Exchange Rate Volatility and Stock Returns: A case of China and Turkey.

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Exchange Rate Volatility and Stock Returns: A case of China and Turkey.

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ABSTRACT

This study analyzes the relationship between stock returns and exchange rate volatility in China and Turkey from 1990 to 2016. GARCH(1,1) model is employed to estimate the volatility of exchange rate. ADF unit root test is used to test for stationarity of the series. Then, relation between exchange rate volatility and stock returns is modelled with OLS Regression and Granger Causality methods. The OLS Regression results show no evidence of an impact of exchange rate volatility on stock returns in China or Turkey. On the other hand, OLS Regression results exhibit that GDP has a significant and positive impact on stock returns in Turkey and China. Regarding Granger causality findings, there is evidence of causality from exchange rate volatility to stock returns in Turkey. Moreover, Granger causality from GDP to stock returns in Turkey is found. In China, the Granger causality runs from stock returns to GDP.

Keywords: Exchange rate volatility, Stock returns, Granger causality, China, Turkey

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STATEMENT OF COMPLIANCE WITH ETHICAL PRINCIPLES AND RULES

I hereby truthfully declare that this thesis is an original work prepared by me; that I have behaved in accordance with the scientific ethical principles and rules throughout the stages of preparation, data collection, analysis and presentation of my work; that I have cited the sources of all the data and information that could be obtained within the scope of this study, and included these sources in the references section; and that this study has been scanned for plagiarism with "scientific plagiarism detection program" used by Anadolu University, and that "it does not have any plagiarism" whatsoever. I also declare that, if a case contrary to my declaration is detected in my work at any time, I hereby express my consent to all the ethical and legal consequences that are involved.

Tao Wang

Table of Contents

Graphs

Page No.

Tables

Page No.

SYMBOLS AND ABBREVIATIONS

ADF	Augmented Dickey-fuller
SSE	Shanghai Stock Exchange
IMF	International Monetary Fund
WB	World Bank
ISE	Istanbul Stock Exchange
CBRT	Central Bank of the Republic of Turkey
REER	Real Effective Exchange Rate
RMB	Renminbi
TRY	Turkish Lira
GDP	Gross Domestic Product
PBC	People's Bank of China
GARCH	Generalised Autoregressive Conditional Heteroskedasticity
OLS	Ordinary Least Squares
VAR	Vector Autoregressive
EVC	Exchange Rate Volatility China
EVT	Exchange Rate Volatility Turkey
RT	Stock Returns Tukey
RC	Stock Returns China

CPI Consumer Price Index

CHAPTER ONE

1 INTRODUCTION

1.1. Background of Problem

Exchange rate refers to the price of one currency in terms of another, which is the worth of a local currency for a foreign one. On the other hand, exchange rate volatility refers to the likelihood of currencies to appreciate or depreciate. Exchange rate regimes have changed over time. After the World War II, the Bretton Woods Exchange Rate system was implemented. This system took over from the “gold standard ”making the US dollar the global currency. This exchange rate regime was a fixed one. The World Bank and the IMF were the two bodies established to monitor it. After the 1970 recession and stagflation in the United States, the Bretton Woods Fixed Exchange rate system collapsed. U.S. President Richard Nixon (1971) announced the "temporary" suspension of the dollar's convertibility into gold.

What followed after the fall of the Bretton Wood regime was an exchange rate system where currency values are allowed to be determined by the forces of demand and supply. This system is referred to as the floating exchange rate system. The forces of demand and supply seem to be fair tools to determine the value of currencies. However, the floating exchange rate system has the tendency of currencies experiencing huge fluctuations and these fluctuations may have impacts on the value of securities.

The strength of a currency signals strong economic performance of a country in many cases. Therefore, currency fluctuations will mean too much uncertainty and this might have some negative effects on the stock markets, stock returns to be specific.

1.2. Problem Statement

As countries maintain the floating exchange rate regime, fluctuations in currency values is imminent. Investors and other stakeholders have a keen interest in the movement of currencies as these movements determine the value of their portfolios. The decision on whether to invest, when to invest and where to invest must depends on factors including the exchange rate. It is in this context that we seek to evaluate the possible effects that exchange rate volatility might have on stock returns. As the world embraces the floating exchange rate system, researchers have been drawn to the issues of the volatility of exchange rates in recent years. However, the previous studies on the impacts of exchange rate movement and the impacts they might have on stock returns have not been unanimous. Pilinkus and Boguslauskas (2015) found that exchange rates have a negative effect on stock market prices. Liu and Shrestha (2008) also found similar results when they examined the exchange rate and stock prices in China. On the other hand, Brooks *et al (2010*) found a positive effect of exchange rate movements on stock returns. In another study by Adjasi, Harvey and Agyapong (2008) on the Ghana stock market was found a negative relationship between exchange rate volatility and stock market returns. A depreciation will cause a fall in returns in the short run whilst in the long run it will yield an increase in returns. Different results were found by Mburu (2015) in his studies on exchange rate volatility and stock market performance in the Kenyan stock market. This study found that exchange rate movements do not have any effects on stock returns.

Our choice of countries – China and Turkey- is motivated by the fact that these countries are developing and their rate of growth is fast. They have attracted a lot of investors and investments in the form of Multinational companies and also domestic investment has significantly grown. China uses a managed floating exchange rate system whereas Turkey uses a floating exchange rate. The similarities in the growth stage of their economies and the slight differences in the exchange rate policies will make this study a worthy one. Turkey has experienced some significant fluctuations in the value of the Lira to major currencies in recent years however China's Yuan has been relatively stable but the strategy of keeping its value managed and low in exchange value to other currencies persists. These situations will also make it the more interesting to examine exchange rate fluctuations on stock returns in these countries. Moreover, given the divergent conclusions on exchange rate volatility on stock prices, it is imperative that we conduct

an empirical study to examine the impacts that exchange rate volatility might have on stock returns in China and Turkey and to compare it.

1.3. Economic Outlook of Turkish and Chinese Economy

1.3.1 Overview of the GDP of Turkey

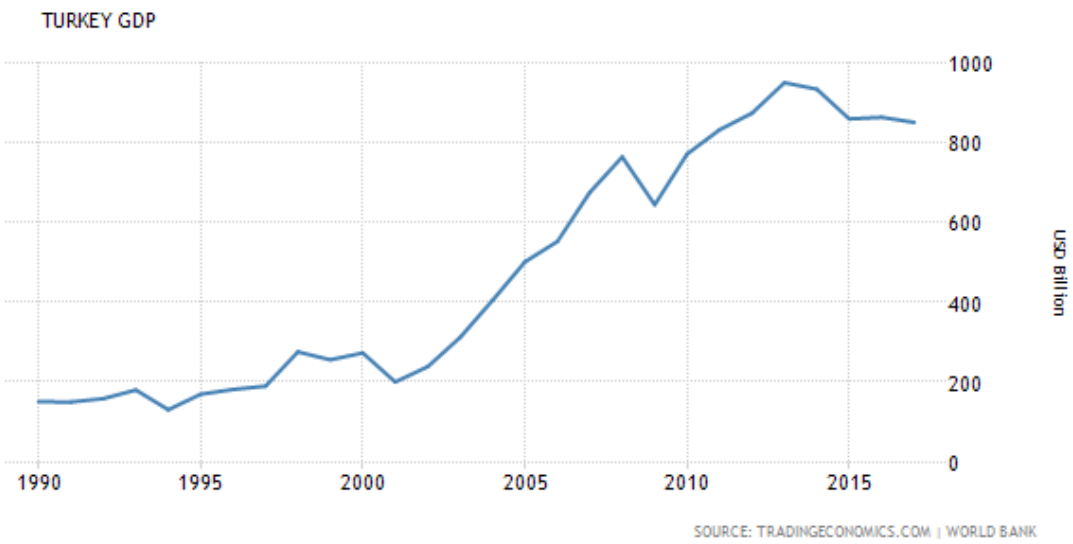
From 1990 to 2000 the Turkish economy went through hurdles experiencing a low and fluctuating economic growth. However, from the year 2001 the Turkish economy stabilized and continuously achieved sustainable growth. This according to the World Bank is owed to macroeconomic and fiscal stability. Since the year 2001, Turkey has been able to cut poverty by 50%, reduce its unemployment rate and move to the level of a middle upper-income country (World Bank). This boost in economic performance led to a dramatic urbanization of the country and subsequent inflow of foreign capital as the state implement favorable trade policies. Turkey currently has a GDP of US $856 billion and a GDP per capita of US $10, 807.

As can be seen in the Graph 2.1, the Turkish economy experienced difficulties in the year 2008 as a result of the spillovers from the financial crises in the USA. In 2010, the economy recovered and realized positive growth. The recent poor economic performance in Europe has not left Turkey untouched. You can see from the graph 2.1 that there are some fluctuations in growth.

The year 2015 and 2016 have been difficult ones for Turkey. The country went through an election full of drama and reshuffling of its cabinet in 2016. In July 2016 there was a coup attempt. In addition there have been numerous terrorist attacks in various cities in the country. These events affected investment and tourism negatively and have played a negative role in the economic performance of Turkey. The impacts are evident in that the economy recorded a significant fall in GDP growth from 6.1% in 2015 to just 2.9% in 2016. Unemployment also increased by 3.7% from 2011 to 12.1% in November 2016.

Another major hurdle is the war in Syria, which has led to the mass inflow of refugees putting an additional weight on an economy that is already suffering (World Bank).

Graph 2.1. Gross Domestic Product, Turkey



Source: *data from the World Bank database*

1.3.2 Overview of the GDP of China

China has achieved dramatic economic growth in recent years. It has grown to become one of the world's largest and fastest growing economies. China's transformation from a centrally planned economy to a market-based economy is helped by its economic performance. The Chinese economy has reached a 10% economic growth yearly which is the highest that an economy has ever attained. The country also managed to join the league of upper-income middle-income countries.

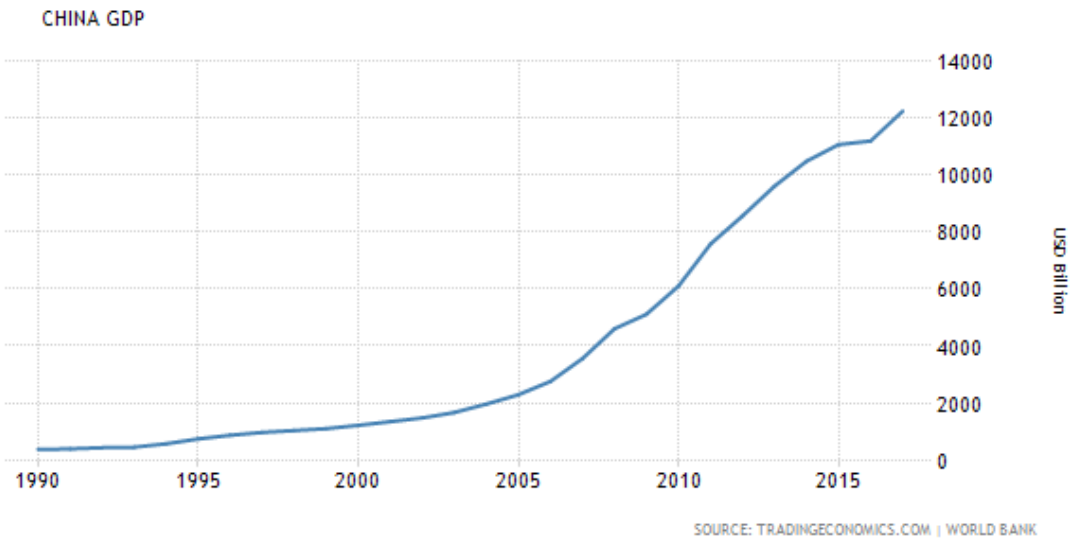
According to the World Bank, China's GDP at 2016 represents 18.06% of the world's GDP. In the Graph 2.2 you can see an outlay of the pattern of the growth China has achieved over the years. From 1990 to 2002, GDP of China was growing but at a moderate level. However, starting from 2003 Chinese economic growth was increasing at an

exponential rate. In 2016, the GDP of China was the US $11199.15 billion. This is the highest record for the economy with record lowest GDP being the US $47.21 billion in 1962. China has a GDP per capita of US $6497.50 in 2016. (World Bank).

China with a population of 1.3 billion is the second largest economy in the world and after the great financial crises that hit the US economy in 2008, China has established itself as the major player in the world's economic growth ahead of the USA.

All these achievements have not changed the status of China as it is still among the developing countries. In fact, the rapid economic growth came with high inequality, urbanization and environmental issues. The World Bank stated that in 2015, 55 million of Chinese living in the villages face poverty.

Graph 2.2. GDP of China



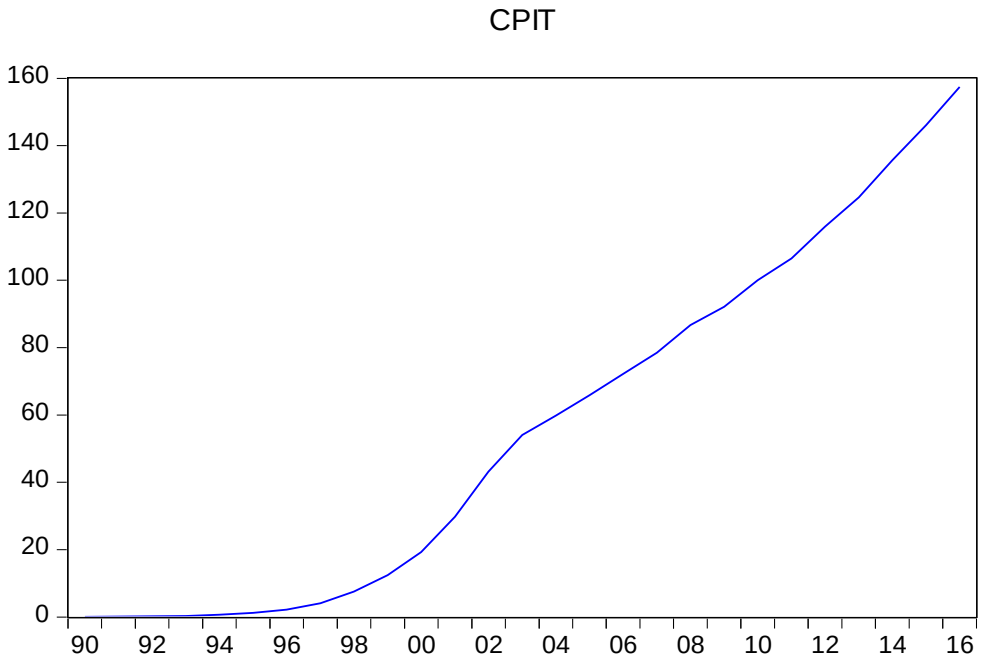
Source: *data from the World Bank database*

1.3.3 Inflation in Turkey

Turkey has over the years faced challenges in controlling the inflation rate. In 2000, Turkey decided to implement an inflation Targeting policy to manage price changes. Inflation remains high in Turkey but the Targeting policy has made significant achievements. In 2002 the target was 35% and the 29.7% was achieved. In 2004, the target was 12% and 9.3% was realized. From 2006 to 2009, the economy failed to achieve

the target. In 2008, inflation reached double figures the highest since 2003. In 2009 and 2010, inflation fell to a single digit but rose again to 10.4% in 2011. From 2011 to 2016 the targeted inflation rate has been 5% a figure that has not been achieved but the inflation has stayed within a digit for the period except in 2012 (TCMB,2017).

Graph 2.3. Inflation in Turkey



Source: data from the World Bank database

According to Khan (2017) in an article published in financial times, the consumer prices increased by 11.29% in March 2012. A situation that lead to pressure on the monetary policy committee of Turkey. The reason for the price increase was stated a result of the poor performance of the lira and the rising global energy prices. This increment in inflation can be seen from Graph 2.3 and 2.4

Graph 2.4. *Inflation in Turkey based on the Financial Times Report*

Source: *The Financial Times* [1]

Table 2.1 shows a breakdown of the consumer prices by expenditure. It can be seen that the main source of the high inflation in Turkey over the years is alcoholic beverages and tobacco. The Turkstat recorded that alcoholic beverages and tobacco had a 21.70 annual rate of change. The other significant catalyst to the consumer price increase is food and non-alcoholic beverages and transportation.

[1] See www.ft.com/content/3de40fc0-90b4-3e93-916b-b6dbd6c1ad13?mhq5j=e2

Table 2.1. *CPI Index of Turkey based on CPI Index*

Rate of changes in the consumer price index and indices by main expenditure groups, June 2017 [2003=100]

Main expenditure groups	Weights of main expenditure groups	Monthly rate of change (%)	Rate of change on December of the previous year (%)	Annual rate of change (%)	Rate of change in 12 months moving averages (%)	Index
Turkey	**100.00**	**-0.27**	**5.89**	**10.90**	**9.36**	**309.78**
Food and non-alcoholic beverages	21.77	-1.06	8.91	14.34	9.23	347.81
Alcoholic beverages and tobacco	5.87	0.01	2.40	21.70	22.72	588.70
Clothing and footwear	7.33	-1.25	4.71	3.24	5.58	207.68
Housing, water, electricity, gas and other fuels	14.85	0.31	4.43	7.39	6.85	341.51
Furnishing, household equipment, routine maintenance of the house	7.72	0.48	4.34	6.76	6.40	239.39
Health	2.63	0.17	9.87	12.66	11.41	191.91
Transportation	16.31	-0.84	5.96	14.07	12.52	292.73
Communication	4.12	-0.39	0.87	3.07	3.60	134.05
Recreation and culture	3.62	-0.14	8.03	10.91	6.97	222.40
Education	2.69	1.05	3.70	9.59	9.45	304.47
Hotels, cafes and restaurants	8.05	1.03	5.60	10.26	8.96	457.12
Miscellaneous goods and services	5.04	0.52	7.23	11.84	11.77	374.37

Source: *Turkish Statistical Institute*[2]

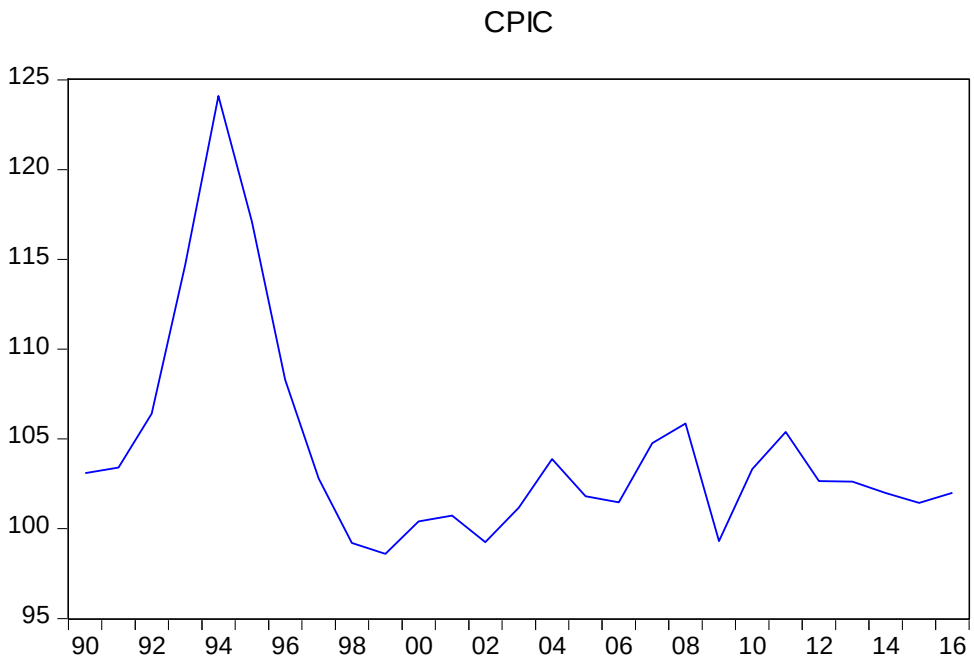
1.3.4 Inflation in China

For the case of China, the People's Bank of China (PBC) is responsible for keeping prices in check. China uses various monetary policy instruments such as repo operations, reserve

[2] See http://www.turkstat.gov.tr/PreHaberBultenleri.do?id=24786 for the breakdown of inflation in Turkey

requirements and ceilings on the interest rate (Berkelmans, Kelly and Sadeghian, 2016). The Graph 2.4 provides an overviews of inflation in China based on the consumer price index. Despite the efforts made by the PBC, inflation in China has been far from stable. From 1992 onwards, China experienced a sharp increase in inflation reaching the peak in 1994 at 21.10%. However, this was followed by a sharp fall in consumer prices reaching a -2.20% in 1999 which is the lowest it has ever been. From 1998 to date, the inflation in China has been fluctuating but the PBC has managed to keep it low at less than 10%.

Graph 2.4. *Inflation in China based on CPI Index*



Source: *Authors computation with data from the World Bank database*[3]

1.4. Exchange rate policies and stock markets in the Turkish and Chinese economy.

In this section, we will look at the exchange rate and stock markets in Turkey and China. As well known, exchange rates are amongst the most volatile macroeconomic variables. They change daily and it's hard to predict their next turn. Also, stock returns tend to be

[3] Graph drawn using Eviews 9

volatile as they are very sensitive to the economic situation and information either good or bad.

1.4.1. Exchange rate policies in Turkey

The Turkish Lira has gone through numerous phases in recent years. Turkey maintains a floating exchange rate regime; in which the forces of demand are allowed to determine the price of the Turkish Lira against the foreign currencies. The foreign exchange demand and supply are determined mainly by fiscal and monetary policies implemented by the Government, the economic situation, expectations and the events in other countries (CBRT, 2016). The Turkish Central Bank does not have an exchange rate target like it does with inflation. However, when the Lira experiences huge appreciation or depreciation, it does take some measures to stabilize it. The recent negative movements in the exchange rate of the Turkish Lira has been a result of the global uncertainty, volatility on expected inflation and prices changes. To curb the situation, the Central Bank of the Republic of Turkey (CBRT) decided to implement a tightening monetary policy. The repo rate increased by 50% whilst the overnight lending rate was raised by 25%. This makes the CBRT lending rate 8.50% and the borrowing rate 7.25%. CBRT does emphasize that based on the price changes, the necessary monetary policies will be implemented (CBRT,2016). From the Graph 2.5, we can see the movements of the Turkish Lira against the dollar for a one year time period. In July of 2016, the Turkish lira was relative doing well against the US dollar. It depreciated at some point at the end of July and the beginning of August. It however recovered and maintained a steady trend at the end of August to September 2016. At the end of September 2016, the lira began depreciating against the dollar at a very high rate. From September 2016 to June 2017 the Turkish lira exchange rate for the dollar has depreciated from TRY/USD 0.33893 to TRY/USD 0.2870.

Graph 2.5. *Exchange rates in Turkey*

Source: *XE Currency Charts: TRY to USD at xe.com* [4]

1.4.2. Exchange Rate Policies in China

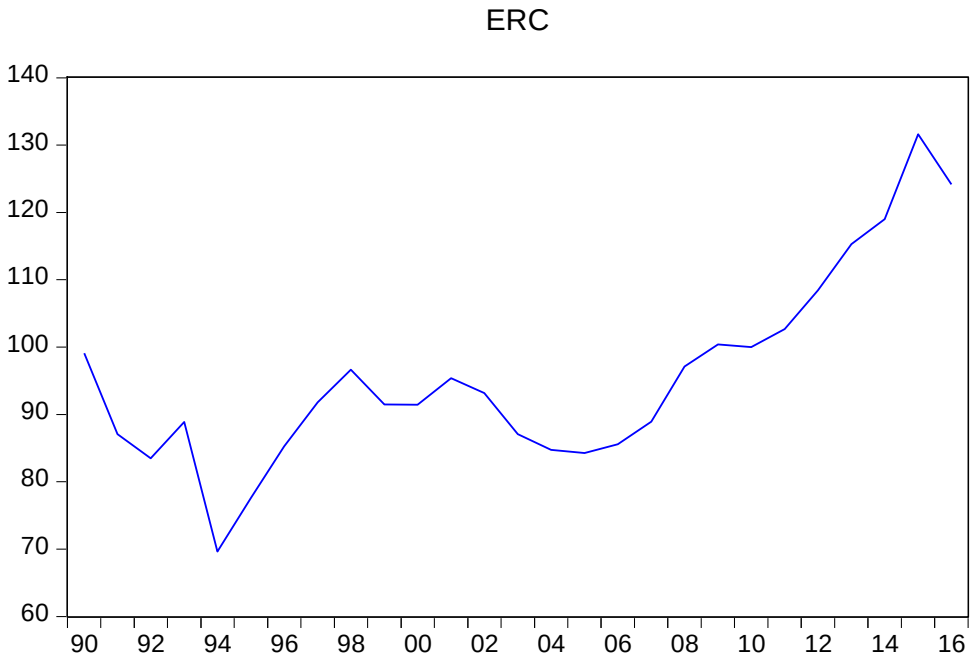
From 1997 to 2005, China operated on pegged exchange rate regime. The Chinese Yuan Renminbi (RMB) was pegged to the US dollar at 8.3 CNY to 1 USD. China has always left the RMB depreciated and many academicians have debated over the years that the low value of the Yuan gives China a trade advantage especially against countries like the USA. In 2005, the Chinese government moves to a slightly liberalized exchange rate regime. They evaluated the RMB and the exchange rate was 8.1 to a US dollar (Das, 2017). The authorities stated that the Yuan will no longer be pegged to the dollar. The exchange rate regime is a managed floating exchange rate(Goujon and Guérineau, 2006). The PBC operated under a trading band between +/-0.3% to +/-2% from 2005 to 2014 (PBC, 2017)

It can be seen from the Graph that from 2005 onwards that the RMB was allowed to fluctuate to some extent and some appreciation were registered against the US dollar during the period. According to the People's Bank of China, the appreciation of the RMB

[4] retrieved from: http://www.xe.com/currencycharts/?from=TRY&to=USD&view=1Y on 20/06/17 at 16:26

against the dollar is partly due to the flexible rule with a control band based market oriented exchange rate regime used by China since 2005. They added that in the first quarter of 2017, the RMB appreciated against the dollar as the US dollar weakened during this period against all the major currencies. From the Graph 2.6, from 2008 to 2016 the Yuan made a significant appreciation against the US dollar. In fact, according to the People's Bank of China after the reforms in exchange rates from a fixed to a managed floating exchange rate in 2005, the RMB has registered a 19.96% appreciation against the US dollar (PBC, 2017).

Graph 2.6. Real effective e*xchange rate of the Chinese Yuan against the US dollar*



Source: *Authors computation with data from the World Bank database*

1.4.3. Stock Market in Turkey and the BIST100

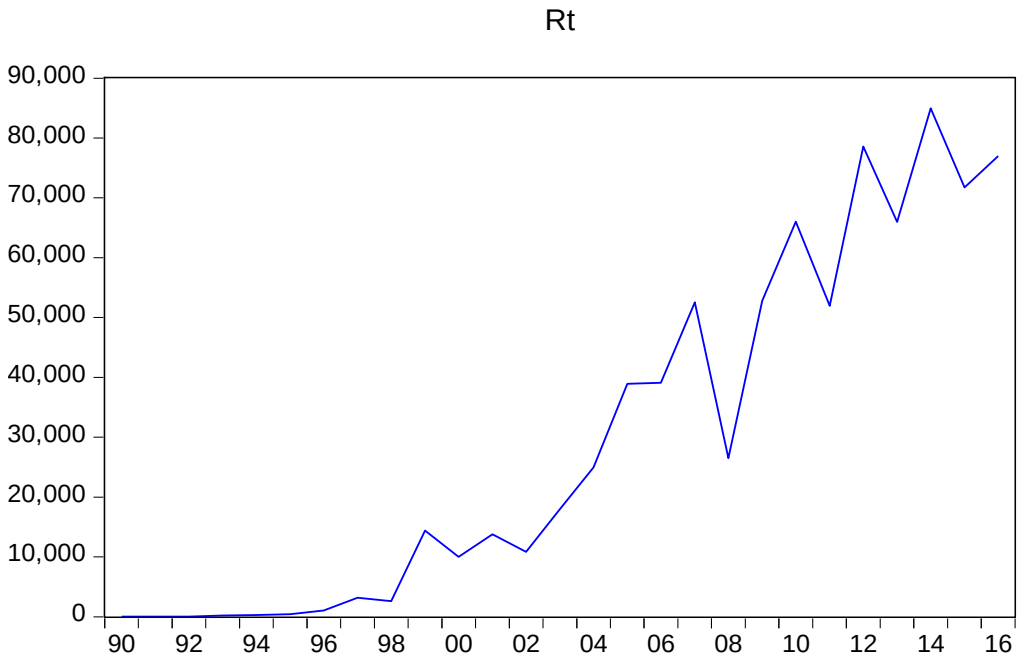
Stock exchange activtites in Turkey begun in the time of the Ottoman Empire. During this time, importance was given to banks and their role in delivering financial activities like stock trading was vital. However, the effects of the World War I negatively affected the development of the capital market of Turkey. In 1960, the capital market started growing and the issuance of stocks by corporation and government increased. The growth

at this point was not significant as a result of the poor regulatory policies and the size of the market as Turkey operated in a closed economy (Chambers, 2006).

In 1980, Turkey transformed into a free, liberal economy and this changed the shape of the capital market. Foreign investors were attracted and the size of the market grew. In 1985, the Istanbul Stock Exchange (ISE) was established. This proved to be the turning point to the history of the capital market of Turkey. The ISE has helped attract foreign capital markets' interest in Turkey and this has made Turkey a significant player in the global capital markets (Chambers, 2006).

Graph 2.7 represents the growth of the Istanbul Stock Exchange National Index (BIST100) and its movements from 1990 to 2016. From 1990 to 1998, the returns on the BIST100 was relatively low. The index was still new. However, the returns started increasing from 1998-1999. The returns seem to have experienced a stagnant growth from 2000 to 2002. Then from 2003 to 2007, the BIST attained significant growth. In fact, from the Graph 2.7 one can say this is the fastest growth the BIST100 has ever attained from 1990 to 2016. In 2008, the growth was affected by the US global financial crises. This can be seen from the Graph 2.7 with a sharp fall. The BIST100 recovered at the end of 2008. Since then it has experienced increased returns followed by fall in returns.

Graph 2.7. *Stock returns in Turkey (BIST100)*



Source: using data from *knoema online database*

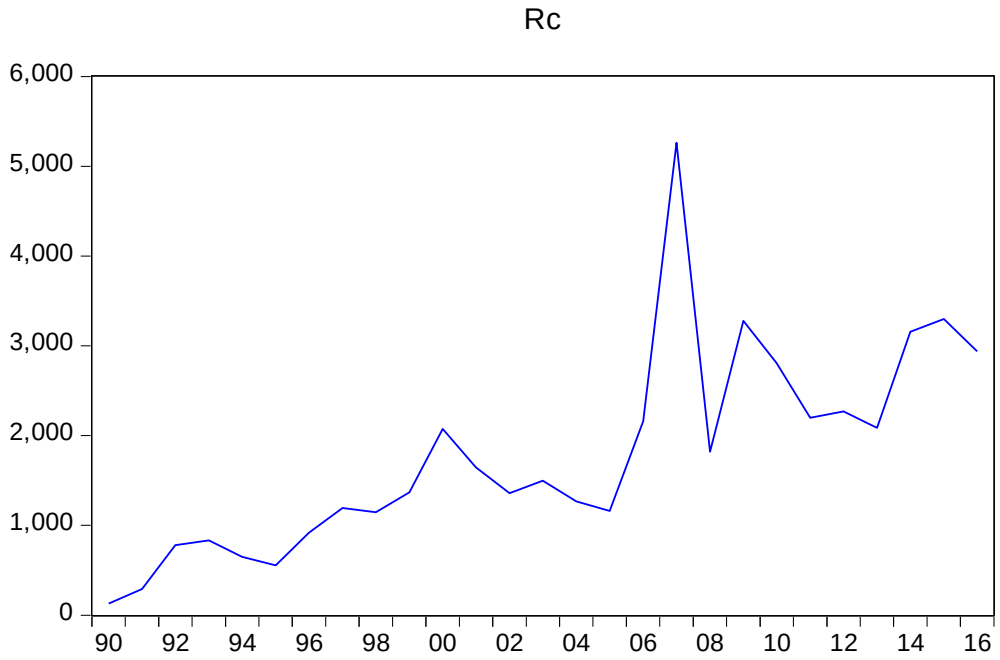
1.4.4. Stock Returns China and Shanghai Stock Exchange Index

Today, China's economy is seen as one of the strongest economies in the World. However, the development of its financial market to the current state has been interesting. In the time of Mao, China's financial market was operated on a one bank system. However, under the management of Deng China transformed to a four bank system with state dominance in the banking sector (Carpenter and Whitelaw, 2017).

China's stock market opened only in 1990. During this time the operations of the stock market were tightly controlled by the government and also most of the trading parties were the privatized government enterprises. The stock market of China was not quite open to the global economy and had huge government control. There were a lot of cases of speculations and scandals. However, in recent years China has seen its GDP growth increase by more than thrice and placing it in the same arena with peers like USA. Its capital market has also grown by more than five times to $7 trillion in 2016 making China's capital market the second largest in the World. After opening up for trade with the rest of the World, China has seen its investment increase to a staggering $3.7 trillion placing it at the top of the chart of the world's largest investor (Carpenter and Whitelaw, 2017).

Graph 2.8 represents the part of the Shanghai Stock Exchange (SSE) over the period 1990-2016. In 1990, after the establishment of the China Stock Market, the SSE took off quite well with significant growth from 1990 to 1992. This was followed by a slight fall in returns from 1993 to 1995. From 1996 to 2000 there was an increase in returns in SSE Index but this was followed by a slight fall in returns from the end of 2000 to 2004. The SSE did magnificently well with returns sky rocketing from 2005 until the US financial crises in 2008. During this the returns plummeted. The markets recovered in 2009 and the SSE also gained from the increase in returns. The recent years have been defined by the increase and fluctuating returns in the SSE.

Graph 2.8. *Stock returns in China (Shanghai Stock Exchange)*



Source: *Author's computation with data from Beijing Guofuruhe Network Technology*

1.5. Objective of our study

The objective of our study is to investigate the nexus between exchange rate volatility and stock returns in Turkey and China. We will consider Stock Returns as our dependent variable. Our explanatory variables will include Real Effective Exchange Rate, Gross Domestic Product(GDP) and Inflation.

1.5.1 Research Questions

1) Does exchange rate volatility have any effect on stock returns in Turkey and China?

2) Does any causality exist between exchange rate volatility and stock returns in Turkey and China?

1.6. Significance of our Study

Our study has the following merits. First, the findings will aid investors in understanding how exchange rates movements in Turkey and China might affect the returns of stock investments. Second, investment bankers and brokers can use the findings of the study to inform their clients on the stock returns and how they are affected by movements by certain macroeconomic variables. Third, policymakers can also use the findings of this study to decide on which precautions, if there is a need, could be further to protect investors from negative effects of exchange rate movements. Finally, given the different conclusions reached on the impact of exchange rate volatility on stock returns, this thesis will provide additional literature on the topic. This may be useful for future researchers on the topic.

CHAPTER TWO

2 LITERATURE REVIEW

2.1 Introduction

In this chapter, we will take a look at the literature on our research topic. First, we will examine some relevant theoretical models and theories. Second, we will summarize some related past empirical works on our topic.

2.2 Theoretical Literature

In studying the relationship between stock prices and exchange rate volatility, we will start by examining the available theoretical literature on the topic. This will give us a clue on the theoretical links between the two prior to check the past empirical studies and examining our data.

Flow Oriented Model

The flow oriented model states that exchange rates affect stock prices. Flow oriented models, first discussed by Dornbusch and Fisher (1980), affirm that currency movement affect international competitiveness and balance of trade position and consequently the real output of the country, which in turn affects current and future cash flows of companies and cause movements in stock prices. Capital flows and its power to determine the competitiveness of firms in the international market is one way that the model explains the relationship between exchange rate and stock prices. When there is an increasing inflow of capital for firms, their profits increase and so does their international position and stock values. In recent years, most firms operate at an international level and offer divergent services. The fluctuation or appreciation and depreciation of currencies affect their performance in different ways depending on whether they are import or export oriented (Mlambo et al.,2013).

When there is a currency appreciation, this might negatively affect exporting firms and benefit importing ones. The appreciation of the local currency given a floating exchange rate regime will make local goods expensive for the international buyers. This will lead them to cut on their demand for the imports. Subsequently, this situation will cause a fall

in international competitiveness and profitability. If profit falls then the domestic stocks will definitely be less attractive and they will gradually fall. This is the account of how an appreciation of the local currency can affect the stock returns of exporting firms. On the other hand, the appreciation of the local currency will positively affect importing firms. This is because an appreciation of the local currency will make the imports cheaper. The reduction in cost as a result of the appreciation of the local currency will lead to increase in sales and profit. The increase in profit will make the importing firms attractive in the domestic market and this will boost the price or returns on their stocks. Equities being part of the wealth may affect the behavior of exchange rate determination Galvin (1989). Similar links can be traced through the portfolio balance model as well Branson (1983).

So one can say, the way exchange rates affect stock returns depends on the sector that the firm operates in. For exporting firms, an appreciation will lead to a negative effect on stock returns. However, for an importing firm, the effect of an appreciation of the local currency has a positive effect on the value of stocks.

Stock Oriented Model

"Stock-oriented" model, which emphasizes the role of capital account transactions stated that the increase in stock return (rising stock market) will attract capital flows which in turn will increase the demand for domestic currency and cause the exchange rate to appreciate (Frankel, 1993). The stock oriented model goes contrary to the flow oriented model in that it put more emphasis on the capital or financial account of a country in explaining the relationship between exchange rate movements and stock prices. The model states that exchange rate is equal to the demand and supply of stocks. So, when there is an increase or decrease or an expected movement in the exchange rates, it has an impact on stock returns. If let's say the Turkish Lira depreciates against the US dollar, this will lead to an increase in the returns on the US dollar. This motivates the rational investor to change his portfolio from the Lira stocks to the US dollar stocks. This phenomenon will eventually lead to a fall in the returns in the Lira stock as a result of the low demand and investors selling it for the US dollar stocks. Hence based on the Stock oriented model, a depreciation of the local currency will have a negative effect on the

stocks quoted in that currency as a result of the fall in the inflow of the capital or the weak financial account (Mlambo et al., 2013).

Portfolio balance theory

The portfolio balance theory is another model that contributed to the relation between exchange rates and stock returns. It states that there is a positive relationship between stock returns and exchange rates. According to Stavárek (2004) the portfolio balance theory holds that there is an internationally diversified portfolio. The role of exchange rate in the market is to bring to equilibrium the demand and supply of local and foreign stocks. Therefore, when the returns on domestic assets increase, their demands increase both in the local and foreign market. At the same time foreign investors will sell their assets for the more attractive local stocks. The model further states that the increase in the returns of domestic stocks will lead to an increase in wealth. This increase in wealth will be followed by an increase in the demand for money. Subsequently, there will be an increase in interest rates in the local market. An increase in interest rates will attract foreign investors to invest in the local market and this will cause an increase in capital inflow. The capital inflow will lead to an appreciation of the local currency. On the other hand, when there is a decrease in stock returns or stock prices, the foreign investors will not be motivated to buy the local stocks. This will provide significant fall in capital inflow. The situation will lead to a depreciation of the local currency.

Ramasamy and Yeung (2005) suggest that the reason for these divergent results is that the nature of the interaction between stock and currency markets is sensitive to the stage of the business cycle and wider economic factors, such as developments or changes in market structures within an economy.

Efficient market Hypothesis

The hypothesis stipulates that the capital markets are efficient and all the price of securities traded reflects the information available. This information can be public or private information. It can include past information on the securities and present information. The efficient market hypothesis is broken into three hypothesis and they entail the weak, the semi strong and the strong. A generation ago, the efficient market

hypothesis was widely accepted by academic financial economists; for example, see Eugene Fama's (1970) influential survey article, "Efficient Capital Markets."

The weak form efficiency refers to the case where security prices reflect past information like prices, trade volume. Since the stock prices only capture historical information it is referred to as the weak form of efficiency (Mlambo et al., 2013).

Another form is the semi strong efficiency. This form refers to a case in which stock prices reflect both historical and publicly available information. Thus this means the semi strong form of efficiency captures the weak form by including historical information. It goes further to capture the publicly available information in its pricing (Mlambo et al., 2013).

The final form is the strong form efficiency. In this form, the stock prices reflect the historical information, the publicly available information and also private information. The private information here is referring to inside information. When prices are in the strong form, there is a zero chance of predicting them (Mlambo et al., 2013).

2.3 Empirical Literature

Introduction

We looked at the theoretical literature in the previous section and found that there were divergent views on the relationship between stock returns and exchange rate volatility. Therefore, we will examine and summarize some relevant empirical work on the relationship between exchange rate, stock returns, GDP and inflation.

Empirical work on the nexus between Stock returns and exchange rate volatility.

Bello (2013) investigated the relationship between exchange rates and stock returns in US market from 2000 to 2012. The study considered the effects of volatility in the Chinese yuan, Japanese yen, Euro and Pound on the stock returns in the US market. The findings showed that the Chinese yuan had a positive effect on U.S stocks.

Mlambo et al. (2013) assessed the impacts of currency volatility on the stock returns in the Johannesburg Stock Exchange market for the period 2000-2010. They used the Generalised Autoregressive Conditional Heteroskedasticity (GARCH) model GARCH (1,1) they established the relationship between exchange rate volatility and the stock market performance. They found that there is a weak relationship between currency volatility and stock market performance.

In another study, Liu and Shrestha (2008) investigate the nexus between Chinese stock market indices and inflation, exchange rate and interest rates. Their study found that there is a long run relationship between stock market indices and the explanatory variables. Furthermore, Inflation, exchange rate and interest rates were found to have a positive effect on the stock market returns in China.

Subair and Salihu (2004) examined the exchange rate volatility and stock market from 1981 to 2007 in Nigeria. The study used a GARCH model to generate exchange rate volatility. The Error Correction Model (ECM) was used to measure the long run and short run effects. The study found that, exchange rates volatility had a significant negative effect on the stock market in Nigeria. Inflation did not have any long run links with the stock markets

Mishra (2004) explored at whether there exists a relationship between stock market returns and foreign exchange markets in India from April 1992 to March 2002. The research questions were answered by using a Granger Causality and Vector Autoregressive (VAR) techniques. The study found no causality between exchange rate and stock returns. The VAR model found that exchange and stock returns are related but no consistent relationship could be found.

Kanas (2000) investigated the interdependence between stock returns and exchange rates in UK, US, Japan, Germany, France and Canada using a bivariate EGARCH model. All the countries examined apart from Germany experienced a volatility spill over from stock returns to exchange rate. However, exchange rate volatility had no effects on stock returns.

Zivkov et al. (2016) examined the linkage between exchange rate and stock returns in European countries. They used a Dynamic Conditional Correlation (DCC) framework to

study the problem. The results imply that there exists a negative correlation between stock returns and exchange rates.

Adjasi et al. (2011) investigated the relationship between stock returns and exchange rate movements in Tunisia, Ghana, Kenya, Mauritius, Nigeria, Egypt and South Africa from 1992 to 2005. The study used Vector Autoregressive (VAR) model approach to study the long run and short run dynamics between exchange rates and stock prices. The finding says that there are a short run and long run relationships between stock prices and exchange rates in Tunisia. Moreover, Ghana, Kenya, Mauritius and Nigeria stock markets experience a fall in stock returns when there is a change in the exchange rate. However, Egypt and South Africa experience an increase in stock returns with a shock in exchange rates.

Nieh and Lee (2002) in their paper on the dynamic relationship between stock prices and exchange rates for G-7 countries found that there is no long run significant relationship between stock prices and exchange rates. However, there exists a short run relationship but lasts only for a day.

Aggarwal (2003) studied exchange rates and stock prices in the US capital markets under a floating exchange rate regime from 1974 to 1978. During the time of the study, stock prices and exchange rate were found to have a positive effect on each other.

Alagidede et al. (2011) studied the relationship between exchange rates and stock returns in Australia, Canada, Japan, Switzerland, and the UK from January 1992 to December 2005. Cointegration and granger Causality approach were used. The cointegration test found no long run relationship between exchange rate and stock prices. There was evidence of causality from exchange rates to stock returns in Canada, Switzerland, and the UK. Stock returns granger causes exchange rates but weakly.

Koulakiotis et al. (2015) explored the impact of stock market news on foreign exchange markets a case of USA, UK and Canada from January 1990 to June 2014 using a cointegration and error correction model. He found that stock markets and exchange rate markets granger cause each other. Moreover, good or bad news impact on stock markets and exchange rate markets significantly in the short run.

Fang (2002) investigated how currency depreciation affects stock returns in the four Asian Tigers from 1997 to 1999. The study found that exchange rate depreciation has adverse effects on stock returns during that period.

Chkili and Nguyen (2014) investigated the relationship between exchange rates and stock returns in Brazil, Russia, India, China and South Africa during low volatility regimes and high volatility regimes. They used a regime-switching model and vector autoregressive (VAR) approaches to study the problem. They found that stock markets have a greater impact on exchange rates than exchange rates have on stock markets. This true both in low volatility and high volatility regimes.

Arfaoui and Ben Rejeb (2015) investigated the interdependence of stock markets and exchange rate markets in the Middle East and North African region from 26, 1999 to June 30, 2014. They found that exchange rates and stock markets in these countries are interdependent as they follow the stock and flow oriented approaches.

Empirical work on the nexus between Stock returns and inflation.

Ratanapakorn and Sharma (2007) examined the long run and the short run dynamic relationship between US stock prices(S&P 500) and macroeconomic variables 1975Q1 to 1999Q4. Their study states that stock prices were positively related to inflation and exchange rates. However, the Granger Causality results shows no sign of exchange rate and inflation short run impact but the long run effects were significant.

Tripathi and Kumar (2014) studied the long run relationship between inflation and stock returns in Brazil, Russia, India, China, and South Africa using a panel data set from March 2000 to September 2013. A negative relationship exists between stock returns and inflation in Russia. In contrast a positive relationship was found for India and China. The cointegration test found no evidence of a long run relationship between stock returns and inflation.

Kuwornu (2011) studied the impact of macroeconomic variables on stock returns from January 1998 to December 2008 using an Ordinary Least Squares (OLS) regression

method. The study concluded that inflation affects stock returns significantly. On the other hand, exchange rates did not have a significant impact on stock returns.

Omran and Pointon (2001) investigated if inflation has any effects on stock returns in the Egypt stock market using an error correction mechanisms (ECM). They found a significant short run and long run relationship between inflation and stock returns.

Katzur and Spierdijk (2013) looked at stock returns and inflation risk considering the statistical and economic evidence. Their study found that there is was substantial evidence to support the claim that inflation has a significant economic impact on stock returns.

Austin and Dutt (2016) investigated if stock returns have the ability to hedge inflation risks in the United States. The study found no evidence that securities such as stocks can hedge inflation.

Albulescu et al. (2017) investigated the relationship between stock prices, inflation and inflation uncertainty in the long run and short run using U.S. sector stock indexes for the 2002M7 - 2015M10. The study found that in the long run inflation and inflation uncertainty affects stock returns negatively. In the short run, inflation uncertainty had a negative effect on stock returns whilst inflation had no effect.

Azar (2013) reported the spurious relationship between inflation uncertainty and stock return in the US. The author noted that individually inflation and inflation uncertainty had a negative effect on stock returns. However, when both variables are included in the regression equation, they both fail to explain the changes in the stock returns.

Engsted and Tanggaard (2002) using a vector-autoregressive (VAR) model investigated the short run and long run relationship between bond returns, stock returns and expected inflation. They examined the US and Danish stock and bond market. US bond and Danish stock returns were found to be closely related to expected inflation in the long run only. Moreover, US stock returns showed a positive relationship with expected inflation.

Boyd (2001) studied the impact of inflation on the financial sector performance. The paper found that there is a significant negative relationship between inflation and stock market performance. As inflation rises the returns of stock market falls.

Kim (2003) studied the causality between stock returns and inflation in Germany from 1970 to 1999. The study found that stock returns and inflation are negatively correlated.

Empirical work on the nexus between Stock returns and GDP.

Pilinkus and Boguslauskas (2009) studied the relationship between stock prices and macroeconomic variables in Lithuania from January 2000 to June 2009 using an impulse response approach to test the short run relationship between the variables. They found that macroeconomic variables play a key role in stock prices movements. GDP had a positive impact on stock prices. However, exchange rates had an inverse relationship with stock prices in Lithuania.

Adam (2015) examined the dynamic relationship between stock returns and economic growth in Indonesia using data from 2004Q1 to 2013Q4. The study used a general univariate causal model to answer the research problem. The study found that a dynamic relationship exists between the stock returns and economic growth. In addition the relationship between them was positive meaning an increase in stock returns will lead to increase in economic growth.

Tursoy and Faisal (2016) studied the dynamic relationship between stock prices and GDP in Turkey from 1989Q2 to 2014Q2 using an autoregressive distributed lag (ARDL) model and error correction framework. There was strong evidence of the existence of a long run relationship between stock prices and economic GDP. Also, GDP and stock returns were found to have a positive relationship. Again, the Granger Causality test showed that there was a bi-directional causality between GDP and stock returns in the long run and a unidirectional causality running from GDP to stock returns in the short run.

Ali et al. (2016) studied the relationship between stock market and economic growth in Tanzania from 2001 to 2011.Their study found no evidence of a linkage between stock market performance and economic growth in Tanzania during the time under study.

Chen et al. (2006) using a threshold vector autoregressive (TVAR) technique measured the dynamic relationship between stock returns and economic growth in Taiwan, Japan, Korea, and Malaysia. They also investigated the causality between economic growth and stock returns. The study found that stock and economic growth are related in the

aforementioned Asian countries. The VAR impulse response found that the market disturbance had a greater shock on economic growth during periods of bad news that times of good news.

Enisan and Olufisayo (2009) in their paper on the market development and economic growth in Sub-Saharan Africa used an autoregressive distributed lag (ARDL) bounds test and Granger Causality approach to measure the dynamic relationship between two variables. The study found that stock market performance has a long run relationship with economic growth in Egypt and South Africa. The Stock market also had a positive effect on economic growth. There was evidence of causality running from the stock market to economic growth in Egypt and South Africa. The VAR method shows a two-way directional causality between economic growth and stock returns for Cote D'Ivoire, Kenya, Morocco and Zimbabwe. The case of Nigeria, the stock market didn't play a significant role in economic growth.

Ikoku (2010) investigated the causal links between economic growth and stock returns in Nigeria from 1984Q1 to 2008Q4 using a Granger Causality approach. The study found that stock returns and economic growth granger cause each other. Also, they are found to be related in the long run according to the cointegration test.

Mauro (2003) in the paper on stock returns and output growth investigated the correlation between economic growth and stock returns. The paper found evidence that a strong correlation exists between stock returns and economic growth in the developed as well as the developing economies. However, the degree of correlation has to with the characteristic of the stock market of a given country.

Duca (2007) inspected the causality between economic growth and stock returns in developed economies the UK, the USA, France and Germany. The study employed a Granger Causality method to answer the research question. The finding of the study shows that there was causality from stock returns to economic growth in all the 3 countries but Germany.

Paramati and Gupta (2013) investigated the short run and long run impacts of stock market performance on economic growth in India from April 1996 to March 2009. They employed a Granger Causality test, Engle-Granger Cointegration test and Error

Correction Model to study the research problem. They found no causality between GDP and Bombay Stock Exchange. However, there was a unidirectional causality from GDP to National Stock Exchange. For the Angel Granger residual cointegration, no long run relationship was found between stock market performance and economic growth. The error correction model signifies that after a disequilibrium, economic growth does make the necessary adjustments to rectify the case.

Rezina et al. (2017) studied the impact of stock market development and its performance on economic growth in Bangladesh from 1994 to 2015. They used a Johansen Cointegration Test and the Granger Causality Test for the study. The finding of the papers showed that stock market performance and stock performance have a long run relationship with economic growth in Bangladesh with the time under study.

Shahbaz et al. (2008) empirically examined the relationship between economic growth and stock market development for developing economies in a case of Pakistan. They employed Angel Granger Causality and Autoregressive Distributed Lag (ARDL) approach to the study. The study found that there is a long run relationship between stock market development and economic growth. Also, from the Granger Causality approach, there exists a long run relationship and economic growth and stock market performance granger cause each other. In the short run, there is a unidirectional causality from stock market performance to economic growth.

Nazir et al. (2010) investigated the stock market development and its relationship with economic growth in Pakistan from 1986 to 2008. Their study found that an increase in the size of the stock market and also enhancement in capitalization can lead to economic growth in emerging economies like Pakistan.

Tsaurai (2016) studied the relationship between stock market development and economic growth in Belgium from 1988 to 2012 using an Autoregressive Distributed lag (ARDL) method. The study found that there is a long run causality from stock market development to economic growth but it was not statistically significant. Also, there was no long run or short run relationship between GDP per capita and stock market capitalization.

Abdelbaki (2013) investigated the relationship between macroeconomic variables and Bahraini stock returns from 1990 to 2007 using an Autoregressive Distributed lag

(ARDL) model. The study found a significant impact of private capital flow and stock market liquidity on economic growth. Therefore, the study does conclude that financial development does have an effect on economic growth.

Conclusion

In this chapter we explored theoretical and empirical studies on our topic. Various findings on the relationship between exchange rate volatility, economic growth, inflation and stock returns were examined. We summarised the results on table 2.2

2.4 **Table 2.2**.*The summery of the empirical literature*

Author(S)	Years of Research	Country/Market	Purpose	Result
Bello(2013)	2000-2012	US market	the relationship between exchange rates and stock returns	findings showed that the Chinese yuan had a positive effect on U.S stocks.
Mlambo et al. (2013)	2000-2010	Johannesburg Stock Exchange market	impacts of currency volatility on the stock returns	a weak relationship between currency volatility and stock market performance has been found.
Liu and Shrestha (2008)	2008	Chinese stock market	the nexus between Chinese stock market indices and inflation, exchange rate and interest rates.	Exchange rate and interest rates were found to have a positive effect on the stock market returns in China.
Mishra (2004)	1992-2002	India	relationship between stock	Exchange and stock returns are related but no

			market returns and foreign exchange markets	consistent relationship could be found.
Kanas (2000)	2000	UK, US, Japan, Germany, France and Canada	interdependence between stock returns and exchange rates	exchange rate volatility had no effects on stock returns.
Adjasi et al. (2011)	1992-2005	Tunisia, Ghana, Kenya, Mauritius, Nigeria, Egypt and South Africa	relationship between stock returns and exchange rate movements	a short run and long run relationships between stock prices and exchange rates in Tunisia. Ghana, Kenya, Mauritius and Nigeria stock markets experience a fall in stock returns when there is a change in the exchange rate. Egypt and South Africa experience an increase in stock returns with a shock in exchange rates.
Alagidede et al. (2011)	1992-2005	Australia, Canada, Japan, Switzerland, and the UK	relationship between exchange rates and stock returns	No long run relationship between exchange rate and stock prices.
Koulakiotis et al. (2015)	1990-2014	USA, UK and Canada	the impact of stock market news on foreign	stock markets and exchange rate markets granger cause each other.

			exchange markets	
Arfaoui and Ben Rejeb (2015)	1999-2014	the Middle East and North African region	the interdependence of stock markets and exchange rate markets	Exchange rates and stock markets in these countries are interdependent
Tripathi and Kumar (2014)	2000-2013	Brazil, Russia, India, China, and South Africa	long run relationship between inflation and stock returns	No evidence of a long run relationship between stock returns and inflation.
Kim (2003)	1970-1999	Germany	causality between stock returns and inflation	Stock returns and inflation are negatively correlated.
Pilinkus and Boguslauskas (2009)	2000-2009	Lithuania	relationship between stock prices and macroeconomic variables.	GDP had a positive impact on stock prices. However, exchange rates had an inverse relationship with stock prices in Lithuania.
Adam (2015)	2004-2013	Indonesia	Relationship between stock returns and economic growth	A positive relationship exists between the stock returns and economic growth.
Paramati and Gupta (2013)	1996-2009	India	impacts of stock market performance on economic growth	No causality between GDP and Bombay Stock Exchange.

Rezina et al. (2017)	1994-2015	Bangladesh	stock market development and its performance on economic growth	stock market performance and stock performance have a long run relationship with economic growth in Bangladesh.
Tsaurai (2016)	1988-2012	Belgium	the relationship between stock market development and economic growth	a long run causality from stock market development to economic growth but it was not statistically significant.
Abdelbaki (2013)	1990-2007	Bahraini	relationship between macroeconomic variables and stock returns.	a significant impact of private capital flow and stock market liquidity on economic growth has been found.

CHAPTER THREE

3 METHODOLOGY

3.1 Introduction

In this chapter, we cover theoretical aspects of the methods we will follow to study our research problem. That is- we explain the unit root testing, the GARCH model, Ordinary Least Squares (OLS) regression methods and Granger Causality method.

3.2 Stationarity Testing

Time series data are characterized by having unit roots. That is the mean of the series and variance change with time. When we have this kind of situation, we say our series have a unit root. In the absence of unit roots, we say our series are stationary. Giving this issues with time series data, we are compelled to examine the series before using them for estimation purposes. One of the issues that using non-stationary time series data causes is spurious regressions. That is regressions with significant test statistics and high R^2 squares but wrong estimates.

There are various methods of testing for stationarity. Some of them are Durbin-Watson (DW) test, Dickey-Fuller test (1979) (DF), Augmented Dickey-Fuller (1981) (ADF) test, Philip-Perron (1988) (PP) test. However, for our study we will consider the Augmented Dickey-Fuller (1981) (ADF) test method. This method is the most commonly used method for testing unit roots.

3.2.1 Augmented Dickey-Fuller (1981) (ADF) test

For our Augmented Dickey-Fuller (1981) (ADF) test we will consider the following three equations. Dickey and Fuller (1979) developed a procedure for testing whether a variable has a unit root or, equivalently, that the variable follows a random walk. We will examine the stationarity whilst we also check for the presence of a trend or an interceptor and the absence of the two in the series.

$$\Delta Y_{t=} \beta Y_{t-1} + \sum_{i=1}^{n} (\gamma_i \Delta Y_{t-1}) + u_t \quad 1.1$$

$$\Delta Y_{t=} \beta_0 + \beta Y_{t-1} + \sum_{i=1}^{n} (\gamma_i \Delta Y_{t-1}) + u_t \quad 1.2$$

$$\Delta Y_{t=} \beta_0 + \beta Y_{t-1} + \beta_2 T + \sum_{i=1}^{n} (\gamma_i \Delta Y_{t-1}) + u_t \quad 1.3$$

The equation 1.1 has no trend and no intercept. Whereas the equation 1.2 has an intercept but no trend. The equation 1.3 has an intercept and a trend.

u_t Represents white noise or error term. $\sum_{i=1}^{n} (\gamma_i \Delta Y_{t-1})$ Represents the sum of the lag changes. This is common between the three equations and it is the only difference between the ADF and the DF. This characteristic of the ADF helps it to solve for any autocorrelation problems that might be present in the series which makes the method superior to many others.

In equation 1.1, 1.2 and 1.3, the unit root will be tested on the β coffiecient.

The null hypothesis will be

$H_0: \beta = 0$

tested against the alternative

$H_1: \beta < 0$

The null hypothesis means there is a unit root. That means if we fail to reject it then our series is not stationary. The alternative hypothesis reads there no unit root which means our series is stationary

We will empirically evaluate our model using annual time series data. Also, we will rely on secondary data for our study. Series from 1980 -2015 will be considered.

Our Models are:

$$RT_t = \beta_0 + \beta_1 EVT_t + \beta_2 GDPT_t + \beta_3 lCPIT_t + \mu_t \quad 1.4$$

$$RC_t = \delta_0 + \delta_1 EVC_t + \delta_2 GDPC_t + \delta_3 lCPIC_t + \varepsilon_t \quad 1.5$$

RT_t Represents Stock Returns in Turkey at time t.

RC_t Represents Stock Returns in China at time t.

EVT_t Represents Exchange Rate Volatility for the Turkish Lira at t.

EVC_t Represents Exchange Rate Volatility for the Chinese Yuan at t.

$GDPT_t$ Represents Gross Domestic Product in Turkey at time period t

$GDPC_t$ Represents Gross Domestic Product in China at time period t

$lCPIT_t$ Inflation at time t Turkey

$lCPIC_t$ Inflation at time t China

μ_t Error term for model 1.4

ε_t Error term for model 1.5

The two economic models are built to investigate the link between exchange rate volatility and stock returns. Equation 1.4 represents the case of Turkey whilst Equation 1.5 represents the case of China.

We will follow the following approach methord to answer our research questions. First, we will use a GARCH model to estimated volatility of exchange rate for the equation 1.4 and 1.5. The GARCH series for volatility will be generated from the real exchange rate variable. Second, we will examine the stationarity of our variables. Then we will estimate the Ordinary Least Squares (OLS) equation to observe the effects of our explanatory variables on stock returns. Third, we will run a Granger Causality estimation to examine the causality between our variables.

3.3 GARCH (1,1)

Exchange volatility means changes or fluctuations in exchange rates. However, volatility by itself is not a variable like the series exchange rate or so. To measure it we have to employ technics that have the capability of capturing changes or volatility. One of the most famous and widely used technics is the GARCH model. The GARCH has been favored by research for its strength in capturing variances in variables. We will therefore employ the GARCH (1,1) model to generate the variable volatility of exchange rates. Subsequently, we will use this variable in our model to estimate its impact on stock returns.

Here is the GARCH (1,1) model

$$\alpha_t^2 = \alpha_0 + \alpha_1 a_{t-1}^2 + \beta_1 \sigma_{t-1}^2, \quad 0 \leq \alpha_1 , \beta_1 \leq 1, (\alpha_1 + \beta_1) < 1.$$

3.4 Ordinary Least Square (OLS) regressions

This method of estimating equations is one of the most famous and preferred one. Prior to moving further, we will examine the assumptions for the OLS methods to be implemented or the qualities that make the techniques preferable to researchers.

3.4.1 Assumptions:

1) The regression entails linear parameters. There is no squares or powers in the equations.
2) The values of the explanatory variables X in the sample do not change in varying samples.
3) The error term or the random disturbance as referred to by some has a zero mean.
4) There is no heteroscedasticity or the variance of our error terms are equal.
5) There is no autocorrelation between our disturbances. That is to say given any two explanatory variables the error terms between them most equal to zero.
6) There should also be zero covariance. Meaning our explanatory variables and the error terms must not be correlated.
7) The number of observations must be more than our estimated parameters.
8) There must be variances in our explanatory variables.

9) The regression model must be correctly specified. There must be no biases or errors in the formulating the model.
10) There should be no perfect multicollinearity. Our explanatory variables must have a perfect linear relationship (Gujarati, 2014).

OLS is said to provide BLUE estimates. That is it gives results that are the best linear unbiased efficient estimates (Greene, 1981). For this reason, we will use this technique to examine the impact of exchange rate volatility on stock returns in China and Turkey. The equations 1.4 and 1.5 will be estimated using the Ordinary Least Squares regression (OLS) method.

3.5 Granger Causality Test

For our paper, we will not just look at the impact of our explanatory variables on our explained variables. We also want to examine the dynamic or causality between our variables. In the OLS technique, we can study how one variable impacts on another, however, we neither see how past situations affect current ones neither do we see the causality between our variables. To this end, we employ Granger Causality method which is a technique capable of analyzing the long run dynamic relationship between our variables. The Granger causality will pair our variables and with the help of the P-values we will be able to tell the direction of the causality if there is any. *Granger causality* is a popular method for studying casual links between random variables (Granger, 1969).

To estimate the causality between our variables, we will consider the following equations 1.6, 1.7, 1.8 and 1.9.

The case of Turkey:

$$RT_t = \sum_{i=1}^{n} \gamma_i \, EVT_{t-i} + \sum_{j=1}^{n} \delta i \, RT_{t-j} + \varepsilon_{1t} \qquad 1.6$$

$$EVT_t = \sum_{i=1}^{n} \rho i \, RT_{t-i} + \sum_{j=1}^{n} \sigma_i \, EVT_{t-j} + \varepsilon_{2t} \qquad 1.7$$

Case of China

$$RC_t = \sum_{i=1}^{n} \partial_i \, EVC_{t-i} + \sum_{j=1}^{n} \alpha i \, RC_{t-j} + \varepsilon_{1t} \qquad 1.8$$

$$EVC_t = \sum_{i=1}^{n} \theta i \, RC_{t-i} + \sum_{j=1}^{n} \pi_i \, EVC_{t-j} + \varepsilon_{2t} \qquad 1.9$$

Equations 1.6 and 1.7 represent the case of Turkey. Whilst equations 1.8 and 1.9 represent the case of China. Equation 1.6 links the present stock returns to the previous stock returns as well as past exchange rate volatility in Turkey. Equation 1.7 relates the current exchange rate volatility to past exchange rate volatility and past stock returns in Turkey. Equation 1.8 models current stock returns in China to past stock returns and past exchange rate volatility in China. Equation 1.9 links current exchange rate volatility in China to past exchange rate volatility and stock returns in China.

We reduced these equations to two variables and leaving out the other variables such GDP, and Inflation so we can explain in a simple way how the Granger causality works.

From the equation 1.6 the γ represents causality running from exchange rate volatility in to Stock returns in Turkey. In the same equation, δ represents the causality running from past stock returns to current stock returns in Turkey. The same interpretation holds for the other equations.

If exchange rate volatility causes stock return then we have a unidirectional causality. However, if at the same time stock returns cause exchange rate volatility then we have a bi-directional causality (Gujarati, 2014).

Prior to estimating the equations 1.6 through 1.9, we must make sure the variables are stationary and the error terms in the causality equations are serially independent .

3.6. Data, Sample Size and Definition of Variables

Our study used secondary data to answer our empirical research question. Data was collected from different sources. From table 3.1 you can find a summary of the variables used, the way they represented in our model, the unit of measurement and where we got it from. For this study we considered a sample from 1990 to 2016 for our series.

Table 3.1.*Name of Variables and data Sources*

Name of Variable	Sign in the Model	Unit of Measurement	Source of Data
Stock Returns(BIST100)	Rt	TRY	knoema Online database
Stock Returns(SSE)	Rc	RMB	Beijing Guofuruhe Network Technology
Gross Domestic Product Turkey	GDPT	GDP (current US$)	World Bank database
Gross Domestic Product China	GDPC	GDP (current US$)	World Bank database
Real Effective Exchange Rate China	EVC	Real effective exchange rate index (2010 = 100)	World Bank database
Effective Exchange Rate Turkey	EVT	(USD) US Dollar (Buying)	Central Bank of the Republic of Turkey
Inflation (Consumer Price Index) Turkey	CPIT	Consumer price index (2010 = 100)	World Bank database
Inflation (Consumer Price Index) China	CPIC	Consumer price index (2010 = 100)	People's Bank of China database

Note: *Table prepared by author*

3.7 Conclusion

In this chapter, we have outlined the procedure and technics we will employ to answer our research questions. We explained the Augment Dickey-Fuller (1981) test for stationarity. Then we moved to how volatility will be measured using a GARCH (1, 1). We went further to look at the OLS regression analysis method for estimating the impact of our dependent variables on stock returns in Turkey and China. We then went on to build our autoregressive dynamic model to measure the causality between our variables.

CHAPTER FOUR

4 EMPIRICAL RESULTS

4.1 Introduction

In this chapter, we will analyze our empirical findings. We will follow the methodology outlined before to do this. Since we are working with two countries for our study, we will treat each one of them separately.

4.2 Empirical Results for Turkey

4.2.1 Introduction

In this section, we will look at some the findings for the case of Turkey. We will perform pre-estimation tests such as Augmented Dickey-Fuller tests and also build the GARCH model and summarize these results. The OLS and Granger Causality results will also be presented in this chapter.

4.2.2 GARCH (1,1) Results

The GARCH (1,1) model is used to measure or generate the volatility of exchange rate, a variable we will use in our model. The First thing we will do is to examine the exchange rate variable for stationary. The GARCH model works with stationary series. To this end, we used ADF testing method and the results are presented in Table 4.1.

Table 4.1. *Unit root tests for Exchange Rate at the level*

Null Hypothesis: ERT has a unit root

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.408336	0.1443
Test critical values:	1% level	-2.656915	
	5% level	-1.954414	
	10% level	-1.609329	

Source: *Author's computation using Eviews 9*

The results from Table 4.1 show that series is not stationary. The null hypothesis is that we have a unit root and the alternative hypothesis is the absence of a unit root. To determine whether to reject the null hypothesis or not we will consider the probabilities 1% and 5%. If the generated P-value from the ADF test is less than 5%, we will reject the null hypothesis and conclude that our variables are stationary. Otherwise, we don't have enough evidence to reject the null hypothesis and the variables have a unit root. Since from the ADF test at the level of the series there was a unit root, we therefore, take the first difference of the variables and test for the unit root. The results are presented in Table 4.2.

Table 4.2. *Unit root test for Exchange Rate at 1st Difference*

Null Hypothesis: D(ERT) has a unit root

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		**-4.099979**	**0.0002**
Test critical values:	1% level	-2.660720	
	5% level	-1.955020	
	10% level	-1.609070	

Source: *Author's computation using Eview 9*

From Table 4.2, we see that the probability of the ADF test (0.0002) is less than 1%.We therefore reject the null hypothesis and conclude that the variable exchange rate is stationary at the first difference.

Since the exchange rate is stationary, we can now estimate the volatility of exchange rate using the GARCH model. The results of the test are found in Table 4.3.

Table 4.3. *GARCH (1,1) results*

Method: ML ARCH
Sample: 1990 2016
GARCH = C(2) + C(3)*RESID(-1)^2 + C(4)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	13602.35	23353.32	0.582459	0.5603
Variance Equation				
C	3.26E+08	5.67E+08	0.575396	0.5650
RESID(-1)^2	0.620416	0.199289	3.113145	0.0019
GARCH(-1)	0.447663	0.064097	6.984112	0.0000
R-squared	-0.263878	Mean dependent var		269899.3
Adjusted R-squared	-0.263878	S.D. dependent var		508436.8
S.E. of regression	571596.5	Akaike info criterion		27.39512
Sum squared resid	8.49E+12	Schwarz criterion		27.58710
Log likelihood	-365.8342	Hannan-Quinn criter.		27.45221
Durbin-Watson stat	0.300707			

Source: *Author's computation using Eview 9*

From the results in Table 4.3, our GARCH coefficient and Squared Residuals of the first difference are significant at 1%. We therefore, generate the GARCH volatility series.

4.2.3 Unit Root Test results for Turkey

To be able to use our series for OLS and Granger causality estimations, we ought to check the stationary and level of integration. The results of the ADF test for the case of Turkey is presented in Table 4.4.

Table 4.4. *Unit root test results for Turkey*

Variable	ADF Test Statistics	P-value	Order of Integration
Stock Returns Turkey	-4.002309	0.0216**ct	I(0)
Exchange Rate Volatility	-2.915483	0.0583**	I(0)
GDP	6.833074	0.0003***	I(0)
Inflation	-3.591451	0.0139***c	I(0)

*** means significant at 1%. **means significance at 5%. The t represents the presence of a trend whilst the c represents a constant.

Source: *Author's computation using Eviews 9*

The null hypothesis says that our variables have a unit root and the alternative holds the opposite. From the table 4.4, we see that all our variables are stationary at the level. They are all integrated with the other I(0). Therefore, we can use the for OLS and Granger causality for estimation purposes.

4.2.4 OLS Regression Results for Turkey

Table 4.5. *Ordinary Least Squares regression results for Turkey*

Dependent Variable: RT

Method: Least Squares

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-29898.73	8883.840	-3.365518	0.0029
EVT	1.43E-07	8.43E-08	1.697416	0.1044

GDPT	1.07E-07	1.43E-08	7.425498	0.0000
LCPIT	355.4651	1789.191	0.198674	0.8444

R-squared	0.898767	Mean dependent var	32231.29
Adjusted R-squared	0.884305	S.D. dependent var	29420.38
S.E. of regression	10007.05	Akaike info criterion	21.40561
Sum squared resid	2.10E+09	Schwarz criterion	21.60063
Log likelihood	-263.5702	Hannan-Quinn criter.	21.45970
F-statistic	62.14719	Durbin-Watson stat	2.629816
Prob(F-statistic)	0.000000		

Source: *Author's computation using Eviews 9*

Table 4.5 shows regression results of our OLS equation for Turkey. The results implied that exchange rate volatility has a positive impact on stock returns in Turkey within the time frame under study. A one unit exchange rate volatility will lead to a 0.0000000143 unit increase in stock returns. However, the P-value (0.1044) is greater than 0.05 and therefore we do not reject the null hypothesis and conclude that exchange rate volatility does not have a statistically significant impact on stock return in Turkey.

GDP had a positive impact on stock returns. The results from OLS showed that a 1 unit growth in GDP will lead to an increase of stock returns by 0.000000107. The p-value of the coefficient of GDP (0.0000) is highly significant. Therefore, we conclude that economic growth in Turkey had a significant positive impact on stock returns.

Inflation which is measured by consumer price index had a positive relation between stock returns in Turkey. A one percent increase in Inflation will lead to a (355.4651) unit increase in stock returns. The p-value of the coefficient (0.8444) is not significant even at the 10% level. Therefore, we conclude that inflation did not have an impact on stock returns in Turkey based on the OLS results.

The F-statistics which is a test for joint significance is 62.14719 and has a p-value of (0.0000). These results confirm that combined, our variables are significant and have an impact on stock returns. The P-value is highly significant even at 1% level.

The R-squared is another important component of an OLS regression equation. It is a measure of goodness of fit. That is, how well do our explanatory variables explain the changes in our dependent variable. In the case of the OLS equation of Turkey, (0.898767) approximately 90 percent changes in stock returns in Turkey is explained by our explanatory variables. This is very high and it shows that our model is correctly specified as the included variables are relevant.

4.2.5 Granger Causality Test for Turkey

Table 4.6. *Granger Causality test results Turkey*

Pairwise Granger Causality Tests

Date: 06/20/17 Time: 15:28

Sample: 1990 2016

Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
EVT does not Granger Cause RT	23	3.56815	**0.0495**
RT does not Granger Cause EVT		0.08588	0.9181
GDPT does not Granger Cause RT	25	3.96206	**0.0355**
RT does not Granger Cause GDPT		2.99513	**0.0728**
LCPIT does not Granger Cause RT	25	3.17983	**0.0632**
RT does not Granger Cause LCPIT		0.34998	0.7089
GDPT does not Granger Cause EVT	23	0.18840	0.8299
EVT does not Granger Cause GDPT		1.40461	0.2711
LCPIT does not Granger Cause EVT	23	0.60154	0.5586
EVT does not Granger Cause LCPIT		0.37463	0.6928
LCPIT does not Granger Cause GDPT	25	4.18000	**0.0304**
GDPT does not Granger Cause LCPIT		0.57864	0.5698

Source: *Author's Computation using Eview9*

Table 4.6 shows results from our estimated Granger Causality equations. The results are paired so we will base our interpretation on the P-values.

For the first pair on Table 4.6, we see the results for the causality between exchange rate volatility and stock returns. Causality runs from exchange rate volatility to stock returns. The P-value is 0.0495 and at 5% we can reject the null hypothesis of no causality. However, there is no causality from stock returns to exchange rate volatility in Turkey as the P-value (0.9181) is not significant even at 10%. We conclude that there is unidirectional causality running from exchange rate volatility to stock returns.

GDP and Stock returns are found to have a unidirectional. The P-value of causality from GDP to stock returns is 0.0355. At 5% level of significance, we reject the null hypothesis of no causality and conclude that GDP in Turkey causes stock returns to change. However, the p-value causality from stock returns to GDP is 0.0728 which at 5% level is not significant.

Inflation was found to not have a significant causality on stock returns during the time under study. The P-value is 0.0632 and at 5% level of significance, we cannot reject the null hypothesis and conclude that there is no causality from inflation to stock returns in Turkey. On the other hand, stock returns did not also have any significant causality on inflation in Turkey. The p-value is 0.7089 and it not statistically significant. We conclude that there is no causality from inflation to stock returns.

The pair GDP and exchange volatility showed no evidence of causality. The p-value of causality from GDP to exchange rate volatility is 0.8299. This is not significant at even 10% level. Therefore, we cannot reject the null hypothesis of no causality from GDP to exchange rate volatility. The same case applies to causality from exchange rate volatility to GDP. The p-value is 0.2711 and even at 10% level we cannot reject the null hypothesis of no causality. Therefore, there is no causality between GDP and exchange rate volatility in Turkey.

Inflation and exchange rate volatility showed no evidence of causality according to the Granger causality results. The causality from inflation to exchange rate volatility had a p-

value of 0.5586 which is not significant at the 5% level. We therefore cannot reject the null hypothesis of no causality. Moreover, the p-value of causality from exchange rate volatility to inflation (0.6928) is statistically insignificant. We therefore conclude that there is no causality between exchange rate volatility and inflation in Turkey.

According to the Granger causality test results, inflation had a significant causality on GDP in Turkey. The p-value of causality from inflation to GDP is 0.0304. This is statistically significant at 5% level. There was no evidence of causality from GDP to inflation. The p-value is 0.5698 and at 5% level, we cannot reject the null hypothesis of no causality. This means there is a unidirectional causality running from inflation to GDP in Turkey.

4.2.6 Conclusion

In this section of the empirical analysis, we looked at the stationarity, OLS and Granger causality results of Turkey. In the next section we will consider the case of China.

4.3 Empirical Results of China

4.3.1 Introduction

In this section, we will analyze the empirical results of the case of China. We will examine the GARCH, Unit root test, OLS and Granger Causality test results.

4.3.2 GARCH (1,1) Results

Since GARCH models require variables be stationary, we examine the exchange rate variable for China prior to estimating the GARCH. The results are summarized in Table 4.7 and 4.8.

Table 4.7. *ADF unit root test at level for Exchange rate China at level*

ADF China ERC Nb. Has trend and intercept

Null Hypothesis: ERC has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		**-2.508153**	**0.3218**
Test critical values:	1% level	-4.356068	
	5% level	-3.595026	
	10% level	-3.233456	

*MacKinnon (1996) one-sided p-values.

Source: **Source:** *Author's Computation using Eview9*

The ADF test results for exchange rate variable for China showed that the variable has a unit root. The p-value is 0.3218 which is greater than even the 5% level of significance. We therefore proceed and take the first difference of the variable.

Table 4.8. *ADF Unit Root Test for Exchange in China at first difference*

Null Hypothesis: D(ERC) has a unit root

Exogenous: None

Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		**-5.120823**	**0.0000**
Test critical values:	1% level	-2.660720	
	5% level	-1.955020	
	10% level	-1.609070	

*MacKinnon (1996) one-sided p-values.

Source: Author's Computation using Eview9

The Exchange rate variable was found to be stationary at the first difference. The ADF p-value is 0.0000 which is significant even at 1% level. We therefore reject the null hypothesis and conclude that exchange rate is stationary at the first difference. The first differenced exchange rate series will be used to estimate the GARCH model.

Table 4.9: *GARCH(1,1) Exchange rate volatility China*

Dependent Variable: ERC
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 06/20/17 Time: 14:18
Sample (adjusted): 1991 2016
Included observations: 26 after adjustments
Failure to improve likelihood (non-zero gradients) after 236 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-208.2637	5700.528	-0.036534	0.9709
AR(1)	1.007584	0.145668	6.917010	0.0000
Variance Equation				
C	1.750340	0.911203	1.920911	0.0547
RESID(-1)^2	-0.333165	0.008673	-38.41195	0.0000
GARCH(-1)	1.292235	0.002684	481.3825	0.0000

R-squared	0.756472	Mean dependent var	95.42930
Adjusted R-squared	0.746325	S.D. dependent var	14.42189
S.E. of regression	7.263745	Akaike info criterion	6.542894
Sum squared resid	1266.288	Schwarz criterion	6.784836
Log likelihood	-80.05762	Hannan-Quinn criter.	6.612565

Durbin-Watson stat	1.826638
Inverted AR Roots	1.01
	Estimated AR process is nonstationary

Source: *Author's Computation using Eviews 9*

The estimated GARCH (1,1) is shown in Table 4.9. From this GARCH results, the volatility of exchange rate is estimated.

The results of the exchange rate volatility measured from the GARCH(1,1) model will be used in the estimated stock returns model.

4.3.3 Unit Root Test results for China

Table 4.10. Unit root test rest for China

Variable	ADF Test Statistics	P-value	Order of Integration
Stock Return China	-4.925239	0.0028***ct	I(0)
Exchange Rate Volatility	-2.913933	0.0579**c	I(0)
GDP	-4.614068	0.0401**c	I(0)
Inflation	-3.518692	0.0015***ct	I(0)

*** means significant at 1%. ** means significance at 5%. The t represents the presence of a trend whilst the c represents a constant.

Source: Author's computation using Eviews 9

From the unit root Augmented Dickey-Fuller (ADF) test results in the table 4.10, we see that all the variables are stationary at the level. That is to say, we have all our variables for China integrated at the level. We therefore can use the variables to estimate the regression equation using the OLS method and also estimate causality using the granger causality approach.

4.3.4 OLS Regression Results for China

Table 4.11. *Ordinary Least Square (OLS) regression results for China*

Dependent Variable: RC

Method: Least Squares

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2470.895	3674.231	0.672493	0.5083
EVC	-8.352620	5.804637	-1.438956	0.1642
GDPC	1.76E-10	4.67E-11	3.777038	0.0010
CPIC	-9.449644	35.84593	-0.263618	0.7945

R-squared	0.502095	Mean dependent var	1846.762
Adjusted R-squared	0.434199	S.D. dependent var	1114.692
S.E. of regression	838.4685	Akaike info criterion	16.44167
Sum squared resid	15466646	Schwarz criterion	16.63522
Log likelihood	-209.7417	Hannan-Quinn criter.	16.49741
F-statistic	7.395048	Durbin-Watson stat	1.881378
Prob(F-statistic)	0.001329		

Source: *Author's computation using Eviews 9*

The OLS results from Table 4.11imply that exchange volatility had a negative impact on stock returns. A one unit exchange rate volatility will reduce stock returns by 8.353 points. However, the p-value (0.1642) is not statistically significant at the even 10% level. So we say, the exchange rate volatility did not have a significant impact on stock returns in China under period under study.

Again, GDP had a positive and statistically significant impact on stock returns in China. A one unit GDP growth will lead to a 0.000000000176 unit increase in stock returns. The p-value is 0.0010 which is statistically significant even at the 1% level.

Inflation was found to have a negative impact on stock returns. A one percent increase in inflation will lead a reduction of stock returns by (-9.449644) points. However the impact

of inflation on stock returns is not statistically significant. The p-value is 0.7945, even at 5% level we cannot reject the null hypothesis. Therefore, we conclude that inflation does not have a statistically significant impact on stock returns in China.

The joint significance test, F-statistics, which measures the impact of all our explanatory variables on stock returns was found to be statistically significant. The p-value is (0.001329) and the coefficient of the F-statistics is 7.395048. Therefore we can reject the null hypothesis and accept the alternative hypothesis that our explanatory have a significant impact on stock returns.

As a test for goodness of fit, we examine the R-Squared which is a coefficient that shows how much the changes in our dependent variable is explained by changes in the explanatory variables. The R-square for the China OLS regression results is 0.50. This means 50% changes in stock returns is explained by changes in our explanatory variables. The R-Squared value is not very high. However, the F-statistics proved that our explanatory variables are significant. Moreover, one can say other variables that are not included in our OLS regression might also have an impact on stock returns in China during the period under study.

4.3.5 Granger Causality Test for China

Table 4.12. Granger Causality test results for China

Pairwise Granger Causality Tests
Date: 06/20/17 Time: 15:24
Sample: 1990 2016
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
EVC does not Granger Cause RC	24	0.79889	0.4644
RC does not Granger Cause EVC		0.18001	0.8367
GDPC does not Granger Cause RC	25	1.22600	0.3146
RC does not Granger Cause GDPC		4.95651	**0.0179**

LCPIC does not Granger Cause RC	25	1.31544	0.2906
RC does not Granger Cause LCPIC		5.19110	**0.0153**
GDPC does not Granger Cause EVC	24	0.26014	0.7736
EVC does not Granger Cause GDPC		0.54074	0.5910
LCPIC does not Granger Cause EVC	24	2.41771	0.1160
EVC does not Granger Cause LCPIC		5.12569	**0.0166**
LCPIC does not Granger Cause GDPC	25	0.44107	0.6495
GDPC does not Granger Cause LCPIC		1.87378	0.1795

Source: Author's computation using Eview 9

Table 4.12 shows results of granger causality test results for the case of China. For the pair exchange rate volatility and stock returns, there was no evidence of causality between the two. The p-value of causality from exchange rate volatility to stock returns is 0.4644. This is not statistically significant even at the 5% level. We therefore say there is no causality from exchange rate volatility to stock returns in China. The p-value of the causality from stock returns to exchange rate volatility is 0.8367. Also, this is not significant even at 5% level. Therefore, we conclude that there is no causality between exchange rate volatility and stock returns in China.

GDP did not have any causality on stock returns. The p-value is 0.3146 and at 5% level we cannot reject the null hypothesis of no causality from GDP to stock returns in China. On the other hand, stock returns appeared to cause GDP. The p-value 0.0179 is statistically significant and at 1% level we can reject the null hypothesis of no causality and say that stock returns cause GDP. There is therefore a unidirectional causality running from stock returns to GDP.

The causality between inflation and stock returns seems to be a unidirectional causality. The inflation didn't have a significant causality on stock returns. The p-value is (0.2906) and that 5% level of significance, we cannot reject the null hypothesis. That is- inflation does not Granger-cause stock returns. However, the causality from stock returns to

inflation was significant. The p-value is 0.0153 and even at 1% level we reject the null hypothesis of no causality and conclude that stock returns have a causality on inflation in China.

The granger causality results for China found no evidence of causality between GDP and exchange rate volatility at the time under study. The p-value of causality from GDP to exchange rate volatility is 0.7736. This is not statistically significant. Also, the p-value of causality from exchange rate volatility to GDP is 0.5910. This also is not statistically significant even at 5% level. So for the case of China, there is no granger causality between GDP and exchange rate volatility.

There was no evidence that inflation causes exchange rates to fluctuate. The p-value of causality from inflation to exchange rate volatility is (0.1160) this not statistically significant even at 10% level. On the hand, there is causality from exchange rate volatility to inflation. The p-value is 0.0166 which is statistically significant at 5% level. Therefore, we conclude that there is unidirectional causality between inflation and exchange rate volatility and it runs from exchange rate volatility to inflation.

In the case of causality between inflation and GDP in China, the Granger causality test found no evidence of causality. The p-value for causality from inflation to GDP is 0.6495. We cannot reject the null hypothesis even at 5% level. Therefore, we say inflation does not granger cause GDP in China. The same applies to causality from GDP to inflation. The p-value is 0.1795 and statistically it is not significant. We then conclude that for the case of China, inflation and GDP do not granger cause each other.

4.3.6 Conclusion

In this section, we looked at the empirical evidence of China. The GARCH(1,1) was employed for volatility and then the OLS used for measuring the regression equation. The Granger Causality was finally employed to measure causality between our variables.

4.4 Conclusion

This chapter presented at the empirical results for our study. The research question was answered using econometric models and techniques. The case of Turkey and China were

treated separately for clarity and simplicity purposes. OLS and Granger Causality techniques were employed to answer the research question for both Turkey and China.

CHAPTER FIVE

5 CONCLUSION AND POLICY RECOMMENDATION

5.1 Introduction

The aim of the paper was to empirically study the impact of exchange rate volatility on stock returns in Turkey and China. Secondary data was used for the study and the data was obtained from various sources including the Central Bank of the Republic of Turkey, The People's Bank of China, Knoema online database and the World Bank database. The Augmented Dickey-Fuller (ADF) was used to test for stationarity of the variables. Moreover, the GARCH(1,1) was employed to generate exchange rate volatility variable. The study went further to estimate Ordinary Least Squares (OLS) regression for China and Turkey to capture the impact of exchange rate volatility and other control variables on stock returns. The Granger Causality method was used to examine the causality between our variables for both Turkey and China.

5.2 Summary of the findings

5.2.1 Turkey

According to the OLS results for Turkey, exchange rate volatility had a positive relationship with stock returns. However, its impact was found to be statistically insignificant. On the other hand, GDP had a positive and statistically significant impact on stock returns in Turkey. Inflation measured by consumer prices had a positive but statistically insignificant impact on stock returns.

For the Granger Causality test, there was a unidirectional causality running from exchange rate volatility to stock returns. This makes sense as exchange rate volatility in recent years in Turkey has been high with Lira losing against major currencies.

There was a unidirectional causality between GDP and stock returns. Economic growth granger causes stock returns. No evidence of causality was found from stock returns to GDP. This makes sense theoretically as well as practically. An increase in a country's GDP will mean strong growth and investors will be attracted to such markets. The stock returns increase because of the strong economic performance of Turkey.

Inflation and stock returns had a no causality between them. The increase in prices does not Granger cause stock returns nor does stock returns Granger cause prices to increase.

No evidence of causality was found between GDP and Exchange rate volatility. It can be said that exchange rates do not have a significant long run impact on economic growth of Turkey.

Unidirectional causality was found to run from inflation to GDP. However, GDP did not have significant causality on consumer prices.

5.2.2 China

The OLS results for China indicated a negative impact of exchange rate on stock returns in China. However, the p-value is not statistically significant. GDP has a positive and statistically significant impact on stock returns. This means the economic growth in China can be credited for the increase stock returns according to our study. Inflation had a negative impact on stock returns, but the coefficient was statistically insignificant. The

joint significant test F-statistics was found to be highly significant meaning our explanatory variables combined have a significant impact on stock returns.

According to the Granger Causality test, there is no causality between exchange rate volatility and stock returns in China. China has always been criticized for devaluing the Yuan. However, even with the managed floating exchange rate policy, the Yuan has been stable mostly and the Chinese economy is credited for being the fastest growing and second largest economy in the World. Hence, it makes sense that exchange rate volatility and the stock did not granger cause each other.

There was a unidirectional causality between GDP and stock returns in China. The causality runs from stock returns to GDP. This signifies the importance the Shanghai Stock Exchange has on the economic growth of China.

Moreover, stock returns were found to granger cause inflation, but no causality runs from inflation to stock returns. No causality was found between GDP and Exchange rate volatility.

A unidirectional causality exists between exchange rate volatility and inflation. It runs from exchange rate volatility to inflation. That is to say, exchange rate movements cause consumer prices to change in China but not vice versa.

In the case on causality between inflation and GDP, no evidence was found from the Granger Causality tests of causality. Both of the coefficients were found to be statistically insignificant meaning they do not granger cause each other.

5.3. Policy Recommendations

5.3.1 Turkey

The study recommends that investors when considering in Turkey take into account the movements in the exchange rate as they play a role in stock returns. One of the most important determinants of stock performance is GDP. This is evident from the Granger Causality and OLS results.

5.3.2 China

Investors considering China for investment should not worry about the exchange rate movements. The exchange rate volatility is not a key variable in determining the stock returns in China. China's economic growth is one of the reasons for the performance of the stocks in the SSE. The managed exchange rate policy used by China should be adhered to as it has created an environment with little volatility in the exchange rate and huge benefits to the capital market of China.

5.4. Suggestions for future studies

For future research, we would recommend using daily series so as to be able to capture the day to day movements as exchange rate and stock returns change daily. Also, it will be worthy to capture other control variables such as interest rates and political stability indictors.

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Appendix

A1: ADF Unit Root Test for Exchange Rate at Level Turkey

Level NB: no trend to intercept

Null Hypothesis: ERT has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.408336	0.1443
Test critical values:	1% level	-2.656915	
	5% level	-1.954414	
	10% level	-1.609329	

*MacKinnon (1996) one-sided p-values.

A2: ADF Unit Root Test for Exchange Rate at 1st Difference Turkey

Null Hypothesis: D(ERT) has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		**-4.099979**	**0.0002**
Test critical values:	1% level	-2.660720	
	5% level	-1.955020	
	10% level	-1.609070	

*MacKinnon (1996) one-sided p-values.

A3: GARCH(1,1) Exchange Rate Volatility Turkey

Dependent Variable: ERT
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 06/20/17 Time: 00:01
Sample: 1990 2016
Included observations: 27
Convergence not achieved after 500 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(2) + C(3)*RESID(-1)^2 + C(4)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	13602.35	23353.32	0.582459	0.5603
Variance Equation				
C	3.26E+08	5.67E+08	0.575396	0.5650
RESID(-1)^2	0.620416	0.199289	3.113145	0.0019
GARCH(-1)	0.447663	0.064097	6.984112	0.0000

R-squared	-0.263878	Mean dependent var	269899.3
Adjusted R-squared	-0.263878	S.D. dependent var	508436.8
S.E. of regression	571596.5	Akaike info criterion	27.39512
Sum squared resid	8.49E+12	Schwarz criterion	27.58710
Log likelihood	-365.8342	Hannan-Quinn criter.	27.45221
Durbin-Watson stat	0.300707		

A4: ADF Unit Root Test for Stock returns BİSt100 at level

Stock returns BİSt100 has a trend and an intercept

Null Hypothesis: RT has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		**-4.002309**	**0.0216**
Test critical values:	1% level	-4.356068	
	5% level	-3.595026	
	10% level	-3.233456	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RT)
Method: Least Squares
Date: 06/19/17 Time: 23:42
Sample (adjusted): 1991 2016
Included observations: 26 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RT(-1)	-0.759880	0.189860	-4.002309	0.0006
C	-13733.73	5301.342	-2.590614	**0.0163**
@TREND("1990")	2814.469	708.8455	3.970498	**0.0006**

R-squared	0.416647	Mean dependent var	2958.808
Adjusted R-squared	0.365920	S.D. dependent var	12010.85
S.E. of regression	9564.138	Akaike info criterion	21.27760
Sum squared resid	2.10E+09	Schwarz criterion	21.42276
Log likelihood	-273.6087	Hannan-Quinn criter.	21.31940
F-statistic	8.213609	Durbin-Watson stat	2.339835
Prob(F-statistic)	0.002033		

A5: ADF Unit Root test for CPI Turkey at level

CPI Turkey: Has an intercept and stationary at the level.

Null Hypothesis: LCPIT has a unit root
Exogenous: Constant
Lag Length: 2 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		**-3.591451**	**0.0139**
Test critical values:	1% level	-3.737853	
	5% level	-2.991878	
	10% level	-2.635542	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LCPIT)
Method: Least Squares
Date: 06/19/17 Time: 23:45
Sample (adjusted): 1993 2016
Included observations: 24 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LCPIT(-1)	-0.042070	0.011714	-3.591451	0.0018
D(LCPIT(-1))	0.579456	0.207298	2.795282	0.0112
D(LCPIT(-2))	0.062183	0.175638	0.354042	0.7270
C	0.214058	0.063773	**3.356583**	**0.0031**

R-squared	0.949982	Mean dependent var	0.280121
Adjusted R-squared	0.942479	S.D. dependent var	0.238984
S.E. of regression	0.057317	Akaike info criterion	-2.729428
Sum squared resid	0.065705	Schwarz criterion	-2.533085
Log likelihood	36.75313	Hannan-Quinn criter.	-2.677338
F-statistic	126.6177	Durbin-Watson stat	2.153544
Prob(F-statistic)	0.000000		

growth Turkey at level: none

A6: ADF Unit Root Test for GDP Turkey at Level

GDP stationary at level

Null Hypothesis: GDPT has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 10 (Automatic - based on HQ, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.833074	0.0003
Test critical values:	1% level	-4.667883	
	5% level	-3.733200	
	10% level	-3.310349	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations
and may not be accurate for a sample size of 16

A7: ADF Unit Root Test for Exchange rate volatility Turkey at level

Null Hypothesis: EVT has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on HQ, maxlag=5)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.915483	0.0583
Test critical values:	1% level	-3.737853	
	5% level	-2.991878	
	10% level	-2.635542	

*MacKinnon (1996) one-sided p-values.

A8: OLS results for Turkey

Dependent Variable: RT
Method: Least Squares
Date: 06/20/17 Time: 15:30
Sample (adjusted): 1992 2016
Included observations: 25 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-29898.73	8883.840	-3.365518	0.0029
EVT	1.43E-07	8.43E-08	1.697416	0.1044
GDPT	1.07E-07	1.43E-08	7.425498	0.0000
LCPIT	355.4651	1789.191	0.198674	0.8444

R-squared	0.898767	Mean dependent var	32231.29
Adjusted R-squared	0.884305	S.D. dependent var	29420.38
S.E. of regression	10007.05	Akaike info criterion	21.40561
Sum squared resid	2.10E+09	Schwarz criterion	21.60063
Log likelihood	-263.5702	Hannan-Quinn criter.	21.45970
F-statistic	62.14719	Durbin-Watson stat	2.629816
Prob(F-statistic)	0.000000		

A9: Granger causality Results for Turkey

Pairwise Granger Causality Tests
Date: 06/20/17 Time: 15:28
Sample: 1990 2016
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
EVT does not Granger Cause RT	23	3.56815	0.0495
RT does not Granger Cause EVT		0.08588	0.9181
GDPT does not Granger Cause RT	25	3.96206	0.0355
RT does not Granger Cause GDPT		2.99513	0.0728
LCPIT does not Granger Cause RT	25	3.17983	0.0632
RT does not Granger Cause LCPIT		0.34998	0.7089
GDPT does not Granger Cause EVT	23	0.18840	0.8299
EVT does not Granger Cause GDPT		1.40461	0.2711
LCPIT does not Granger Cause EVT	23	0.60154	0.5586
EVT does not Granger Cause LCPIT		0.37463	0.6928
LCPIT does not Granger Cause GDPT	25	4.18000	0.0304
GDPT does not Granger Cause LCPIT		0.57864	0.5698

A10: ADF Unit Root Test for Exchange rate at level China

ADF China ERC Nb. Has trend and intercept

Null Hypothesis: ERC has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		**-2.508153**	**0.3218**
Test critical values:	1% level	-4.356068	
	5% level	-3.595026	
	10% level	-3.233456	

*MacKinnon (1996) one-sided p-values.

A11: ADF Unit Root Test for Exchange rate at 1st Difference China

ERC 1st difference. Note: no trend to intercept

Null Hypothesis: D(ERC) has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		**-5.120823**	**0.0000**
Test critical values:	1% level	-2.660720	
	5% level	-1.955020	
	10% level	-1.609070	

*MacKinnon (1996) one-sided p-values.

A12: GARCH(1,1) China

Dependent Variable: ERC
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 06/20/17 Time: 14:18
Sample (adjusted): 1991 2016
Included observations: 26 after adjustments
Failure to improve likelihood (non-zero gradients) after 236 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-208.2637	5700.528	-0.036534	0.9709
AR(1)	1.007584	0.145668	6.917010	0.0000
Variance Equation				
C	1.750340	0.911203	1.920911	0.0547
RESID(-1)^2	-0.333165	0.008673	-38.41195	0.0000
GARCH(-1)	1.292235	0.002684	481.3825	0.0000

R-squared	0.756472	Mean dependent var	95.42930
Adjusted R-squared	0.746325	S.D. dependent var	14.42189
S.E. of regression	7.263745	Akaike info criterion	6.542894
Sum squared resid	1266.288	Schwarz criterion	6.784836
Log likelihood	-80.05762	Hannan-Quinn criter.	6.612565
Durbin-Watson stat	1.826638		

Inverted AR Roots 1.01
Estimated AR process is nonstationary

A13: Unit root test for Exchange rate volatility China at level

Null Hypothesis: EVC has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.913933	0.0579
Test critical values:	1% level	-3.724070	
	5% level	-2.986225	
	10% level	-2.632604	

*MacKinnon (1996) one-sided p-values.

A14: ADF unit root test for SSE returns China at level

Null Hypothesis: RC has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.925239	0.0028
Test critical values:	1% level	-4.356068	
	5% level	-3.595026	
	10% level	-3.233456	

*MacKinnon (1996) one-sided p-values.

A15: ADF unit root test for CPI China at level

Null Hypothesis: LCPIC has a unit root
Exogenous: Constant
Lag Length: 4 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.614068	0.0015
Test critical values:	1% level	-3.769597	
	5% level	-3.004861	
	10% level	-2.642242	

*MacKinnon (1996) one-sided p-values.

A16: ADF unit root test GDP China at level

Null Hypothesis: GDPC has a unit root

Exogenous: Constant

Lag Length: 3 (Automatic - based on AIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.834269	0.0401
Test critical values:	1% level	-3.752946	
	5% level	-2.998064	
	10% level	-2.638752	

*MacKinnon (1996) one-sided p-values.

A17: OLS results for China

Dependent Variable: RC
Method: Least Squares
Date: 06/20/17 Time: 14:23
Sample (adjusted): 1991 2016
Included observations: 26 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2470.895	3674.231	0.672493	0.5083
EVC	-8.352620	5.804637	-1.438956	0.1642
GDPC	1.76E-10	4.67E-11	3.777038	0.0010
CPIC	-9.449644	35.84593	-0.263618	0.7945

R-squared	0.502095	Mean dependent var	1846.762
Adjusted R-squared	0.434199	S.D. dependent var	1114.692
S.E. of regression	838.4685	Akaike info criterion	16.44167
Sum squared resid	15466646	Schwarz criterion	16.63522
Log likelihood	-209.7417	Hannan-Quinn criter.	16.49741
F-statistic	7.395048	Durbin-Watson stat	1.881378
Prob(F-statistic)	0.001329		

A18: Granger causality results for China

Pairwise Granger Causality Tests
Date: 06/20/17 Time: 15:24
Sample: 1990 2016
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
EVC does not Granger Cause RC	24	0.79889	0.4644
RC does not Granger Cause EVC		0.18001	0.8367
GDPC does not Granger Cause RC	25	1.22600	0.3146
RC does not Granger Cause GDPC		4.95651	**0.0179**
LCPIC does not Granger Cause RC	25	1.31544	0.2906
RC does not Granger Cause LCPIC		5.19110	**0.0153**
GDPC does not Granger Cause EVC	24	0.26014	0.7736
EVC does not Granger Cause GDPC		0.54074	0.5910
LCPIC does not Granger Cause EVC	24	2.41771	0.1160
EVC does not Granger Cause LCPIC		5.12569	**0.0166**
LCPIC does not Granger Cause GDPC	25	0.44107	0.6495
GDPC does not Granger Cause LCPIC		1.87378	0.1795

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