ise.org | | | | | |

When it is founded, ISE's market capitalization was found to be only $938 million. However, during the year 2011, it has risen to $201,924 million. The market

capitalization of the exchange becomes 215 times within the past 25 years. It is seen that the Gulf crisis in 1992 caused the ISE's market capitalization to diminish from $15,564 million to $9,922 million and the ratio of the market capitalization to GDP went down from 9.32 percent to 5.77 percent. In accordance with this, the financial crisis for the three years i.e. 1994, 1998 and 2001 influenced the market capitalization of Borsa Istanbul. As can be observed from Table 2, in 1994 the market capitalization of Borsa Istanbul experienced a sharp decline from $37,824 million to $21,785 million. In 1998, it almost fell to the half of 1997 and in 2001 a decrease from $69,507 million to $47,689 million was witnessed. And with the global financial crisis of 2008, the market capitalization of BIST fell to $119,698 million from its value of $289,986 million in 2007 while the ratio of the figure to the GDP fell from 39.84 percent to 19.15 percent in-between 2007 and 2008.

The eruption of the Gulf Crisis influenced the stock market and economy negatively. The foreigners also purchased the stocks within the stock market during the year 1990 (Phylaktis and Kassimatis, 1997). Moreover, the share index also surpassed the 5.0 level while illustrating the increase with the instant fluctuations instead of the Gulf War. There was an issuance of the regulation of Borsa Istanbul and storing centers. The basic intention was to make the selling and buying of the transactions by the means of the exchange center for eradicating the challenges which would take place where the parties would fulfill the liabilities to bear from the operations so as to develop the confidence of the fluency within the operations and the stock market ultimately. During 1997, with the influence of the crisis within the Asian nations, a rise in the Asian countries and an expansion in the inflation rate increased in Turkey and this was found to be quite parallel to the development which resulted in the increase of the interest rates (Phylaktis and Kassimatis, 1997) which is followed by the Russian Crises. The devaluation of the Rouble during August 1998 further resulted in the demand being associated with the borrowing restructuring (Li and Miller, 2015). There was a serious decline within the foreign reserves. In accordance with this, the investors/shareholders came back to the stock market during 1999. In accordance with the global crisis of 2007-2009, the ISE attained the share from such crisis and was further negatively influenced. There were two notable crises within Turkey i.e. real sector crisis and financial crisis. Such crises resulted

due to financial crisis and hence, conflated into the industrial crisis. This effect was found to be significantly intense in 1998 and that the growth rate also regressed till 3.8 percent. Furthermore, with the transaction volume, it is found to be conceivable to find out that transaction volume of Borsa Istanbul illustrated a slow trend in 1999 along with a stable increase throughout the years 1990-99. In 2000, the transaction volume is more than doubled compared to 1999 with a higher fall in 2001. In 1999, the transaction volume of Borsa Istanbul was $84,034 million while in 2001 it was 80,400 million. During 2002, it further decreased to the 1998 level. Such a decrease was caused significantly by the financial crisis that was mainly experienced during the year 2000 November (SARAÇLI, 2014).

A program associated with the inflation prevention and economic restructuring came into being during 2000. This resulted in the decrease of yearly inflation from 70 percent to 50 percent. The annual yields on the government bonds also diminished from 120 percent to 40 percent. There was a sudden entry and exit of the foreign shareholders/investors to the markets which resulted in immediate fluctuations within the capital movements and this further played a pivotal role in the development after the formation of the crisis. Numerous companies that were found to be quoted on the stock exchange illustrated an immediate increase in 2000. Significant capital releases were observed during 2001 because of the sale of the financial assets by the foreigners emulated by the non-renewal of the credits by the foreign banks on a short term basis (Olmezsoy, n.d.). There was an overnight increase in the interest rate to 6200 percent. There was also a major decrease of 4.5% in the national income which further expanded 3 times to 11.8% within the quarter which was further emulated by the decrease in the national income. In accordance with the aftereffects of the negative events, the financial markets were diminished in size within 2001 and that the foreign investors further restrained from making certain investments. With this hindrance, the operational volume of the foreign shareholders was only 6 percent in Borsa Istanbul within 2002. By November 2002, the aggregate borrowing of Turkey reached at $150.1 billion where $94.6 billion were found to be domestic and the remaining were found to be external. Furthermore, the budget deficits were mainly financed with domestic borrowing that resulted in an increase of the loan. Apart from this, a monetary policy was made applicable between the years

2001-2003 which focused on the price stability objective while further declaring the determination of the interest rates on a short term basis that would only be performed while reaching the focused rate of inflation. During 2003, there was a decrease in the interest rates six times by the Central bank relying on the significant developments within the macroeconomic indicators. In accordance with the existing policy, there was a further continuation for the regime of the fluctuating currency that started during 2001 in accordance with a forecast for 2003 as well. With this particular concept, there was an announcement by the Central Bank while conducting the transparent purchase tenders of the currency for countering the extreme fluctuations within the rates of currency in a way that would further contribute a significant increase in the foreign reserves. The overnight interest rates of December 2002 i.e. 55 percent remained quite same during March 2003, but then it reduced in 2003 June to 46 percent and to 38 percent in September and to 26 percent in December. With the effects of the positive and favorable developments during 2003 as compared to the previous year, the volume of the foreign shareholders further expanded to 34.6 percent.

A noteworthy development is found to be a derivatives market that got established during 2005 which is founded to be the market for derivative securities. Thereafter, 2005 was found to be a year where there was a stable balance of macroeconomic indicators. The rate of inflation also decreased to the lowest possible level and that there was a horizontal movement of the exchange rates as there was an attainment of an important progress in the GNP and privatization which proceeded with the consistency of the expansion within the last few years. More than this, the current account deficit and foreign trade deficit also increased significantly.

The stock exchange has also been influenced in accordance with the positive and favorable developments within the macroeconomic indicators. The favorable aspect of this phase began progressively in 2003 and proceeded in 2004 and 2005. The pattern of reduction in the financing cost and inflation has influenced emphatically the stock exchange so that the Borsa Istanbul National 100 Index (BIST100) is emulated by the volume of the transactions expanded quickly within the year. There was an upward trend within the index in 2005. This pattern which went on for the couple of months, started to show a flat development in April and

May. Moreover, after June onward, it is conceivable to see that there was an increase in the index again. The rate of this expansion kept on developing in the next months and in 2005 mainly closed with a significantly high index coming to the level 39.778. Positive anticipations encompassing negotiations related to accession among Turkey and the Europe quickened the upward pattern of the index in September. When it got to be clear that the negotiations related to accession were to begin in October, the increases moved to record levels. The National 100 index of ISE has indicated expansions of 61 percent in US Dollar terms in 2005 and 59 percent in YTL terms. In accordance with the market value, it is found to be conceivable that the market value has reached at the peak in the stock exchange history 2005. However, the aggregate market value was found to be $98 billion during 2004 but it further expanded by 65 percent during 2005 which amounted to $163 billion. Such an increase is mainly because of the 11 public offerings contribution being realized during 2005. In accordance with the 35 public offerings during 2000, one company was found to have an initialization of being quoted whereas 6 companies were taken out from the stock exchange due to which the quantity of the companies that were found to be traded on the stock exchange expanded by 30 to be totaled up to the companies being 315 in number. In 2003, there was a realization of the two public offerings, while the stocks of the other two companies were found to be quoted again. Furthermore, the 7 companies were found to be eradicated from the quotation, the quantity of the traded companies further diminished to 285. By the end of 2012, the number of the traded firms on BIST arrived to 404 while it was only 258 at 1997.

Borsa Istanbul which is highly volatile and is characterized by short term speculative trading offers two basic national indices: BIST 30 and BIST100. BIST 30 is composed of 30 large firms by the value of outstanding shares traded in the stock market. Leading holding companies and financial institutions are examples of firm types of the BIST30. BIST100 is the main index of Borsa Istanbul and is composed of BIST30 and the following largest industrial companies by the value of outstanding shares traded in the stock market.

# CHAPTER 3

## THE RELATIONSHIP BETWEEN EXCHANGE RATES AND STOCK PRICES

Determining the relationship between exchange rates and stock prices is important due to several reasons. First of all, it may affect decisions about fiscal and monetary policies. Gavin (1989) argues that a booming stock market will foster aggregate demand which is if large enough, expansionary monetary or contractionary fiscal policies that target the interest rate and the real exchange rate will be neutralized. Besides, policy-makers may prefer a cheaper currency to improve the export sector. However, they should consider whether such a policy might depress the stock market. Next, since currency is usually included in investment portfolios, it is important to know how it correlates with the other assets in the portfolio in terms of both risk and expected return in order to be able to analyze its performance more effectively and make investment decisions more efficiently. Further, the link between the two markets may be used to predict the path of the exchange rates as well. This will benefit multinational corporations in managing their exposure to foreign contracts and exchange rate risk stabilizing their earnings.

The relationship between exchange rates and stock markets may vary among countries due to the trade volume, equity, economic relations, risk assessment etc. The direction of this relationship can be unidirectional or bidirectional where each of these alternatives finds empirical support which are reviewed in Section 3.2.

## 3.1. Theoretical Arguments

### 3.1.1 Effect of Stock Market on Exchange Rates

Mishkin (2001) describes the influence of increasing stock prices on expenditure. This influence refers firstly to enlarged investment by companies. For short term, if a company's stock price rises, so does the value of its equity. The prices of new equipment, however, stay the same. Therefore, companies will have the tendency to invest more, as investment is less costly. So investment becomes a function of stock prices:

$$I = f\ (R, SP)$$

In the formula above, SP stands for stock prices, and *I* represents investment while *R* indicates the lending interest rate which has negative impact on investment due to the increased costs of funding.

With growing stock prices, we can observe a positive effect on a household's financial assets which leads to more wealth and consumption. Usually, people connect greater wealth to a low financial risk and thus they tend to hold more liquidity which increases the expenditures on both housing and durables.

$$C = f\ (MPC_{(Y\text{-}T)}, W_{SP})$$

where *C* represents consumption, *MPC* denotes marginal propensity to consume, *W* stands for wealth, while *Y-T* refers to disposable income as *Y* denotes income and *T* refers to net taxes.

Then the aggregate expenditure of the economy can be calculated as:

$$Y = E = C + I + G + NX = C(MPC_{(Y\text{-}T)}, W_{SP}) + I_{(R,SP)} + G + NX$$

where *G* and NX denote government spending and net exports respectively.

The outcomes of the stock price is included into investment patterns and consumption leading to an *IS* link that depends on these stock prices. Therefore, it modifies the Mundell-Fleming Model which signifies the relationship between the interest rates and nominal exchange rates of the economy.

The model argues that it is not possible for an economy to maintain free capital movement, fixed exchange rate and an independent monetary policy

simultaneously because any attempt to increase the interest rates will lead capital flows, which will alter the foreign exchange rates, followed by central bank intervention to the market reversing all the way back. On the other hand, under fully flexible exchange rates as the central banks do not intervene in the foreign exchange market, the exchange rates must adjust to clear the market so that the demand for and the supply of foreign exchange balance (Dornbusch, Fischer and Startz, 2004).

The increase in capital flows between the international financial markets works to create a close relationship between stock prices and foreign exchange markets. The increasing flow of capital from overseas investors leads to increased demand for the country's currency where the opposite occurs in the case of low stock prices as investors try to sell their shares to avoid the loss (Golaka, 2003). Additionally, lower interest rates will lead lower capital inflows which in turn causes the domestic currency to depreciate. In this case, it is expected that the exchange rate has a negative correlation with share price (Tabak, 2005).

### 3.1.2. Effect of the Exchange Rates on the Stock Market

Exchange rates can affect stock prices in various ways. Firstly, depreciation leads to a fall in the stock prices due to inflation expectations. As argued by Ajayi and Mougoue (1996) plunging currency leads to a decrease in stock prices because of the assumed threat of the inflation:

$$RER = \frac{E \; x \; P^*}{P}$$

where *P and P** denote home and foreign currencies respectively, *E* indicates the nominal exchange rate and *RER* denotes the real exchange rate.

As the above equality clarifies a depreciation of the home currency will create expectations of inflation for the future. In turn, inflation usually restrains consumer spending and thus company earnings, so inflation affects the stock market negatively. Besides, the return on investment for foreign investors can be affected by a depreciating currency, so these investors will be more reticent when it comes to owning assets in that respective currency. In other words, a depreciation of the home

currency will make investors abstain from holding stocks and assets in that country leading to a decline in the domestic market share prices.

Secondly, exchange rate fluctuations will have a direct consequence on the economy such that an appreciation of local currency reduces profits through competitiveness and vice versa.

Next, at the macroeconomic level, a depreciation of a national currency will work to strengthen the export industry while decreasing the imports in that country which will positively affect the gross domestic product where increases in production is generally perceived a sign of booming economy that may motivate the investors to buy more shares in that national market(s) thus increasing the stock prices.

Of course, if the exchange rate changes, companies will experience different results depending on how much they actually import or export by the foreign units owned. For example, a company importing more will have increased costs due to the depreciation of their currency which will cause a decline in their profits and share prices. In any country, multinational companies will have an advantage in the form of increased earnings, even if the currency is dropping in value, because the profit from their external subsidiaries will be converted into the national currency at a higher exchange rate. Companies that have an adequate hedge strategy will not be affected by a variation in the currency values. Therefore, stock market, due to the number of companies included, will react to depreciation in an ambiguous manner. While talking about the home country at a macroeconomic level, it is important to mention that a decreased value of the currency (depreciation) will encourage exports and have the opposite effect on imports, while domestic output will be affected positively which may potentially increase share prices as it is usually perceived as a sign of a growing economy by the investors.

### 3.2. Empirical Evidence

The existence of the relationship between exchange rates and stock prices received considerable attention in recent times, as it focuses on the idea that any change in exchange rates affect the company's total profits, and the price of its shares. Studies such as Maysami-Koh (2000), Aggarwal (1981) and Soenen and Hennigar (1988), show that the exchange rate and interest rate are determinants of stock prices. Causality tests applied by using the daily or monthly data showed that the differences in the stocks returns have positive effects on the volatility of exchange rates. As argued by Gaurav (2010) an increase in the total local share prices have a negative impact on the short term and have a positive impact on the long-term local currency. However, some of these studies like Abdalla and Murinde (1997) have inconclusive results. Some of the results such as Sjaastad and Scacciavillani (1996), lack to provide a relationship between exchange rates and stock prices while others like Pan et al. (1999) found a causal relationship. Some studies like Bahmani and Sohrabian (1992) showed the existence of a short-term relationship while others such as Russek and Miller (1990) identified a long-term relationship. It was concluded that the relationship between exchange rates and stock prices leads to mixed results and in some cases the results are inconclusive (Gopalan, 2010).

Ajayi and Mougoue (1996) investigate the relationship in the short and long term between stock prices and exchange rates in developed economies and found that increasing stock prices lead to a depreciation of the currency. Granger, Yang and Huang (2000) looked at a multitude of country example and no less than seven of those displayed a convincing connection between the two markets, with both unidirectional in some examples and bidirectional causality being present in others. In cases with unidirectional causality, no matter whatever the leading variable is, the connection was negative. Only in four out of seven countries, their study found joint causality, but its direction and the trigger variable could not be determined. What sparked the result differences between specific countries could vary according to degrees of economic links, trade volume and capital mobility. A further cause could

be an omitted variable bias, such as the influence of interest rates on currency and stock markets.

Bahmani-Oskooee and Sohrabian (1992) applied Granger Causality Tests to examine the relationship between exchange rates and stock markets for the period of 1973-1988, and found a two-way relationship in the short run while Franck and Young (1972) who investigated this relationship by using six different exchange rates, lack to find any significant relation.

There are various studies that examine this relationship for Turkey as well. For example, through applying Granger Causality Tests, Rittenberg (1993) finds that stock prices affect exchange rates in Turkey, but lacks to provide any evidence for the reverse direction. The findings of Muradoğlu and Metin (1996) supports that stock returns are expected to increase as exchange rates increase while the findings of Karamustafa and Küçükkale (2003) demonstrate that the relationship between stock returns and exchange rates is uncertain implying that the Borsa Istanbul is neither a cause nor a result variable of exchange rates. Likewise, the findings of Öztürk (2008) and Tursoy et. al (2008) also lack to provide a causal relationship between stock returns and exchange rates.

The empirical results of Aydemir and Demirhan (2009) indicate a bidirectional causal relationship between exchange rates and all stock market indices. While the negative causality is found to exist from the BIST 100, services, financial and industrial indices to exchange rates, a positive causal relationship is detected from technology index to exchange rates whereas a negative causal relationship is reported from exchange rates to all stock market indices. Besides, Kandir (2008) finds that exchange rates affect all of the portfolio returns, Kasman (2003) signifies a long-run stable relationship between stock indices and exchange rates ($), and Doğanay and Karabacak (2010) conclude a unidirectional causality running from stock prices to exchange rates.

In sum, studies have shown that the existence of a causal relationship is difficult to be concluded because of the disparity in results between different countries as well as the variation movement of capital, the volume of trade and economic relations (Desislava, 2005). Using the data to find the relationship between the two variables academic literature shows that the causal relationships between

economic variables are not easily identifiable because of the effects of the fluctuations in foreign exchange rates on the equity markets (Zakri, 2013). It can be explained by the causal relationship between exchange rates and stock prices on the assumption of a positive and a negative correlation with causation. While, the depreciation of the local currency value makes local companies more competitive, which makes it cheaper in the international market, and thus rising exports which will in turn lead to a higher income and an increase in stock prices in the companies while the increase in stock prices leads to a rise in the value of the national currency (Godwin, and Joseph, 2012). In accordance, the impact of exchange rates on stock prices is inconclusive since many studies support the existence of a positive relationship while others report a negative relationship (Ajayi and Mougoue, 1996).

Following the aforementioned arguments, this research thesis is basically designed to search for the impact of foreign exchange rates on the stock market for Turkish economy through focusing on Borsa Istanbul with an additional concern of investigating the causality in-between these two markets.

# CHAPTER 4

# EMPIRICAL RESEARCH

## 4.1. Data and Methodology

The aim of this research is to investigate the impact of foreign exchange rates on stock markets with an additional concern of searching for a causal relationship in-between these two markets and to provide additional evidence for Turkey. For this purpose, Euro and US Dollar (USD) are used as the selected foreign exchange rates along with the stock indices National 100 Index (XU100), Services Index (XUHIZ), Financial Index (XUMAL) and Industrials Index (XUSIN). In order to identify and evaluate the relationship between exchange rates and stock market indices and to determine whether a short-and/or a long-term correlation is present between the selected exchange rates and the stock market returns in Turkey, daily data is used for the period between April 1, 2011 and December 31, 2015.

Within the scope of study, USD and Euro are used as the foreign exchange indicators since they are the most widely used major currencies not only in Turkey, but in the world as well. In terms of Borsa Istanbul indicators, there are several reasons that explain why they are the most suitable variables within the content of this analysis. For example, BIST National 100 Index (XU100) is relevant for this study due to the following reasons:

1) It is considered as the main market indicator and found to be a capitalization weighted index mostly composed of the companies associated with the national market with the exception of investment trusts. Other than this, the constituents of the BIST National 100 index are chosen in accordance with the criteria that is pre-determined and is found to be directed for the companies to be

incorporated in the indices. Moreover, the base date is found to be January 1986 and the base value is found to be 1 for the base price TL.

2) It is the most proficient index of its class, providing a longer time-span horizon and greater depth, which is necessary when analyzing the long term relationship between factors of interest.

BIST Industrial Index (XUSIN) is found to be a capitalization weighted free float adjusted index composed of the companies associated in the industrial sector. The Borsa Istanbul Services Index (XUHIZ) is organized a capitalization weighted free float adjusted index mainly composed of the companies in the service sector. The Borsa Istanbul financial index (XUMAL) is established to be a capitalization weighted free float adjusted index composed of the companies in the financial sector.

In Table 3 the descriptive data statistics are summarized, to better enunciate their impact for this study.

**Table 3**: Descriptive Statistics

| | USD | EURO | XU100 | XUHIZ | XUMAL | XUSIN |
|---|---|---|---|---|---|---|
| Mean | 2,085758 | 2,64694 | 72013,15 | 49607,34 | 99794,68 | 65218,4 |
| Median | 1.94835 | 2.5753 | 74009.68 | 52225.6 | 101136.5 | 65423.77 |
| Maximum | 3.0581 | 3.4623 | 93178.87 | 64217.49 | 139069.6 | 85845.29 |
| Minimum | 1.5106 | 2.163 | 49621.67 | 32630.98 | 67975.7 | 43396.42 |
| Std, Dev, | 0.385451 | 0.316259 | 10083.62 | 8120.339 | 13533.99 | 10412.13 |
| Skewness | 0.917871 | 0.398021 | -0.28232 | -0.36065 | 0.008524 | 0.013971 |
| Kurtosis | -0.18337 | -0.94294 | -0.93466 | -1.1392 | -0.36343 | -1.16186 |
| Jarque-Bera | 169,3 | 75.91 | 59.48 | 90.56 | 6.724 | 67.33 |
| Probability | 1.8e-37 | 3.3e-17 | 1.2e-13 | 2.2e-20 | .0347 | 2.4e-15 |
| Observations | 1196 | 1196 | 1196 | 1196 | 1196 | 1196 |

*USD-EURO: Exchange rate*

*XU100: Borsa Istanbul National 100 Index (BIST100)*

*XUHIZ: Borsa Istanbul Services Index*

*XUMAL: Borsa Istanbul Financial Index*

*XUSIN: Borsa Istanbul Industrials Index*

For the analysis, first unit root test for time-series is applied by the use of Augmented Dickey-Fuller (ADF) Test is applied to check for the stationary of the data.

Augmented Dicker Fuller Test (ADF) verifies the existence of unit root in an *AR*(*p*) framework by performing hypothesis testing $H_0 : \beta = 1$ versus $H_1 : \beta < 1$ for the regression

$$y_t = \mu + \beta t + \gamma y_{t-1} + \sum_{i=1}^{p-1} \alpha_i \Delta y_{t-i} + \varepsilon_t, \quad \varepsilon_t \sim N(0, \sigma^2), \tag{1}$$

where, $\mu$ , $\beta$ are constants and $\Delta$ is the difference operator. The ADF *t*-statistics is given by $\text{ADF} = \dfrac{\hat{\beta} - 1}{\text{std.dev.}(\hat{\beta})}$ ; here $\hat{\beta}$ , is the least-squares estimator of $\beta$ .

The series clearly has a unit root, if we accept the null hypothesis ($\gamma$ = 0). Rejection of the null hypothesis determines that the series is stationary or integrated of order zero. The ADF tests the null hypothesis ($H_0$) against the alternative ($H_1$) hypothesis;

$H_0$: All variables have unit root

$H_1$: All variables do not have unit root.

Residuals are given as a linear combination of the variables, only when they are expressed in this particular way. When the unit root test accentuate that all variables are integrated of order I(1), for this regression, then the linear combination of I(1) var. = I(0). In other words, the previous regression is stationary if the variables are co-integrated (Brooks,2002).

Then Regression Analysis is run to investigate the impact of foreign exchange rates on the stock market BIST with the following models:

$$XU = \alpha + \beta_{xt} + \varepsilon \tag{2}$$

where XU refers to the stock market indices of XU100, XUHIZ, XUMAL, XUSIN and $X_t$ denotes the exchange rate, Euro and USD, α and β are the regression coefficients, where α is a constant and ε is the error term.

Then by adding lags to the regression model, we arrive:

$$XU = \alpha + \beta_{xt} + \beta_{LAGXU} + \varepsilon \quad (3)$$

We can also write the model as:

$$XU = \alpha + \beta_{USD} + \beta_{EUR} + \beta_{LAGXU100} + \beta_{LAGXUHIZ} + \beta_{LAGXUMAL} + \beta_{LAGXUSIN} + \varepsilon \quad (4)$$

This indicates that inclusion of dependent variables gives a dynamic model and the auto correlation of error terms gives us an opportunity to modify our regression analysis.

Finally, the Granger Causality Test is applied to analyze the causality linkage between exchange rates and stock prices. The equations used in the tests are as follows:

$$yt = \beta_0 + \Sigma^m_{k=1}\beta_k y_{t-k} + \Sigma^m_{i=1}\alpha_i x_{t-1} + u_t \quad (5)$$

$$xt = y_0 + \Sigma^m_{k=1} y_k x_{t-k} + \Sigma^n_{i=1}\delta_i y_{t-1} + y_t \quad (6)$$

In this equation, $x_t$ and $y_t$ are stationary variables which are to be tested, *t* is the time frame, *k* and *l* represent the number of lags and $u_t$ and $v_t$ are mutually uncorrelated white noise errors.

Below are both the null and the alternative hypotheses:

$H_0 = \alpha_i = \gamma_i = 0$ for all i

$H_1 = \alpha_i \neq 0$ and $\gamma_i \neq 0$ at least for some i

From this method we can conclude that x causes y only if $\alpha_i$'s are statistically significant and $\gamma_i$'s are not. If the statistical significance is opposite, then y causes x and if both are statistically relevant, then there is an evidence of a bidirectional connection between x and y.

## 4.2. Empirical Results

The above explained models are run through the use of STATA and all the obtained results are provided in the Appendix.

### 4.2.1. Unit Root Test Results

In order to achieve the correct co-integration analysis, the variables have to be integrated in the same order. By using the Augmented Dickey-Fuller test, we can determine the stationary of the timeframe. The test results included in the Table 4 below, show that there is no unit root in the model variables. Since *p*-values are lower than 0.1, 0.05, and 0.001 respectively. The null of unit root in level for all variables are rejected indicating that the variables are stationary.

**Table 4:** Augmented Dickey – Fuller Test Results for Unit Root

| variables | t-statistic | probability | Number of obs | p-value | Results |
|---|---|---|---|---|---|
| USD | -34.883 | 1.8e-37 | 1195 | 0.0000 | Rejection |
| EURO | -33.310 | 3.3e-17 | 1195 | 0.0000 | Rejection |
| XU100 | -35.987 | 1.2e-13 | 1195 | 0.0000 | Rejection |
| XUHIZ | -36.434 | 2.2e-20 | 1195 | 0.0000 | Rejection |
| XUMAL | -36.072 | .0347 | 1195 | 0.0000 | Rejection |
| XUSIN | -34.350 | 2.4e-15 | 1195 | 0.0000 | Rejection |

### 4.2.2. Regression Model Test Results

The results obtained from the regression analyses are summarized through the Tables 5-8.

**Table 5:** Regressions Model Test Results for XU100

| Variable | Model USD | Model EUR | Model (USD and EUR) | Lag Model |
|---|---|---|---|---|
| USD | -.96475424*** | | -.81414952*** | -.81497243*** |
| EUR | | -.72156223*** | -.22916795** | -.23552138** |
| Lag bench | | | | -.06510801** |
| _ cons | .00060225 | .00031372 | .00059339 | .00059447 |
| Observation (N) | 1196 | 1196 | 1196 | 1195 |
| $R^2$ _ a adjusted | .1922246 | .11651357 | .19868584 | .20147428 |
| *p <. 1; **p <. 05; ***p <. 01 | | | | |

All the results for the XU100 indicate that the beta coefficient is negative and significant for USD and Euro exchange rates. Both USD and Euro have significant negative impact on XU100 stock indices, but USD impact is more apparent or significant. When lagged dependent variables are added to the model, it seems that XU100 (lag model) fits better since adjusted $R^2$ is greater than the adjusted $R^2$ of USD and Euro Models.

**Table 6:** Regressions Model Test Results for XUHIZ

| Variable | Model USD | Model EUR | Model (USD and EUR) | Lag Model |
|---|---|---|---|---|
| USD | -.6830387*** | | -.53576759*** | -.53884983*** |
| EUR | | -.54812539*** | -.22409537** | -.22456595** |
| Lag HIZ | | | | -.07110411* |
| _ cons | .00055333 | .00036062 | .00054467 | .00054581 |
| Observation (N) | 1196 | 1196 | 1196 | 1195 |
| $R^2$ _ a adjusted | .13432542 | .09374323 | .14313343 | .14644582 |
| *p <. 1; **p <. 05; ***p <. 01 | | | | |

The results for the XUHIZ also demonstrate both USD and Euro have significant negative impact on XUHIZ stock index however USD impact is more apparent or significant. When we add lagged dependent variable to the model, it seems that XUHIZ (lag model) fits better since adjusted $R^2$ is greater than others.

**Table 7:** Regressions Model Test Results for XUMAL

| Variable | Model USD | Model EUR | Model (USD and EUR) | Lag Model |
|---|---|---|---|---|
| USD | -1.1390595*** | | -.98571483*** | -.98580846*** |
| EUR | | -.82949354*** | -.23333728** | -.24423331** |
| Lag MAL | | | | -.06931793** |
| _ cons | .00060367 | .00025604 | .00059465 | .00059052 |
| Observation (N) | 1196 | 1196 | 1196 | 1195 |
| $R^2$ _ a adjusted | .19271867 | .11069874 | .19736439 | .20075804 |
| *p <. 1; **p <. 05; ***p <. 01 | | | | |

Table 7 provides the results for the XUMAL. It can be seen that the beta coefficient is also negative and significant for both USD and Euro. Again USD impact is more apparent or significant. When we add lagged dependent variable to the model, it seems that XUMAL (lag model) fits better since adjusted $R^2$ is greater than others.

**Table 8:** Regressions Model Test Results for XUSIN

| Variable | Model USD | Model EUR | Model (USD and EUR) | Lag Model |
|---|---|---|---|---|
| USD | -.73360418*** | | -.58398458*** | -.58369344*** |
| EUR | | -.5808604*** | -.22766893** | -.22789328** |
| Lag SIN | | | | -.00509074 |
| _ cons | .00061238* | .00040297 | .00060358* | .0006032* |
| Observation (N) | 1196 | 1196 | 1196 | 1195 |
| $R^2$ _ a adjusted | .15868606 | .10783524 | .16804864 | .16703182 |
| *p <. 1; **p <. 05; ***p <. 01 | | | | |

Table 8 provides the results for the XUSIN. It can be seen that the beta coefficient is also negative and significant for USD and Euro exchange rate. Both USD and Euro have significant negative impact on XUSIN stock indices, but USD impact is more significant. When we add lagged dependent variable to the model, it seems that XUSIN (lag model) fits better since adjusted $R^2$ is greater than others.

### 4.3. Granger Causality Test Results

In the application of the Granger Causality Test, first appropriate lag should be chosen. The lag selection methodology utilized here is based on choosing the lag level which has the greatest number of significant criteria employed in the process. On the other hand, AIC -the Akaike information criterion- is generally more relevant than other criteria in providing us a hint to select the exact lag level. In this framework, Vector Auto Regression (VAR) Models are used in order to test for Granger Causality.

1) Granger causality for XUMAL and USD

When we test for the null hypothesis whether XUMAL does not cause USD or vice versa, the results with 2 lags in Appendix C1 show that a one-way relationship exists in that changes in USD causes changes in XUMAL.

However, when we apply lag –order selection statistics as shown in Table-9, "3" lags is the critical one for the overall analysis. The results of 3 lags is also provided in Appendix C1 which posit that there is essentially a two-way relationship between USD and XUMAL.

**Table 9:** Granger Causality Result for USD-XUMAL

Selection-order criteria
Sample: 08/04/2011 – 25/12/2015, but with gaps
Number of observation = 217

| lag | LL | LR | df | P-value | FPE | AIC | HQIC | SBIC |
|---|---|---|---|---|---|---|---|---|
| 0 | 1410.23 | | | | 7.9e-09 | -12.979 | -12.9665 | -12.9479* |
| 1 | 1417.73 | 15.003 | 4 | 0.005 | 7.7e-09 | -13.0113 | -12.9736* | -12.9179 |
| 2 | 1421.57 | 7.6834 | 4 | 0.104 | 7.7e-09 | -13.0099 | -12.9469 | -12.8541 |
| **3** | 1426.68 | **10.221*** | 4 | 0.037 | **7.6e-09*** | **-13.0201*** | -12.932 | -12.802 |
| 4 | 1429.45 | 5.5407 | 4 | 0.236 | 7.7e-09 | -13.0088 | -12.8955 | -12.7284 |

Endogenous: USD XUMAL
Exogenous: _cons

2) Granger causality for XUMAL and EUR

When we test for the null hypothesis whether XUMAL does not cause EUR or vice versa, the results are somewhat mixed, because the relationship between XUMAL and EUR is unstable depending on the lag level as portrayed in Appendix C2. For instance, with 2 lags the relation is towards EUR-XUMAL while it is the opposite for 4 lags. With 3 lags, however, there is a two-way relationship between these variables.

When we apply lag –order selection statistics, we find by Table-10 that "0" lags is appropriate for the analysis. So we can argue that no relations at all can be found between EUR and XUMAL.

**Table 10:** Granger Causality Result for EUR-XUMAL

Selection-order criteria
Sample: 08/04/2011 – 25/12/2015, but with gaps
Number of observation = 217

| lag | LL | LR | df | P-value | FPE | AIC | HQIC | SBIC |
|---|---|---|---|---|---|---|---|---|
| **0** | 1391.06 | | | | **9.4e-09*** | **-12.8024*** | **-12.7898*** | **-12.7712*** |
| 1 | 1393.79 | 5.4685 | 4 | 0.243 | 9.6e-09 | -12.7907 | -12.753 | -12.6973 |
| 2 | 1396.49 | 5.3851 | 4 | 0.250 | 9.7e-09 | -12.7787 | -12.7158 | -12.6229 |
| 3 | 1401.82 | 10.675* | 4 | 0.030 | 9.6e-09 | -12.791 | -12.7029 | -12.5729 |
| 4 | 1401.83 | 6.0078 | 4 | 0.199 | 7.6e-09 | -12.7818 | -12.6686 | -12.5015 |

Endogenous: EUR XUMAL
Exogenous: _cons

3) Granger causality for XU100 and USD

When we test for the null hypothesis whether XU100 does not cause USD or vice versa, the results with 2 lags in Appendix C3 show that a one-way relationship exists in that changes in USD causes changes in XU100.

However, when we apply lag –order selection statistics as shown in Table-11, "3" lags is the critical one for the overall analysis. The results of 3 lags are also provided in Appendix C3 which posit that there is essentially a two-way relationship between USD and XU100.

**Table 11:** Granger Causality Result for USD-XU100

| Selection-order criteria<br>Sample: 08/04/2011 – 25/12/2015, but with gaps<br>Number of observation = 217 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| lag | LL | LR | df | P-value | FPE | AIC | HQIC | SBIC |
| 0 | 1449.02 | | | | 5.5e-09 | -13.3366 | -13.324 | -13.3054* |
| 1 | 1455.97 | 13.898 | 4 | 0.008 | 5.4e-09 | -13. 3638 | -13.326* | -13.2703 |
| 2 | 1459.94 | 7.9405 | 4 | 0.094 | 5.4e-09 | -13.3635 | -13.3006 | -13.2077 |
| **3** | 1466.55 | **13.215*** | 4 | 0.010 | **5.3e-09*** | **-13.3875*** | -13.2995 | -13.1695 |
| 4 | 1468.87 | 4.6474 | 4 | 0.325 | 5.3e-09 | -13.3721 | -13.2588 | -13.0917 |
| Endogenous: USD bench<br>Exogenous: _cons | | | | | | | | |

4) Granger causality for XU100 and EUR

When we test for the null hypothesis whether XU100 does not cause EUR or vice versa, the results are somewhat mixed, because the relationship between XU100 and EUR is unstable depending on the lag level as portrayed in Appendix C4. For instance, with 2 lags the relation is towards EUR-XU100 while it is the opposite for 4 lags. With 3 lags, however, there is a two-way relationship between these variables.

When we apply lag –order selection statistics, we find by Table-12 that "0" lags is appropriate for the analysis. So we can argue that no relations at all can be found between EUR and XU100.

**Table: 12** Granger Causality Result for EUR-XU100

| Selection-order criteria<br>Sample: 08/04/2011 – 25/12/2015, but with gaps<br>Number of observation = 217 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Lag | LL | LR | df | P-value | FPE | AIC | HQIC | SBIC |
| **0** | 1431.11 | | | | **6.5e-09*** | **-13.1715*** | **-13.1589*** | **-13.1404*** |
| 1 | 1433.3 | 4.3713 | 4 | 0.358 | 6.6e-09 | -13. 1548 | -13.1171 | -13.0614 |
| 2 | 1436.29 | 5.9843 | 4 | 0.200 | 6.7e-09 | -13.1455 | -13.0826 | -12.9898 |
| 3 | 1442.63 | 12.681* | 4 | 0.013 | 6.6e-09 | -13.1671 | -13.079 | -12.949 |
| 4 | 1445.94 | 6.6229 | 4 | 0.157 | 6.6e-09 | -13.1607 | -13.0475 | -12.8804 |
| Endogenous: EUR bench<br>Exogenous: _cons | | | | | | | | |

5) Granger causality for XU100-XUMAL and EUR-USD

With the same logic we can apply the same methodology for USD and EUR together rather than analyzing them individually.

Tables provided in Appendix C5 and Appendix C6 show that USD and EUR cause both XUMAL and XU100 as combined, i.e. p-value of ALL towards XUMAL and XU100 is 0.000. This is also the case for USD towards XUMAL and XU100, individually. On the other hand, EUR does not cause XUMAL on its own, since p-value of EUR towards XUMAL and XU100 is 0.495 and 0.597 respectively.

The relationship between exchange rates and stock markets by means of Granger Causality Tests are provided in a nutshell in Table 13.

**Table 13:** Granger Causality Test Results

| **Direction of causality** | **Lags** | **Chi2** | **p-value** | **Rejection of null at 5%** |
|---|---|---|---|---|
| XUMAL to USD | 3 | 10.295 | 0.016 | Reject |
| USD to XUMAL | 3 | 51.373 | 0.000 | Reject |
| XUMAL to EUR | 0 | No relationship | | |
| EUR to XUMAL | 0 | | | |
| XU100 to USD | 3 | 9.6473 | 0.022 | Reject |
| USD to XU100 | 3 | 53.988 | 0.000 | Reject |
| XU100 to EUR | 0 | No relationship | | |
| EUR to XU100 | 0 | | | |
| USD and EUR to XUMAL | 2 | 28.139 | 0.000 | Reject |
| USD and EUR to XU100 | 2 | 34.208 | 0.000 | Reject |

- There is a two-way relationship between USD and XUMAL as well as USD and XU100.
- There is no causality relationship between neither Euro and XUMAL nor Euro and XU100. At this point, it is worth to mention that previous regression results of Euro and stock indices do not contradict with Granger causality results. Although regression results show that there is a significant relationship between Euro and stock indices, this relationship does not create causality as lagged variables are not used in regressions. Indeed, this is in line with the results of Granger causality tests where we have found that lag "0" is significant for Euro.
- Euro causes XUMAL and XU100 only together with USD.
- Causality from lagged changes in exchange rate variable towards fluctuations in stock prices points to informational ineffectiveness.

# CHAPTER 5

# CONCLUSION

The impact of foreign exchange rates on the stock markets is an important factor for investment, while longer stability of the currency exchange rates is of the utmost importance to monetary policy standards as an essential factor to attract savings and to maintain price stability. Most of the developing countries significantly suffer from economic openness and a deficit in their balance of payments, making it one of the most influential international economic factors. National currency's strength is an important factor in the stability of the national economic factors and has direct consequences on foreign trade and financial dealings with the outside world. So it is considered as one of the most important tools for the management of monetary policy through its impact on the financial and economic indicators such as lower inflation, higher production, and smaller real cost of the various productive sectors. In addition, the exchange rate is among the core indicators that contribute to the foreign investment and attract international economic cooperation. In conclusion, the impact of fluctuations in exchange rates should be assessed to meet the challenges, to determine the country's economic performance, and to assess their impact on inflation and output growth (Guittian, 1976:6). Besides, the continuing increases in global trade and capital movements made the exchange rates one of the most important determinants of business profitability and equity prices (Kim, 2003). Hence, the relationship between stock returns and exchange rates which is often used to predict future movements of each other by investors, has attracted massive interest of economists for both theoretical and experimental reasons, as both played a prominent role in the development of a country's economy.

There are many factors that may lead to the correlation between exchange rates and stock markets which are mainly based on the trade flows or on the capital flows. However, while trade flow oriented models mainly support the view that a

depreciation of the home currency will lead to a rising stock prices due to increased competitiveness of the local firms and improved national economy with an increase in the gross domestic product while capital flow oriented models support the view that a depreciation of the local currency will lead the investors to sell their stocks due to decreased profitability of their stock investments which will cause a decline in the stock prices. Besides, it is argued that a depreciation of the nominal exchange rates will create expectations of inflation for the future which usually restrains consumer spending and thus company earnings, so inflation affects the stock market negatively. Furthermore, increasing capital inflows will also lead to an increase in the demand for the local currency causing it to appreciate.

As the relationship between exchange rates and stock prices leads to mixed results and in some cases the results are inconclusive (Gopalan, 2010), no consensus could have been reached yet. In an attempt to provide an additional empirical evidence for Turkey, this research thesis is aimed to investigate the impact of foreign exchange rates on the Turkish stock market Borsa Istanbul with an additional concern of investigating the causality in-between these two markets.

The results obtained from the regression analyses indicate that both US dollar and Euro have a statistically significant negative impact on the indices of Borsa Istanbul, specifically the BIST100 Index, the Services Index, the Financial Index and the Industrials Index. However, the impact of US dollar is found to be more apparent.

The results of Granger Causality Test present a bidirectional relationship between US dollar and stock indices of National 100 and Financial Indices. In contrast, no causal relationship could be detected between Euro and the stock indices of National 100 and Financial Indices.

Overall, it can be concluded that both US dollar and Borsa Istanbul indices can be used to predict each other. However, for Euro, at “lag 0” for each Euro-based Granger Causality test no historical relationship could be detected between Euro and Borsa Istanbul indices. This fact reveals itself in regression tests since the “contemporaneous” relationship between Euro and Borsa Istanbul indices are significant. Thus, Euro has an instant effect, but it does not have a predictor power on stock market indices.

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# APPENDICES

## Appendix A: Augmented Dickey-Fuller Unit Roots Tests

### A.1. Dickey – Fuller Unit Roots Test for USD

Dickey-Fuller test for unit root  Number of obs = 1195

| | Test Statistic | 1% Critical Value | 5% Critical Value | 10% Critical Value |
|---|---|---|---|---|
| | | Interpolated Dickey-Fuller | | |
| Z(t) | -34.883 | -3.430 | -2.860 | -2.570 |

MacKinnon approximate p-value for Z(t) = 0.0000

### A.2. Dickey – Fuller Unit Roots Test for EUR

Dickey-Fuller test for unit root  Number of obs = 1195

| | Test Statistic | 1% Critical Value | 5% Critical Value | 10% Critical Value |
|---|---|---|---|---|
| | | Interpolated Dickey-Fuller | | |
| Z(t) | -33.310 | -3.430 | -2.860 | -2.570 |

MacKinnon approximate p-value for Z(t) = 0.0000

## A.3. Dickey – Fuller Unit Roots Test for HIZ

Dickey-Fuller test for unit root  Number of obs = 1195

| | Test Statistic | 1% Critical Value | 5% Critical Value | 10% Critical Value |
|---|---|---|---|---|
| | | Interpolated Dickey-Fuller | | |
| Z(t) | -36.434 | -3.430 | -2.860 | -2.570 |

MacKinnon approximate p-value for Z(t) = 0.0000

## A.4. Dickey – Fuller Unit Roots Test for XUMAL

Dickey-Fuller test for unit root  Number of obs = 1195

| | Test Statistic | 1% Critical Value | 5% Critical Value | 10% Critical Value |
|---|---|---|---|---|
| | | Interpolated Dickey-Fuller | | |
| Z(t) | -36.072 | -3.430 | -2.860 | -2.570 |

MacKinnon approximate p-value for Z(t) = 0.0000

## A.5. Dickey – Fuller Unit Roots Test for XUSIN

Dickey-Fuller test for unit root  Number of obs = 1195

| | Test Statistic | 1% Critical Value | 5% Critical Value | 10% Critical Value |
|---|---|---|---|---|
| | | Interpolated Dickey-Fuller | | |
| Z(t) | -34.350 | -3.430 | -2.860 | -2.570 |

MacKinnon approximate p-value for Z(t) = 0.0000

## A.6. Dickey – Fuller Unit Roots Test for XU100

Dickey-Fuller test for unit root  Number of obs = 1195

| | Test Statistic | 1% Critical Value | 5% Critical Value | 10% Critical Value |
|---|---|---|---|---|
| | | Interpolated Dickey-Fuller | | |
| Z(t) | -35.987 | -3.430 | -2.860 | -2.570 |

MacKinnon approximate p-value for Z(t) = 0.0000

## Appendix B: Regression Model Test

### B.1. Regressions Model Test for XU100

$XU_{100} = \alpha + \beta_{USD} + \varepsilon$
Dependent variable: XU100
Independent Variable: USD

```
Linear regression                               Number of obs =    1196
                                                F(  1,  1194) =  194.85
                                                Prob > F      =  0.0000
                                                R-squared     =  0.1929
                                                Root MSE      =  .01352
```

| BENCH | Coef. | Robust Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| USD | -.9647542 | .0691132 | -13.96 | 0.000 | -1.100351 | -.8291574 |
| _cons | .0006023 | .0003904 | 1.54 | 0.123 | -.0001637 | .0013682 |

$XU_{100} = \alpha + \beta_{EUR} + \varepsilon$
Dependent variable: XU100
Independent Variable: EUR

```
Linear regression                               Number of obs =    1196
                                                F(  1,  1194) =  112.69
                                                Prob > F      =  0.0000
                                                R-squared     =  0.1173
                                                Root MSE      =  .01414
```

| BENCH | Coef. | Robust Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| EUR | -.7215622 | .067971 | -10.62 | 0.000 | -.8549182 | -.5882063 |
| _cons | .0003137 | .0004066 | 0.77 | 0.441 | -.0004841 | .0011115 |

$XU_{100} = \alpha + \beta_{USD} + \beta_{EUR} + \varepsilon$
Dependent variable: XU100
Independent Variable: USD, EUR

```
Linear regression                               Number of obs =    1196
                                                F(  2,  1193) =  101.98
                                                Prob > F      =  0.0000
                                                R-squared     =  0.2000
                                                Root MSE      =  .01346
```

| BENCH | Coef. | Robust Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| USD | -.8141495 | .0839652 | -9.70 | 0.000 | -.9788853 | -.6494137 |
| EUR | -.229168 | .0788754 | -2.91 | 0.004 | -.3839179 | -.074418 |
| _cons | .0005934 | .0003896 | 1.52 | 0.128 | -.0001709 | .0013577 |

$XU_{100} = \alpha + \beta_{USD} + \beta_{EUR} + \beta_{LAGXU100} + \varepsilon$
Dependent variable: XU100
Independent Variable: USD, EUR, LAGGED XU100

```
Linear regression                               Number of obs =    1195
                                                F(  3,  1191) =   71.04
                                                Prob > F      =  0.0000
                                                R-squared     =  0.2035
                                                Root MSE      =  .01343
```

| BENCH | Coef. | Robust Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| USD | -.8149724 | .0839239 | -9.71 | 0.000 | -.9796276 | -.6503173 |
| EUR | -.2355214 | .0783351 | -3.01 | 0.003 | -.3892115 | -.0818313 |
| lagbench | -.065108 | .0316668 | -2.06 | 0.040 | -.1272369 | -.0029791 |
| _cons | .0005945 | .0003898 | 1.52 | 0.128 | -.0001704 | .0013593 |

| Variable | model3 |
|---|---|
| USD | -.81497243*** |
| EUR | -.23552138*** |
| lagbench | -.06510801** |
| _cons | .00059447 |
| N | 1195 |
| r2_a | .20147428 |

legend: * p<.1; ** p<.05; *** p<.01

## B.2. Regressions Model Test for XUHIZ

$XU_{HIZ} = \alpha + \beta_{USD} + \varepsilon$
Dependent variable: XUHIZ
Independent Variable: USD

```
Linear regression                               Number of obs =    1196
                                                F(  1,  1194) =  128.03
                                                Prob > F      =  0.0000
                                                R-squared     =  0.1350
                                                Root MSE      =  .01184
```

| HIZ | Coef. | Robust Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| USD | -.6830387 | .0603664 | -11.31 | 0.000 | -.8014748 | -.5646026 |
| _cons | .0005533 | .0003417 | 1.62 | 0.106 | -.000117 | .0012236 |

$XU_{HIZ} = \alpha + \beta_{EUR} + \varepsilon$
Dependent variable: XUHIZ
Independent Variable: EUR

Linear regression

| | |
|---|---|
| Number of obs | = 1196 |
| F( 1, 1194) | = 81.55 |
| Prob > F | = 0.0000 |
| R-squared | = 0.0945 |
| Root MSE | = .01211 |

| HIZ | Coef. | Robust Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| EUR | -.5481254 | .0606959 | -9.03 | 0.000 | -.6672079 | -.4290429 |
| _cons | .0003606 | .0003482 | 1.04 | 0.301 | -.0003225 | .0010437 |

$XU_{HIZ} = \alpha + \beta_{USD} + \beta_{EUR} + \varepsilon$
Dependent variable: XUHIZ
Independent Variable: USD, EUR

Linear regression

| | |
|---|---|
| Number of obs | = 1196 |
| F( 2, 1193) | = 68.37 |
| Prob > F | = 0.0000 |
| R-squared | = 0.1446 |
| Root MSE | = .01178 |

| HIZ | Coef. | Robust Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| USD | -.5357676 | .072548 | -7.39 | 0.000 | -.6781035 | -.3934317 |
| EUR | -.2240954 | .0723687 | -3.10 | 0.002 | -.3660795 | -.0821112 |
| _cons | .0005447 | .0003409 | 1.60 | 0.110 | -.0001242 | .0012135 |

$XU_{HIZ} = \alpha + \beta_{USD} + \beta_{EUR} + \beta_{LAGXUHIZ} + \varepsilon$
Dependent variable: XUHIZ
Independent Variable: USD, EUR, LAGGED XUHIZ

Linear regression

| | |
|---|---|
| Number of obs | = 1195 |
| F( 3, 1191) | = 47.38 |
| Prob > F | = 0.0000 |
| R-squared | = 0.1486 |
| Root MSE | = .01174 |

| HIZ | Coef. | Robust Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| USD | -.5388498 | .0723398 | -7.45 | 0.000 | -.6807774 | -.3969223 |
| EUR | -.224566 | .0724481 | -3.10 | 0.002 | -.366706 | -.0824259 |
| laghız | -.0711041 | .0368126 | -1.93 | 0.054 | -.1433289 | .0011207 |
| _cons | .0005458 | .0003419 | 1.60 | 0.111 | -.0001251 | .0012167 |

| Variable | model2 |
|---|---|
| USD | -.53884983*** |
| EUR | -.22456595*** |
| laghız | -.07110411* |
| _cons | .00054581 |
| N | 1195 |
| r2_a | .14644582 |

legend: * p<.1; ** p<.05; *** p<.01

## B.3. Regressions Model Test for XUMAL

$XU_{MAL} = \alpha + \beta_{USD} + \varepsilon$
Dependent variable: XUMAL
Independent Variable: USD

Linear regression — Number of obs = 1196; F( 1, 1194) = 195.32; Prob > F = 0.0000; R-squared = 0.1934; Root MSE = .01593

| MAL | Coef. | Robust Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| USD | -1.13906 | .0815029 | -13.98 | 0.000 | -1.298964 | -.9791548 |
| _cons | .0006037 | .0004613 | 1.31 | 0.191 | -.0003014 | .0015088 |

$XU_{MAL} = \alpha + \beta_{EUR} + \varepsilon$
Dependent variable: XUMAL
Independent Variable: EUR

Linear regression — Number of obs = 1196; F( 1, 1194) = 106.68; Prob > F = 0.0000; R-squared = 0.1114; Root MSE = .01672

| MAL | Coef. | Robust Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| EUR | -.8294935 | .0803105 | -10.33 | 0.000 | -.9870589 | -.6719282 |
| _cons | .000256 | .0004825 | 0.53 | 0.596 | -.0006906 | .0012026 |

$XU_{MAL} = \alpha + \beta_{USD} + \beta_{EUR} + \varepsilon$
Dependent variable: XUMAL
Independent Variable: USD, EUR

Linear regression

| | |
|---|---|
| Number of obs | 1196 |
| F( 2, 1193) | 101.06 |
| Prob > F | 0.0000 |
| R-squared | 0.1987 |
| Root MSE | .01589 |

| MAL | Coef. | Robust Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| USD | -.9857148 | .098047 | -10.05 | 0.000 | -1.178078 | -.7933512 |
| EUR | -.2333373 | .0914652 | -2.55 | 0.011 | -.4127878 | -.0538868 |
| _cons | .0005947 | .0004605 | 1.29 | 0.197 | -.0003089 | .0014982 |

$XU_{MAL} = \alpha + \beta_{USD} + \beta_{EUR} + \beta_{LAGXUMAL} + \varepsilon$
Dependent variable: XUMAL
Independent Variable: USD, EUR, LAGGED XUMAL

Linear regression

| | |
|---|---|
| Number of obs | 1195 |
| F( 3, 1191) | 72.02 |
| Prob > F | 0.0000 |
| R-squared | 0.2028 |
| Root MSE | .01585 |

| MAL | Coef. | Robust Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| USD | -.9858085 | .0977992 | -10.08 | 0.000 | -1.177686 | -.7939306 |
| EUR | -.2442333 | .0903735 | -2.70 | 0.007 | -.4215423 | -.0669243 |
| lagmal | -.0693179 | .0292894 | -2.37 | 0.018 | -.1267825 | -.0118534 |
| _cons | .0005905 | .0004599 | 1.28 | 0.199 | -.0003118 | .0014928 |

| Variable | model1 |
|---|---|
| USD | -.98580846*** |
| EUR | -.24423331*** |
| lagmal | -.06931793** |
| _cons | .00059052 |
| N | 1195 |
| r2_a | .20075804 |

legend: * p<.1; ** p<.05; *** p<.01

## B.4. Regressions Model Test for XUSIN

$XU_{SIN} = \alpha + \beta_{USD} + \varepsilon$
Dependent variable: XUSIN
Independent Variable: USD

Linear regression

| | |
|---|---|
| Number of obs | = 1196 |
| F( 1, 1194) | = 135.89 |
| Prob > F | = 0.0000 |
| R-squared | = 0.1594 |
| Root MSE | = .01154 |

| SIN | Coef. | Robust Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| USD | -.7336042 | .0629317 | -11.66 | 0.000 | -.8570732 | -.6101352 |
| _cons | .0006124 | .0003296 | 1.86 | 0.063 | -.0000344 | .0012591 |

$XU_{SIN} = \alpha + \beta_{EUR} + \varepsilon$
Dependent variable: XUSIN
Independent Variable: EUR

Linear regression

| | |
|---|---|
| Number of obs | = 1196 |
| F( 1, 1194) | = 91.49 |
| Prob > F | = 0.0000 |
| R-squared | = 0.1086 |
| Root MSE | = .01188 |

| SIN | Coef. | Robust Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| EUR | -.5808604 | .0607283 | -9.56 | 0.000 | -.7000064 | -.4617144 |
| _cons | .000403 | .0003389 | 1.19 | 0.235 | -.0002619 | .0010678 |

$XU_{SIN} = \alpha + \beta_{USD} + \beta_{EUR} + \varepsilon$
Dependent variable: XUSIN
Independent Variable: USD, EUR

Linear regression

| | |
|---|---|
| Number of obs | = 1196 |
| F( 2, 1193) | = 72.06 |
| Prob > F | = 0.0000 |
| R-squared | = 0.1694 |
| Root MSE | = .01147 |

| SIN | Coef. | Robust Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| USD | -.5839846 | .0742429 | -7.87 | 0.000 | -.7296457 | -.4383235 |
| EUR | -.2276689 | .0695298 | -3.27 | 0.001 | -.3640831 | -.0912547 |
| _cons | .0006036 | .0003288 | 1.84 | 0.067 | -.0000416 | .0012487 |

| Variable | sınusd | suneur | sınall |
|---|---|---|---|
| USD | -.73360418*** | | -.58398458*** |
| EUR | | -.5808604*** | -.22766893** |
| _cons | .00061238* | .00040297* | .00060358* |
| N | 1196 | 1196 | 1196 |
| r2_a | .15868606 | .10783524 | .16804864 |

legend: * p<.5; ** p<.01; *** p<.001

$XU_{SIN} = \alpha + \beta_{USD} + \beta_{EUR} + \beta_{LAGXUSIN} + \varepsilon$
Dependent variable: XUSIN
Independent Variable: USD, EUR, LAGGED XUSIN

Linear regression

Number of obs = 1195
F( 3, 1191) = 48.89
Prob > F = 0.0000
R-squared = 0.1691
Root MSE = .01148

| SIN | Coef. | Robust Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| USD | -.5836934 | .0743761 | -7.85 | 0.000 | -.7296161 | -.4377708 |
| EUR | -.2278933 | .0695312 | -3.28 | 0.001 | -.3643105 | -.0914761 |
| lagsın | -.0050907 | .0486707 | -0.10 | 0.917 | -.1005807 | .0903992 |
| _cons | .0006032 | .0003329 | 1.81 | 0.070 | -.0000499 | .0012563 |

| Variable | model |
|---|---|
| USD | -.58369344*** |
| EUR | -.22789328*** |
| lagsın | -.00509074 |
| _cons | .0006032* |
| N | 1195 |
| r2_a | .16703182 |

legend: * p<.1; ** p<.05; *** p<.01

## Appendix C: Granger Causality Test

### C.1. Granger Causality Test for XUMAL to USD and USD to XUMAL

Results for 2-lags

Granger causality Wald tests

| Equation | Excluded | chi2 | df | Prob > chi2 |
|---|---|---|---|---|
| usd | xumal | 3.994 | 2 | 0.136 |
| usd | ALL | 3.994 | 2 | 0.136 |
| xumal | usd | 29.916 | 2 | 0.000 |
| xumal | ALL | 29.916 | 2 | 0.000 |

Results for 3-lags

Granger causality Wald tests

| Equation | Excluded | chi2 | df | Prob > chi2 |
|---|---|---|---|---|
| usd | xumal | 10.295 | 3 | 0.016 |
| usd | ALL | 10.295 | 3 | 0.016 |
| xumal | usd | 51.373 | 3 | 0.000 |
| xumal | ALL | 51.373 | 3 | 0.000 |

### C.2. Granger Causality Test for XUMAL to Euro and Euro to XUMAL

Results for 2-lags

Granger causality Wald tests

| Equation | Excluded | chi2 | df | Prob > chi2 |
|---|---|---|---|---|
| eur | xumal | 2.4627 | 2 | 0.292 |
| eur | ALL | 2.4627 | 2 | 0.292 |
| xumal | eur | 9.7223 | 2 | 0.008 |
| xumal | ALL | 9.7223 | 2 | 0.008 |

Results for 3-lags

Granger causality Wald tests

| Equation | Excluded | chi2 | df | Prob > chi2 |
|---|---|---|---|---|
| eur | xumal | 14.68 | 3 | 0.002 |
| eur | ALL | 14.68 | 3 | 0.002 |
| xumal | eur | 15.789 | 3 | 0.001 |
| xumal | ALL | 15.789 | 3 | 0.001 |

Results for 4-lags

Granger causality Wald tests

| Equation | Excluded | chi2 | df | Prob > chi2 |
|---|---|---|---|---|
| eur | xumal | 9.7443 | 4 | 0.045 |
| eur | ALL | 9.7443 | 4 | 0.045 |
| xumal | eur | 6.1245 | 4 | 0.190 |
| xumal | ALL | 6.1245 | 4 | 0.190 |

## C.3. Granger Causality Test for XU100 to USD and USD to XU100

Results for 2-lags

Granger causality Wald tests

| Equation | Excluded | chi2 | df | Prob > chi2 |
|---|---|---|---|---|
| usd | bench | 3.628 | 2 | 0.163 |
| usd | ALL | 3.628 | 2 | 0.163 |
| bench | usd | 35.27 | 2 | 0.000 |
| bench | ALL | 35.27 | 2 | 0.000 |

Results for 3-lags

Granger causality Wald tests

| Equation | Excluded | chi2 | df | Prob > chi2 |
|---|---|---|---|---|
| usd | bench | 9.6473 | 3 | 0.022 |
| usd | ALL | 9.6473 | 3 | 0.022 |
| bench | usd | 53.988 | 3 | 0.000 |
| bench | ALL | 53.988 | 3 | 0.000 |

## C.4. Granger Causality Test for XU100 to Euro and Euro to XU100

Results for 2-lags

Granger causality Wald tests

| Equation | Excluded | chi2 | df | Prob > chi2 |
|---|---|---|---|---|
| eur | bench | 1.5746 | 2 | 0.455 |
| eur | ALL | 1.5746 | 2 | 0.455 |
| bench | eur | 12.717 | 2 | 0.002 |
| bench | ALL | 12.717 | 2 | 0.002 |

Results for 3-lags

Granger causality Wald tests

| Equation | Excluded | chi2 | df | Prob > chi2 |
|---|---|---|---|---|
| eur | bench | 14.455 | 3 | 0.002 |
| eur | ALL | 14.455 | 3 | 0.002 |
| bench | eur | 17.701 | 3 | 0.001 |
| bench | ALL | 17.701 | 3 | 0.001 |

Results for 4-lags

Granger causality Wald tests

| Equation | Excluded | chi2 | df | Prob > chi2 |
|---|---|---|---|---|
| eur | bench | 8.7366 | 4 | 0.068 |
| eur | ALL | 8.7366 | 4 | 0.068 |
| bench | eur | 7.0793 | 4 | 0.132 |
| bench | ALL | 7.0793 | 4 | 0.132 |

## C.5. Granger Causality Test for USD and Euro to XUMAL

Granger causality Wald tests

| Equation | Excluded | chi2 | df | Prob > chi2 |
|---|---|---|---|---|
| eur | usd | .02888 | 1 | 0.865 |
| eur | xumal | .36046 | 1 | 0.548 |
| eur | ALL | .3607 | 2 | 0.835 |
| usd | eur | 3.4376 | 1 | 0.064 |
| usd | xumal | .83485 | 1 | 0.361 |
| usd | ALL | 4.6221 | 2 | 0.099 |
| xumal | eur | .46616 | 1 | 0.495 |
| xumal | usd | 21.516 | 1 | 0.000 |
| xumal | ALL | 28.139 | 2 | 0.000 |

## C.6. Granger Causality Test for USD and Euro to XU100

Granger causality Wald tests

| Equation | Excluded | chi2 | df | Prob > chi2 |
|---|---|---|---|---|
| eur | usd | .00073 | 1 | 0.978 |
| eur | bench | .0016 | 1 | 0.968 |
| eur | ALL | .00185 | 2 | 0.999 |
| usd | eur | 3.4786 | 1 | 0.062 |
| usd | bench | .45272 | 1 | 0.501 |
| usd | ALL | 4.2384 | 2 | 0.120 |
| bench | eur | .27947 | 1 | 0.597 |
| bench | usd | 25.127 | 1 | 0.000 |
| bench | ALL | 34.208 | 2 | 0.000 |

## CURRICULUM VITAE

### PERSONAL INFORMATION

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### EDUCATION

| Degree | Institution | Year of Graduation |
|---|---|---|
| MSc | Çankaya University. Financial Economics | 2016 |
| BSc | Mosul University. Financial and Banking Sciences | 2006 |
| High School | Kozloo Baba (Literary Section) | 2002 |
| Primary School | Laylan Primary School for Boys | 1996 |

### WORK EXPERIENCE

| Year | Place | Enrollment |
|---|---|---|
| 2008 | Kirkuk University. College of Law | Assistant Accountant |
| 2008-2013 | Presidency of Kirkuk University | An Accountant in the Financial Department |

### LANGUAGES

| Language | Speaking | Reading | Writing |
|---|---|---|---|
| English | Good | Good | Good |
| Turkish | V. Good | V. Good | Good |
| Arabic | V. Good | V. Good | V. Good |
| Kurdish | Good | Good | Good |

### HOBBIES

**Football, Reading, Drawing, Travelling, Movies.**