THE RELATIONSHIP BETWEEN MONETARY POLICY AND STOCK PRICES UNDER INFLATION TARGETING REGIME

SUBMITTED FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

Albina Hysaj

Eskişehir, 2019

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Department of Business Administration
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Eskişehir
Anadolu University
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This thesis titled "**The Relationship Between Monetary Policy and Stock Prices Under Inflation Targeting Regime**" has been prepared and submitted by **Albina HYSAJ** in partial fullfillment of the requirements in "Anadolu University Directive on Graduate Education and Examination" for the PhD. **Department of Business Admistration Program in Finance** has been examined and approved on 11/10/2019.

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ABSTRACT
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Prof. Dr. Güven Sevil

Monetary authorities use monetary policy to achieve their objectives. Keeping inflation stable, at low levels is the main objective of central banks. While central banks use monetary policy to control inflation, its decisions also impact the overall economy and financial market. The aim of this research is to investigate the relationship of monetary policy with stock prices in countries that have implemented inflation targeting, by dividing the chosen countries in two groups, emerging and developed market economies.

This research is organized in four chapters. The first chapter is a theoretical background about the aims, objectives, instruments, and decisions of monetary policy. In the second chapter, we use ARDL Bound testing approach to investigate the relationship between inflation and stock prices. By analyzing monthly data, we conclude that there is a negative long-run relationship among variables, although the rate of inflation is not a significant determinant of stock prices.

In the third chapter, we use GARCH(1:1) and ARDL Bound testing approach to analyze the relationship between short term interest rate and stock prices. The results show that in all developed markets there is a negative long-run relationship between the short-term interest rate and stock prices. Regarding emerging market economies, this relationship is negative in countries where inflation target is achieved, and positive in countries where is not achieved.

In the last chapter, we analyze daily data of stock indices and S&P1200 Global index by using Johansson Cointegration, Gregory-Hansen, and a simple version of CAPM to investigate the long-run and short-run diversification opportunities. Our results suggest that

stock markets are cointegrated in long run however in short run investors may benefit by investing in stock markets of Mexico, Brazil, Canada, Chile, Iceland, Israel, and UK.

Keywords: monetary policy, inflation targeting, stock prices, diversification

ÖZET

Doktora Tezi

ENFLASYON HEDEFLEMESİ ÇERÇEVESİNDE
PARA POLİTİKASI VE PAY SENEDİ FIYATLARI ARASINDAKİ İLİŞKİ

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Danışman: Prof. Dr. Güven SEVİL

Her ülkenin parasal yetkilileri makroekonomik değişkenlere ilişkin kendi hedeflerine ulaşmak için para politikasını kullanmaktadır. Enflasyon oranının istikrarlı, düşük seviyelerde tutulması tüm merkez bankalarının temel amacıdır. Merkez bankası, enflasyon oranını kontrol etmek için para politikasını kullanırken, kararları genel ekonomiyi ve mali piyasaları da etkilemektedir. Bu araştırmanın amacı, belirlenen ülkeleri, gelişmekte olan ve gelişmiş piyasa ekonomileri olmak üzere iki ana gruba ayırarak, enflasyon hedeflemesi rejimi uygulamış olan ülkelerde para politikası ile pay senedi fiyatları arasındaki ilişkiyi araştırmaktır.

Bu araştırma dört bölümden oluşmakta olup, ilk bölümde, amaç, hedef, araçlar ve para politikası kararlarının teorik arka planı tanıtılmıştır. İkinci bölümde enflasyon ve pay senedi fiyatları arasındaki ilişkiyi araştırmak için ARDL Sınır Testi Yaklaşımı kullanılmıştır. Aylık veriler analiz edildiğinde, enflasyon oranı pay senedi fiyatları için önemli bir belirleyici olmasa da bu iki değişken arasında negatif uzun dönemli bir ilişki olduğu sonucuna varılmıştır.

Üçüncü bölümde para politikasının bir aracı olan kısa vadeli faiz oranı ile pay senedi fiyatları arasındaki ilişkiyi analiz etmek için GARCH (1:1) ve ARDL Sınır Testi Yaklaşımı kullanılmış ve ampirik sonuçlar, tüm gelişmiş pazar ekonomilerinde kısa vadeli faiz oranı ile pay senedi fiyatları arasında uzun vadeli negatif bir ilişki olduğunu göstermektedir. Gelişmekte olan piyasa ekonomileriyle ile ilgili olarak, bu ilişki enflasyon hedefine ulaşıldığı ülkelerde negatif, enflasyon hedefine ulaşılamayan ülkelerde ise pozitiftir.

Son bölümde tüm ülkeler için pay senedi endeksleri ve S&P1200 Küresel endeksi günlük verileri analiz edilerek, ülkeler arasında uzun vadede ve kısa vadede çeşitlendirme olanaklarını araştırmak için Johansson Co-entegrasyonu, Gregory & Hansen testi ve CAPM modelinin basit bir sürümünü kullanılmıştır. Sonuçlar, borsaların uzun vadede bütünleşik olduğunu göstermektedir. Ancak kısa vadede, yatırımcıların Meksika, Brezilya, Kanada, Şili, İzlanda, İsrail ve İngiltere borsalarına yatırım yaparak fayda sağlayabilecekleri saptanmıştır.

Anahtar Kelimeler: para politikası, enflasyon hedeflemesi, pay senedi fiyatları, çeşitlendirme

.../10/2019

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.

(Signature)
Albina Hysaj

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ABBREVIATION LIST

AD	: Aggregate Demand
ADF	: Augmented Dickey-Fuller
ARCH	: Autoregressive Conditional Heteroscedasticity
ARDL	: Autoregressive Distributed Lag Model
BRICS	: Acronym for the association of five economies: Brazil, Russia, India, China, and South Africa.
CUSUM	: Cumulative Sum
ECB	: European Central Bank
ECM	: Error Correction Model
ECT	: Error Correction Term
FED	: Federal Reserve System
GARCH	: Generalized Autoregressive Conditional Heteroscedasticity
MSCI	: Morgan Stanley Capital International
OECD	: Organization for Economic Co-operation and Development
OLS	: Ordinary Least Square
PP	: Phillips-Perron
REPO	: Repurchase Agreement
UK	: United Kingdom
US	: United States
VAR	: Vector Autoregressive
VECM	: Vector Error Correction Model

1. INTRODUCTION

Monetary policy is the main instrument governments use to ensure financial stability and achieve several objectives expressed in macroeconomic terms (Aziza, 2010). In addition to the direct impact that monetary policy has on macroeconomic variables, it affects stock markets as well (Ioannidis & Kontonikas, 2008). As Gordon Dividend Model[1] calculates the value of stocks as the sum of discounted future dividends, a change in monetary policy will cause the change in discount rates of future inflows of stocks, affecting the future expected earnings and consequently the price of stocks (Sellin, 2001). Due to the significant impact that decisions related to monetary policy and macroeconomic variables have on long-run and short-run financial market performance, markets participants carefully follow the decisions of central banks (Durham, 2003).

European Central Bank and Federal Reserve as the most influential monetary authorities in the international financial system, determine price stability as the primary objective of monetary policy. However, although the objectives of monetary policy may change over time Debortoli & Nunes (2011), some macroeconomic variables such as the level of nominal interest rates, the currency and the average rate of inflation are certainly influenced by the decisions of monetary policies (Niculae, 2013).

Even though, monetary policy is the primary instrument monetary authorities use to control macroeconomic variables, the ability of monetary policy to achieve its objectives has always been an issue of discussion among different scholars. Regardless of the efforts of monetary authorities to reduce inflation by using a contractionary monetary policy latest years, countries such as Turkey, Bangladesh, South Africa, Brazil, Colombia, and Mexico continue to face high inflationary periods[2]. While despite the efforts of monetary authorities, monetary policy cannot achieve its objectives related to inflation, it is important to study stock market reaction toward this situation.

The purpose of this study is to analyze the relationship between monetary policy and stock prices in countries that have implemented inflation targeting regime. Aside from

[1] Also known as Dividend Discount Model, developed by Myron J. Gordon in 1956
[2] World Bank Data

previous studies which investigate the direct effects of monetary policy on stock prices by considering the financial market as part of monetary policy transmission channels, this study examines the relationship of monetary policy with stock prices by evaluating the effectiveness of the monetary policy on inflation. First, we investigate whether central banks have achieved their goal regarding inflation targeting and then we analyze whether the relationship of monetary policy with stock prices is the same in countries where there is a deviation between achieved inflation and the target and in countries where there is not any deviation. The findings of this study might serve as a broad guideline for investors regarding the investment strategies they may follow in order to have a well-diversified portfolio. The objectives of the study are:

1. Analyzing the relationship between monetary policy and stock prices in economies that have implemented the inflation target regime.
2. Analyzing the differences between economies where the target rate of inflation is achieved and those where the target rate of inflation is not achieved.
3. Investigating the factors which affect the effectiveness of the monetary policy on inflation.
4. Developing an investment strategy.

This thesis is organized into three chapters. The first chapter is a theoretical background about the role of monetary policy in controlling macroeconomic variables of a country. In the first chapter, we discuss the objectives of monetary policy and the tools that monetary authorities use to fulfill those objectives. We discuss the transmission channels of monetary policy in order to have a clear view of how the monetary policy is transmitted to the macroeconomic environment and to financial markets. As the main focus of the thesis is monetary policy and its impact on economy and markets, at the end of this chapter we also discuss the implication of monetary policy on economic growth, the interdependence between inflation and economic growth and how inflation targeting regime impacts the performance of the economy in general terms.

In the second chapter, we investigate the relationship of inflation with stock prices in countries that have implemented inflation targeting. There are numerous studies that investigate the relationship between inflation and stock prices. In this study we aim to study

the relationship of monetary policy with stock prices under inflation targeting regime, supposing that this relationship depends on the fact whether inflation target is achieved or not. For this reason, we consider as important to investigate how stock returns react to the changes in the inflation rate.

The third chapter investigates the relationship of monetary policy with stock return volatility and stock return under inflation targeting regimes. In countries such as Turkey, in the last three years, inflation has increased more than twofold, nevertheless the effort of monetary authorities to reduce inflation by increasing the interest rate progressively. In the third chapter, we aim to analyze what happens to stock prices in countries where monetary policy's main focus is achieving a target rate of inflation. We investigate if there is any difference in the relationship between monetary policy and stock return in countries where inflation target is achieved and those where the target is not achieved and try to explain those differences. In the last chapter, we analyze the cointegration relationship between stock markets of countries involved in this research and propose the composition of a diversified portfolio.

The variables we use in this study are the short-term interest rate, the rate of inflation, the target rate of inflation and stock prices index of selected countries. In this research we investigate seventeen countries, eight developed market economies, and nine emerging market economies. Due to the deviation between the target and achieved rate of inflation, developed economies and emerging market economies are separated into two other groups. For each of the groups, we investigate the relationship between monetary policy and stock prices. We compare the results achieved for each group and try to examine the factors which contribute to these results. In the end, after analyzing the co-integration between stock prices of each market by using Johansen co-integration test, Gregory Hansen test and a modified Capital Asset Pricing Model, based on the results of these tests, we propose the composition of a well-diversified portfolio. We use monthly data from January 2002 to December 2017 provided by Thompson Reuters DataStream platform, and other websites with financial and macroeconomic data such as inflation.eu, investing.com.

This study has three major limitations. First, as one of the variables is the rate of inflation and inflation data published by central banks are monthly, the stock return data we use are

monthly as well. Stock return data are characterized by high fluctuations and volatility clustering, meaning that conditional variance is not constant over time. To model time series with such characteristics are used ARCH family models. However as the frequency of stock return data is not daily, our data do not have ARCH effect, thus we use ARDL Bound testing approach. Second, in this analysis not all the countries that have implemented inflation targeting regime are included. Countries such as United Stated, Russia, India, Argentina, Japan have implemented inflation targeting after 2010, meanwhile, we use monthly data from January 2002 until December 2017. Third, even though we investigate the relationship of monetary policy with stock prices, we use only short term interest rate as an instrument of monetary policy and do not include other instruments such as money supply, interest on reserves and so forth.

2. THEORETICAL BACKGROUND

2.1. Introduction

This chapter aims to capture a theoretical background about the role of monetary policy, as an instrument of monetary authorities in controlling macroeconomic and financial variables of one economy. It starts with a brief presentation of monetary policys' aims, objectives, and transmission channels, and continues with a literature review of the relationship between inflation and economic growth, and the impact of inflation targeting regime in overall economic performance.

2.2. Monetary policy objectives and tools

Monetary policy is the main instrument monetary authorities use to control macroeconomic parameters of one economy. There is a compromise between different scholars regarding the role and objectives of monetary policy, but the ability of monetary policy to achieve its objectives remains a central topic of debate among scholars. Keynes, in The General Theory of Employment, Interest, and Money, doubts the ability of monetary policy as an instrument for achieving a number of macroeconomic goals. According to Keynes (1936) even though monetary authorities may follow an expansionary monetary policy by reducing the interest rate, this will not necessarily bring an increase in consumption and investment because there are many other factors that determine investors and consumers decisions. Thus, instead of just relying on monetary policy, Keynes suggests an interaction between monetary and fiscal policy. On the other hand, Friedman (1968) as the main representative of monetarism theory, arguments that the years of the Great Depression in the USA testified once more the power of monetary policy. According to Friedman, the Great Depression did not happen because of the inability of monetary policy to provide economic growth but because monetary policy followed by Federal Reserve was wrong.

Other studies investigate if there is an incoherence between different goals of monetary policy. Rangarajan (1997) discusses that while monetary authorities focus on economic growth and low unemployment, and follow an expansionary monetary policy by decreasing

interest rate, the policy will result in a negative impact on inflation. The author concludes that even though monetary policy seems to have an adverse effect on its different goals however, it is difficult for a country to ensure economic growth if there is no price stability. On the other hand, monetarists argue that there is not any incompatibility between the goals of monetary policy because in long-run monetary policy's decisions affect only inflation and there is just a short-run trade-off between inflation and unemployment (Stein, 1981).

Although, different economic scholars have different views on the ability of monetary policy in achieving a number of objectives, maintaining stable prices and a low unemployment level are the main objectives of monetary policy (Spiegel, 2007). While Bofinger (2001); Handa (2009) determine that the objectives of monetary policy include low unemployment rate or full employment, high output growth rate, a stable price level, low inflation, a stable exchange rate, and so forth. European Central Bank acknowledges price stability as the primary objective of the Eurosystem and of every monetary policy for which it is responsible. ECB aims to maintain a rate of inflation close to 2%. Also, Eurosystem supports all the policies that contribute to achieving other objectives of the Union, as full employment and balanced economic growth.

Federal Reserve defines stable prices, maximum employment, and moderate long-term interest rates as three main objectives of monetary policy. While achieving objectives of monetary policy, Federal Reserve should also consider the indirect impact it has on exchange rates, stock prices and wealth, besides the direct impact it has on interest rates. Those variables also serve as channels of monetary policy in influencing other variables as employment, spending, inflation, production, investment and so forth.

The main instruments that the European Central Bank uses are:

- Open market operations
- Standing facilities
- Reserve requirements

Aside from those instruments FED also use:

- Interest on Required reserved balances and excess balances
- Overnight reverse REPO facility
- Term deposit facility

- Expired Policy Tools

2.3. Monetary policy transmission channels

Monetary policy is a very useful tool for monetary authorities, but a wrong monetary policy would result in a lower overall economic performance (Mishkin, 1995). To avoid the unexpected consequences, monetary authorities should be able to predict the effects of their decisions by having a clear view of the transmission channels of monetary policy. Mishkin (1995) determines four main transmission channels.

- **Interest rate channel**

When monetary authorities follow a contractionary monetary policy by tightening the money supply consequently interest rates will increase. After tightening the money supply, as the amount of money that can be used by the economic agents will be smaller and because in short-run the demand for money will be the same, interest rates will increase. A higher interest rate means a higher cost of capital. Because a higher cost of capital will also have a negative effect on the investment decisions of individuals and companies, the amount of investment will also decrease. As aggregate demand is the sum of consumption, investment, government spending, and net export, declined investment will also result in diminished aggregate demand and a fall in output level. So a contractionary monetary policy, transmitted by interest rate channel will also bring a decline in output level.

$\downarrow M \rightarrow \uparrow i \rightarrow \downarrow I \rightarrow \downarrow AD = C + I + G + NX$

Apart from the negative impact on output level, a contractionary monetary policy will have a positive impact on inflation. Less money in circulation means a more appreciated currency and a lower inflation rate.

$\downarrow M \rightarrow \uparrow i \rightarrow \downarrow \pi_e$

- **Exchange rate channel**

When Monetary authorities follow a contractionary monetary policy, interest rates increase. The increased interest rate will make domestic currency deposits more attractive than deposits denominated in other currencies. By having a higher demand for domestic

money, the currency will appreciate, resulting in an increased exchange rate. Because of the appreciation of the currency, domestic good and services will be relatively more expensive than foreign goods, resulting in a decreased demand for domestic goods. Such a situation will contribute to a decline in net exports and aggregate demand, which means a fall in output level. On the other hand, a stronger currency means a lower rate of inflation.

↓M→↑i→↑E→↓NX→↓AD

↓M→↑i→↑E →↓π_e

- **Other asset price channel**

When monetary policy decreases the money supply, because there is less money in economy, interest rates will increase. With higher interest rates, return on debt securities will be higher compared to the return on other assets. As the return on debt securities is relatively higher, the investors will prefer to invest more in debt securities and less in equities. Lower demand for equities will decrease their price. Lower stock prices mean declined companies' value. As companies will face such a situation, they will cut their investment spendings contributing to diminished aggregate demand and lower level of output. However less money in circulation makes the currency more valuable and decreases inflation.

↓M→↑i→↓I→↓AD

↓M→↑i→↓π_e

- **Credit channel**

When monetary authorities follow a contractionary monetary policy, executed by an increase in interest rates or an increase in required reserve, money supply will also decrease. With less circulating money, the cost of financing will increase resulting in a reduction of investment. Lower investments decrease aggregate demand and output level as well. Even though credit channel, contractionary monetary policy will result in a lower inflation rate.

↓M→↑i→↓I→↓AD

↓M→↑i→↓π_e

A report published by Central Bank of Mexico (2003) analyzes the effects of monetary policy in the economy. According to this report, price stability is the main condition for economic growth; therefore inflation should be the primary goal of monetary policy. Even though monetary policy is a very important tool, it is not able to have a direct influence on prices, because prices are determined by the demand and supply of goods and services. Monetary policy can affect prices only through a process called transmission mechanism shown in Figure 2.1.

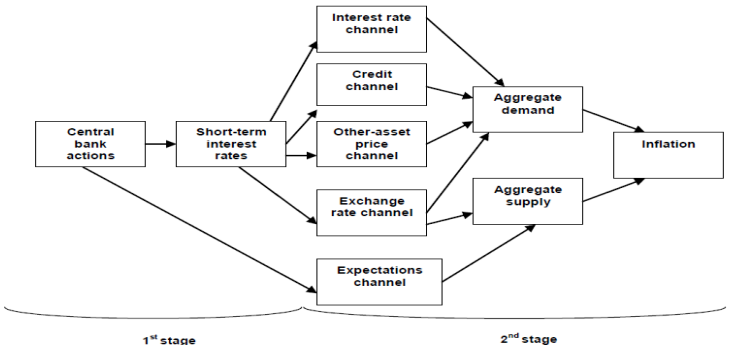


Figure 2. 1: *Monetary Policy Transmission Mechanism*

Source: *Central Bank of Mexico*

Figure 2.1 shows that the Monetary Policy Transmission Mechanism goes through two stages. The first stage starts with the decision of monetary policy on the short time interest rates. The second stage describes the impact that changes in short interest rates will have on aggregate demand and supply through four different channels: medium and long-term interest rate channel, credit channel, other asset price channel, and exchange rate channels. Expectation channel is also a significant channel of transmission mechanism which is directly related to the central bank actions.

Many studies try to investigate the effectiveness of monetary policy transmission channels in developed and developing economies. Rahman and Ahmed (2014) analyze the importance of monetary policy transmission channel in Bangladesh during 1999-2013 after some reforms, focusing on the financial sector and market-orientated economy were undertaken. They use VAR model to study the impact of monetary policy instruments on output level and stock prices. Their findings emphasize that monetary policy affects output

level and inflation rate in the expected direction; the most efficient transmission channels are credit and exchange rate channels; asset price channel is also useful but not in the same intensity, while interest rate channel is weaker compared to others.

Considering that the financial system in Romania is mainly dominated by banking sector Apostoale and Roman (2010) analyze the effectiveness of monetary policy transmission channels in this country. Because of this fact, the most important transmission channels in the Rumanian economy are lending channel and the interest rate channel. The study reveals that the effectiveness of those channels was very low before 2000, but they are more effective with the changes in the financial sector. While other studies consider interest rate channel as the most important, Mishkin (2001) investigates the transmissions channels of monetary policy through asset prices channels such as stock prices, real estate prices and exchange rate. Apart from interest rate channels, Mishkin defines asset prices channels as a very important transmission channel of monetary policy and for this reason, monetary authorities consider targeting asset prices while conducting monetary policy.

By using VAR and VECM models, Montes (2012) studies the credibility and effectiveness of monetary policy transmission channels under the inflation targeting regime in Brazil. Instead of investigating which of the channels is more important to the economy, in this study transmission channels are considered interdependent with each other with a special focus on the credibility of monetary policy in entrepreneurs expectation under inflation targeting regime. The findings of the study show that the credibility of monetary policy is even higher under inflation targeting, contributing to higher macroeconomic stability which is very important to investment and employment.

Favero, Giavazzi, and Flabbi (1999) investigate the effectiveness of the credit channel during 1992 in four big European Monetary Union economies, in Germany, Italy, Spain, France. To study whether a contractionary monetary policy affects banks loans, instead of analyzing macroeconomic variables as output growth and inflation, they use data from the balance sheet of different banks for every country. They find out that the effect of a contractionary monetary policy on bank loans is not significant in any of those countries. While, Baki (2010) uses VAR methodology to study the effectiveness of the monetary transmission mechanism in Egypt during 1991-2009, which is a period characterized by

important reforms in the economic and financial sector. With a special focus on interest rate and exchange rate channels, the author finds a strong interaction between those two channels. The empirical results suggest that the interest rate channel has a significant impact on output level, but the impact is not significant on inflation. On the other hand, the exchange rate channel has a significant impact on inflation but this cannot be said about the impact on output level. After the reforms conducted during those years in Egypt, the effectiveness of those two transmission channels has increased significantly.

To investigate whether central banks announcements and statements trigger the transmission channels of monetary, McCredie et al. (2016) use data of Australian equity market from October 2003 to October 2013. The findings of their study show that monetary policy in Australia significantly affects the equity market through the exchange rate, interest rate, and bank loans channels; while the balance sheet channel seems to be not so important. Another significant finding is that those channels are not generally triggered by the actions of the central bank.

2.4. Monetary policy implication on economic growth

Due to the impact that prices level has on other macroeconomic variables, inflation is one of the most influential macroeconomic variables in one economy. Consequently, the main objective of monetary authorities is to maintain a stable level of prices. As macroeconomic variables are closely related to each other, a change in one of the variables will affect other variables as well. Because of this reason, policymakers should be concerned about this domino effect before conducting monetary policy.

2.4.1. Inflation and economic growth

The most evident trade-off between macroeconomic variables is the trade-off between inflation and economic growth. In order to keep a low rate of inflation, monetary authorities follow a contractionary monetary policy by tightening money supply or by increasing interest rate. This policy increases the cost of money and also makes consumption and investment more costly. Individuals will consume less and investors will delay their investment decisions for a later moment when the cost of money will be lower. A decrease

in consumption and investment will have a negative impact on economic growth even though the objective of keeping inflation low is being fulfilled. In a speech on March 2013, Spencer Dale the former Executive Director for Financial Stability in Bank of England claimed that monetary policy should be concerned about economic growth as much as about inflation.

Salunkhe and Patnaik (2017) study the efficiency of monetary policy in India by analyzing the impact that certain decisions of monetary authorities have in output and inflation. They use Granger Causality test to investigate the causal relationship between monetary policy and its objectives; output growth and inflation. The results show a bidirectional relationship between monetary policy and inflation as well as between monetary policy and the output gap, while is also found a positive relationship between the output gap and inflation. Even though monetary authorities were equally concerned for inflation as well as for output gap, the negative impact monetary decisions have on output gap are generally higher than positive impact on inflation.

Aydin, Esen, and Bayrak (2016), which investigate the impact of inflation on economic growth in five developing economies such as Azerbaijan, Kazakhstan, Kyrgyzstan, Uzbekistan and Turkmenistan for the period from 1992 to 2013, by using dynamic panel data analysis based on a threshold, find a nonlinear relationship between those two variables. They determine a 7.97% threshold value. Inflation below this value has a positive influence on economic growth while an inflation rate above this value has a negative influence on economic growth. Also, Eggoh and Khan (2014) study the relationship between inflation and economic growth in 102 developed and developing economies. They provide indications that there is a nonlinear relationship between those two variables and also exist a threshold level below which inflation generates growth and above which inflation is harmful. The nonlinear relationship comes mainly from macroeconomic conditions. The authors conclude that this threshold level is specific for every country and it depends mostly on many factors as government size, trade openness, the degree of financial development end so forth.

Burdekin et al., (2004) investigate the effect of inflation on economic growth. They find out that the effect of inflation on growth is generally negative and nonlinear. Even

though the effect of inflation on growth varies from one country to another, in industrial countries this effect is higher than in developing countries. The authors conclude that for each group of countries can be determined a threshold below which the effect of inflation on growth is not important.

Erbaykal and Okuyan (2008) analyze the relationship between economic growth and inflation from January 1987 to February 2006, in Turkey. The study identifies a significant short term relationship between the two variables but the long-run relationship is not significant. Also the authors study the causality between variables. They found out that while there is a causality relationship from inflation to economic growth, there is not any causality relationship between economic growth to inflation.

Barro (2013) investigates the effects of inflation on economic growth for 100 countries from 1960 to 1990. By keeping constant a number of country characteristics, the author concludes that a 10% increase in the rate of inflation reduces the economic growth by 0.2-0.3% per year. According to author, it is reasonable to think that there is a causality relationship between inflation and economic growth. However this relationship is significant when periods of high inflation are included in the analysis.

2.4.2. Impact of inflation targeting on overall economic performance

Since 1990, beginning with New Zealand many developed and emerging market economies have implemented inflation targeting regime. As the number of countries using this regime is increasing, there is a discussion among academics and researchers if countries that have implemented inflation targeting have a better overall performance.

Mishkin and Schmidt-Hebbel (2007) study whether inflation makes a difference in countries performance, by choosing a sample of twenty-one developed and emerging inflation targeting economies and comparing with thirty developed non-targeted countries. They conclude that inflation targeting provides a more effective monetary policy, lower inflation in the long run, increases the independence of monetary policy and also makes the economy less affected by exchange rate and oil price shocks. Chevapatrakul & Paez, (2018) which investigate the effectiveness of monetary policy in emerging markets economies find that monetary policy framework has crucial significance in emerging market economies.

Because of the financial and economic features of this group of countries the exposure to high inflation and shocks is higher compared to other countries. Having a target for inflation provides certainty related to the expected inflation and this is also reflected in economic performance. The authors provide evidence that emerging market economies benefit the most from inflation targeting.

On the other hand, Willard (2011) provides evidence that in emerging economies even though inflation targeting provides positive effects as increased transparency and lack of inflation shocks, this regime does not significantly influence inflation outcomes. Willard arguments that, because inflation targeting does not have a significant impact on inflation uncertainty, inflation variability, and volatility, it is difficult to conclude that it affects inflation outcomes. Ball and Sheridan (2003) also provide evidence that inflation targeting does not improve the performance expressed in terms of inflation, interest rate, and outputs. Authors use twenty OECD countries, seven of them have implemented inflation targeting. They find that countries that have implemented inflation targeting perform better after targeting inflation, but the same can be said for other countries too. They conclude that there is another factor other than inflation targeting improving those countries performance. While Vega and Winkelried (2005) find that inflation targeting ensures low mean inflation, low inflation volatility and it reduces inflation persistence in emerging economies. Also, Petursson (2004) concludes that inflation targeting increases the credibility of monetary policy because this regime improves the transparency and accountability of central banks.

Eroglu, Cinar, and Eroglu (2017) use the Least Square Method (LSM) to study the effect of inflation targeting strategy in economic circumstances in Turkey. The authors find out that inflation targeting has a positive impact on inflation performance and exchange rate even though this impact is weak. They find that there is a strong positive effect of inflation targeting on the nominal interest rate, but there is not any significant impact of this regime on economic growth. To investigate the effect of inflation targeting on economies of Brazil, Chile, and Mexico, Werner and Schmidt-Hebbel (2002) use descriptive statistics. They conclude that generally those countries have successfully achieved inflation target and after implementing this regime the output level volatility has been lower. Also, inflation targeting has strengthened credibility in all those countries.

Ozturk, Sozdemir, and Ulger (2014) investigate the performance of developed and developing economies with a special focus during pre and post stages of the global financial crisis. After implementing inflation targeting both developing and developed economies have a lower rate of inflation compared with countries which do not have inflation targeting. Also, countries that have inflation targeting regime perform better than other countries except during the 2007-2009 crisis. Developed economies with inflation targeting perform better during the period pre and after the crisis, but this cannot be said about developing economies which perform worse than countries which have not implemented inflation targeting. Authors suggest that central banks should review the inflation targeting regime considering also financial crisis effects. Mishkin (2004) also claims that in emerging market economies inflation targeting is more complicated than developed market economies, while according to (Taylor, 2000) when an emerging market abandons the fixed exchange rate, an effective monetary policy should be based on a flexible exchange rate, an inflation target, and a monetary policy rule.

Goncalves and Carvahlo (2009) investigate whether inflation targeting affects economic performance in OECD countries. The authors conclude that the targeters were able to reduce inflation with lower costs than non-targeters. Also if during disinflation periods targeters have had higher initial inflation and low debt levels, they cover the disinflation with a lower cost than non-targeters. On the other hand, Brito and Bystedt (2010) which investigate the impact of inflation targeting regime in developing countries, find out that the impact of this regime on level of inflation and output growth is not significant. The authors conclude that even though inflation targeting economies are more inflation reverse than countries that have not implemented inflation targeting, it can not be said the cost of disinflation is not lower than in other countries.

3. THE RELATIONSHIP BETWEEN INFLATION AND STOCK PRICES

3.1. Introduction

Efficient Market Hypothesis, as one of the most important investing theories related to stock evaluation, states that share prices reflect all the relevant information, meaning that every change in microeconomic, macroeconomic or market level is reflected in the shares' prices. Even though shares' prices reflect every event the impact those events have depends on a number of factors making the relationship between those variables different and specific for each economy and market.

Governments and central banks aim to control macroeconomic variables through monetary and fiscal policy, which affects stock prices as well. Due to the dynamism of the macroeconomic environment and increased speed of information, the investigation of the impact that macroeconomic variables have on stock prices is very difficult. Especially the relationship between inflation and stock prices is very complex. On one side, as fixed-income securities lose their purchasing power, stocks may be used as a hedge in inflationary periods and this will increase their price. On the other hand downtrend during inflationary periods may also affect stock prices negatively.

As stated earlier the main purpose of this paper is to analyze the relationship of monetary policy with stock prices in countries that have implemented inflation targeting. We aim to investigate whether the relationship of monetary policy with stock prices in countries where the target is achieved is different from the countries where the target is not achieved. As we examine the relationship of monetary policy with stock prices through inflation, and the relationship between inflation and stock prices is very complex, in this chapter we aim to analyze how those two variables are related with each other. It is particularly important to study the relationship between those two variables because if the results suggest that the relationship between monetary policy impact and stock prices is different in different economies we assume that those differences are related with the success of monetary policy in achieving inflation target.

This chapter continues with a short review of literature related to the relationship between inflation and stock prices. Then we use the Autoregressive Distributed Lag

(ARDL) model to analyze the relationship between those variables. At the end of this chapter, we shortly describe the results of the model.

3.2. Literature Review

The literature that investigates the relationship between inflation and stock prices can be divided into two main groups. A group of studies suggests that there is a positive relationship between inflation and stock markets (Boudoukh & Richardson, 1993; Chakravarty & Mitra, 2013). In those studies is argued that during inflationary periods funds invested in fixed income securities lose their value and purchasing power, meaning that during those periods, investors tend to channel their funds from fixed income securities to ownership securities. As all investors move their funds to stocks, because of the increased demand their price will increase, making them even more profitable investments (Kramer, 2013). Also, Gregoriou and Kontonikas (2010) which analyze the long-run relationship between stock prices and inflation in 16 OECD countries over the period 1970-2006 by using time series data, find a positive long-run cointegration relationship between those two variables and also a long-run causal relationship from inflation to stock prices concluding that stocks can be used as a hedge against inflation in the long run. They also find that inflation elasticity of stock prices increase while moving from a high to a low inflation regime.

Other authors as Li, Narayan, and Zheng (2010) which study the short term and medium-term relationship between inflation and stock returns in the UK, find that in the medium term, there is a positive relationship between expected inflation and stock return, but the relationship between unexpected inflation and stock return is negative. Regarding short-term relationship, the authors conclude that stocks cannot be used as a hedge against inflation. One of the most important conclusions of their paper is that the relationship between inflation and stock return is different in different inflation regimes. Also, Tripathi and Kumar (2014) investigate the relationship between inflation and stock returns in BRICS markets over the period 2000-2013 by using panel data. They find a positive relationship between stock return and inflation in China and India, while this relationship is negative in Russia and Brazil. Results of cointegration test reveal a long-term relationship

in India, Russia, and South Africa but there is not long-term relationship in markets of Brazil and China.

On the other hand, other studies conducted by Fama (1981); Zhao (1999) suggest a negative relationship between inflation and the stock market by reasoning that the negative relationship between inflation and stock prices is induced by the negative relationship between inflation and economic growth which by other side is positively correlated with stock prices. Also, Fama arguments that high inflation is an indicator of an economic downturn and instability. During an economic downturn, investors tend to move their funds to fixed income securities because investment in stocks is too risky (Feldstein, 1983). During those periods, investors aim to reconstruct their portfolio by selling their stocks, increasing so the supply of stocks which will decrease their price.

Crosby (2002) examines the relationship between inflation and stock return in Australia. The author concludes that price shocks permanently affects the stock prices in Australia. The study suggests that there is a negative short-run relationship but there is not detected any long-run relationship between those two variables. Also, Khumalo (2013) studies the relationship between inflation and stock prices in South Africa by using quarterly data from 1980 to 2010. Causality test shows significant unidirectional causation from inflation to stock prices. According to this study, there is a strong negative relationship between inflation and stock prices.

In accordance with other studies that reveal a negative relationship between those two variables, Yeh and Chi (2009) study the relationship between inflation and stock prices in 12 OECD countries. The results of the tests show the co-movement and long-run relationship between those variables in all the countries under study. Inflation and stock prices are negatively related in those 12 OECD countries.

Chakravarty and Mitra (2013) study the relationship between inflation and stock prices using VAR model based on monthly data. They find a causal negative relationship from stock prices to inflation but the opposite direction is not significant. By using cointegration the authors find that in very long run inflation affects stock prices positively. Also, unexpected inflation increases the equity value of the companies if they are not debtor. Geetha, et al. (2011) study the short-run and long-run relationship between stock market,

expected inflation rate and the unexpected inflation rate for Malaysia, US, and China by using monthly data from January 2000 to November 2009. The authors conclude that there is not any short-run relationship between the stock market, unexpected inflation, and expected inflation in the US and Malaysia but they detect short-run relationship between stock returns and expected inflation in China. Also, they find that there is long-run relationship between inflation, expected inflation and unexpected inflation in all those countries.

As different studies suggest different causality relationships between inflation and stock performance, the investigation of the relationship between monetary policy and stock prices cannot be considered fulfilled without considering the relationship of inflation with stock prices and the effectiveness of monetary policy regarding price stability objective.

The hypothesis that we aim to test in this chapter is:

$H_0 1$: The relationship between inflation and stock prices is not the same in developed market and emerging market economies.

3.3. Data and Methodology

3.3.1. Empirical Methodology

In this part of the research, we use monthly data to investigate the relationship between inflation and stock prices. The analysis is conducted by analyzing two variables, Consumer Price Index and the most important stock index of countries included in the study, where the continuously compounded rate of Inflation and Stock Return are:

$$\text{Inflation} = \ln\left(\frac{CPI_n}{CPI_{n-1}}\right) \tag{3.1}$$

$$\text{Stock return} = \ln\left(\frac{P_n}{P_{n-1}}\right) \tag{3.2}$$

The investigation consists of time series analysis and the duration of the study is from January 2002 until December 2017. The main source of the data is inflation.eu, investing.com and Thomson Reuter's database, while for the analysis of data we use E-

views 9 software. As most of the econometric models require stationary data, first we conduct Augmented Dickey-Fuller developed by Dickey and Fuller (1979) and Phillips-Perron test by Phillips and Perron (1988) to check for the order of cointegration. The formulation of the Augmented Dickey-Fuller model is given in equation (3.3).

$$\Delta y_t = \theta y_{t-1} + \sum_{t=1}^{p} \theta_i \Delta y_{t-i} + u_{it} \quad (3.3)$$

The null hypothesis of the ADF test is H_0: $\theta = 0$, meaning that there is a unit root, and series are not stationary, otherwise the alternative hypothesis H_a: $\theta < 0$, that states that there is not a unit root and series are stationary.

The model we use in this part of the research is ARDL Bound testing approach. ARDL Bound testing approach is convenient when variables are purely cointegrated at level I(0), cointegrated at the first order I(1) and a mixed order of cointegration I(0) and I(1). The variables should not be integrated at second order I(2).

3.3.1.1. Cointegration Concept

In the literature, most of the studies use econometric modeling to investigate the relationship between macroeconomic variables. Cointegration, as an econometric concept indicates the existence of long-run relationship between variables. The concept of cointegration was first introduced by Granger (1981) and after Engle and Granger (1987) developed a number of tests and procedures to estimate the long-run relationship between variables. Another very important cointegration test is developed by Johansen (1991). The advantage of Johansson cointegration test over Engle-Granger is that it is a multivariate test, meaning that when we have to study the relationship between two or more variables it can estimate more than one cointegration relationship. Johansson Cointegration similarly to Engle-Granger requires the variable under study to be integrated in the same order. To deal with time series regardless of their integration order, Pesaran, Shin, and Smith (2001) developed autoregressive distributive lag, ARDL Bound testing approach model.

3.3.1.2. ARDL Bound testing approach

ARDL Bound testing approach is used to test for cointegration, to study the long-run relationship and short-run dynamics between variables. ARDL Bound testing approach has a number of advantages compared to other econometric models. First, it can be used to study the relationship between variables regardless if variables are purely I(0), purely I(1) or a mixed order of cointegration. This method does not require pretest for unit roots, however, before applying ARDL Bound testing approach we determine the order of cointegration because this model will crash if variables are cointegrated in the second-order I(2) (Nkoro & Uko, 2016; Akmal, 2007; Duasa, 2007; Ahmed, Muzib, & Roy, 2013). Second, according to Haug (2002), compared to other models, ARDL is more effective for a small sample of data. Third, Pesaran and Shin (1997) have shown that the ARDL method distinguishes the variables in dependent and explanatory, and it is possible to estimate relationship considering all variables as endogenous.

The general shape of ARDL(p;q) can be written as in equation (3.4):

$$y_t = \delta + \beta_1 y_{t-1} + \ldots\ldots + \beta_i y_{t-i} + \gamma_0 x_t + \gamma_1 x_{t-1} + \ldots\ldots\ldots + \gamma x_{t-j} + \varepsilon_t , \quad (3.4)$$

where, δ - is a constant

$\beta_{i,,}\ \gamma_i$ - are the coefficients of lagged values of the dependent and independent variable

y_t - is the dependent variable

y_{t-1}, y_{t-i} - are lagged values of the dependent variable

x_{t-1}, x_{t-j} – are lagged values of the independent variable

i,j – are lags of the dependent and independent variable

ε_t - is a random "disturbance" term

From equation (3.4) we notice that yt is explained by its own lagged values which makes it autoregressive and it is also explained by the lagged values of the explanatory variable which can be considered the distributed lag component of the equation. Shortly, in ARDL model dependent variable is explained by its own lags and the current value and lags of the explanatory variable.

ARDL Bound testing approach Steps

The development of Autoregressive Distributed Lag Bound testing procedure goes through some steps. The first step is conduction of stationary test in order to be sure that none of the variables are integrated at the second-order I(2). Most of the studies use Augmented Dickey-Fuller (ADF) and Philips-Perron (PP) tests.

The second step is to formulate a model in order to study the short-run dynamics and long-run relationship between variables. If we suppose we have one dependent variable and one independent variable, unrestricted or conditional ECM model will be as below:

$$\Delta y_t = \beta_0 + \Sigma\, \beta_i \Delta y_{t-i} + \Sigma \gamma_j \Delta x_{t-j} + \theta_0 y_{t-1} + \theta_1 x_{t-1} + e_t, \text{ where,} \qquad (3.5)$$

- β_i, γ_j are short-run coefficients
- θ_0, θ_1 are long-run coefficients

Before starting the analysis we determine the optimal lag structure each equation. We use Lag Length Criteria under VAR model to determine the optimal lag structure. We estimate the equation (3.5) using the Ordinary Least Square (OLS) method. Before proceeding with bound testing we conduct model diagnosing tests. We check for serial correlation and model stability by using Serial Correlation LM test and Cusum Test under Recursive Estimates (OLS only). After conducting model diagnostic tests, in order to check if variables have long-run relationship, we perform bound testing which is a Wald F-statistic that checks for joint significance of long-run coefficients.

- The null hypothesis is $\theta_0 = \theta_1 = 0$ There is no long-run relationship
- The alternative hypothesis is: H_0 is not true;

The rejection of H_0, means that there is long-run relationship between variables. If the calculated F value is above the upper bound critical value determined by Pesaran et al. (2001) then we reject the null hypothesis of no long-run relationship between the independent and the dependent variable. If the calculated F value is below the lower bound critical value, we cannot reject the null hypothesis of no long relationship between variables. If the calculated F value is between upper and lower bound then it is undetermined if there is or not long-run relationship.

Supposing that we can reject the null hypothesis and we find long-run relationship between variables we can estimate the long-run relationship between variables

$$y_t = \alpha_0 + \alpha_1 x_{1t} + \alpha_2 x_{2t} + v_t \ , \qquad (3.6)$$

As well as, ECM model.

$$\Delta y_t = \beta_0 + \Sigma\, \beta_i \Delta y_{t-i} + \Sigma \gamma_j \Delta x_{1t-j} + \varphi z_{t-1} + e_t \qquad (3.7)$$

Knowing that in long-run equilibrium Δy_t and Δx_t are equal to zero, from equation (3.5) we can also determine the long-run coefficient for the independent variable as $-(\theta_1/\theta_0)$.

3.3.2. Empirical results

In this chapter, before we proceed with the estimation of the model we examine the dynamic characteristics of the time series of the variables. Even though the ARDL model can be applied regardless of the order of cointegration of time series, it is necessary to be sure that none of the variables is cointegrated at second order. We start by checking the order of integration of time series using unit root test, specifically the Augmented Dickey-Fuller and the Phillips-Perron tests.

- Null hypothesis: There is a unit root
- Alternative Hypothesis: There is not a unit root.

The rejection of the null hypothesis means that the time series are stationary, while the acceptance of the null hypothesis means that time series are not stationary.

Table 3.1. *Unit Root Test - Inflation*

Unit root test-Stationary at level – Inflation				
Tests	Augmented Dickey-Fuller		Philips-Perron	
Country	t-statistic	Probability	t-statistic	Probability
Brazil	-6.141	0.0000	-6.141	0.0000
Canada	-18.985	0.0000	-23.522	0.0000
Chile	-12.151	0.0000	-16.721	0.0000
Colombia	-8.293	0.0000	-8.264	0.0000
Czech	-13.493	0.0000	-13.489	0.0000
Hungary	-19.323	0.0000	-23.676	0.0000
Iceland	-11.276	0.0000	-11.151	0.0000
Israel	-18.096	0.0000	-21.184	0.0000
Mexico	-9.0451	0.0000	-9.282	0.0000
Norway	-14.731	0.0000	-33.310	0.0000
Poland	-11.294	0.0000	-13.180	0.0000
South Africa	-18.640	0.0000	-18.163	0.0000
South Korea	-7.0579	0.0000	-14.521	0.0000
Sweden	-15.0997	0.0000	-16.695	0.0000
Thailand	-18.5102	0.0000	-29.953	0.0000
Turkey	-7.8586	0.0000	-10.6233	0.0000
UK	-20.6137	0.0000	-20.7841	0.0000

Table 3.2. *Unit Root Test - Stock Return*

Unit root test-Stationary at level – Stock Return				
Tests	Augmented Dickey Fuller		Philips-Perron	
Country	t-statistic	Probability	t-statistic	Probability
Brazil	-12.3738	0.0000	-12.3578	0.0000
Canada	-13.1667	0.0000	-13.2821	0.0000
Chile	-8.40062	0.0000	-14.5203	0.0000
Colombia	-13.1806	0.0000	-13.1718	0.0000
Czech	-12.7280	0.0000	-12.8150	0.0000
Hungary	-12.3061	0.0000	-12.2909	0.0000
Iceland	-6.97718	0.0000	-12.8528	0.0000
Israel	-7.67919	0.0000	-12.6393	0.0000
Mexico	-13.7227	0.0000	-13.7454	0.0000
Norway	-12.5086	0.0000	-12.5725	0.0000
Poland	-13.1432	0.0000	-13.3710	0.0000
South Africa	-14.6135	0.0000	-14.5915	0.0000
South Korea	-13.4388	0.0000	-13.4372	0.0000
Sweden	-14.0179	0.0000	-14.0581	0.0000
Thailand	-12.0471	0.0000	-12.2280	0.0000
Turkey	-14.9577	0.0000	-14.9299	0.0000
UK	-15.9667	0.0000	-15.8901	0.0000

Table 3.1 shows the results of Augmented Dickey-Fuller and Philips-Perron test of stationarity with intercept and trend for inflation time series while Table 3.2 shows the results of the same test for stock return time series. The results of both Augmented Dickey-Fuller and Philips-Perron tests show that time series of stock return and inflation are stationary at the level for all the countries. Since variables are purely cointegrated at the level it is appropriate to use ARDL Bound testing approach to analyze the relationship between them. Before proceeding with the estimation of the model we determine the optimal lag length of variables by using Lag Length tests under VAR model.

Table 3.3. *Lag Length*

Country	Bra	Can	Chil	Col	Czch	Hun	Ice	Isr	Mex	Nor	Pol	SAfr	Skor	Swd	Thai	Tur	Uk
Lag	3	1	2	1	2	3	2	4	2	2	3	3	3	2	3	2	2

3.3.2.1. Model Estimation

After we determined the dynamic characteristics of the time series and optimal lag length we proceed with model estimation. The general form of the ARDL model we will estimate is shown in equation (3.8):

$$Stock\ ret = \delta + \sum_{i=1}^{n} \beta_i * Stock\ Ret_{t-i} + \sum_{j=1}^{n} \gamma_j * Infl_{t-j} + \theta_0 * Stock\ Ret_{t-1} + \theta_1 * Infl_{t-1} + e_t \quad (3.8)$$

Before we continue with the calculation of long-run coefficients and the derivation of the Error Correction Model, it is necessary to conduct diagnostic check of the model. We will test whether the model has serial correlation and if the model is stable or not. Especially lack of serial correlation is very important. However, Pesaran[3] (2001) explains that in ARDL model existence of serial correlation is not important.

- Null Hypothesis H_0: There is no serial correlation
- Alternative hypothesis H_a: Rejection of null hypothesis

To test if the model we develop for each country has or not serial correlation we use Breusch-Godfrey Serial Correlation LM test. If the P-value is lower than 5% then we reject null hypothesis, which means there is serial correlation. If the P-value is higher than 5 % this means that we cannot reject null hypothesis and the model does not suffer from serial correlation. We run this test for each model and the results are summarized in Table 4.3.

[3] M. Hashem Pesaran, Yongcheol Shin and Richard J. Smith, 'Bounds Testing Approaches to the analysis of level relationships, Journal of applied Econometrics 16: 289–326 (2001), page 314, footnote 37.

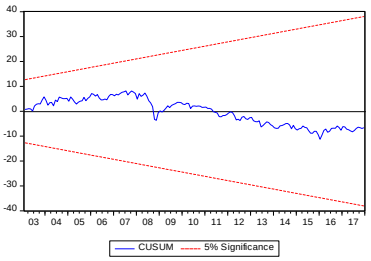
Table 3.4. *Serial Correlation Test*

	Serial Correlation Test	
	Breusch-Godfrey Serial Correlation LM Test	
Country	Chi-square	Prob. Chi-square
Brazil	2.0289	0.5664
Canada	0.2599	0.6102
Chile	0.9056	0.6359
Colombia	0.5689	0.4507
Czech	0.2075	0.9015
Hungary	2.2790	0.5166
Iceland	0.1677	0.9195
Israel	8.5274	0.0741
Mexico	0.7509	0.6870
Norway	0.6346	0.7281
Poland	0.8099	0.8471
South Africa	0.2736	0.8722
South Korea	2.2437	0.3257
Sweden	1.2954	0.5232
Thailand	1.9170	0.5898
Turkey	2.3778	0.3045
UK	0.6510	0.7222

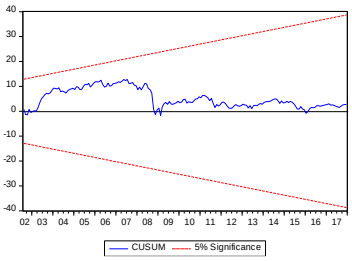
Test results of the Breusch-Godfrey Serial Correlation LM Test show that we cannot reject the null hypothesis for any of the models. This means that all other models are free of serial correlation.

The next step is to check the stability of the model. We use the Cumulative Sum (CUSUM) test to check whether the models are stable or not. The null hypothesis cannot be rejected if the plots of the CUSUM remain within the critical bound of a 5% significance level (Bahmani-Oskooee & Wing Ng, 2002). The results of CUSUM tests for each country are shown in figure 3.1. For all the countries blue line is within the redlines. As the blue line is within the two red lines, we cannot reject the null hypothesis of stability, meaning that all the models are stable.

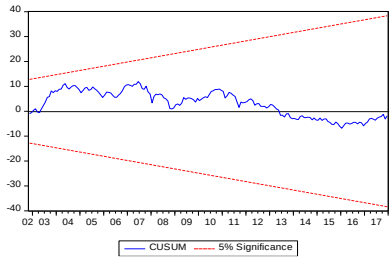
- Null hypothesis: All the coefficients are stable.
- Alternative hypothesis: The coefficients are not stable.



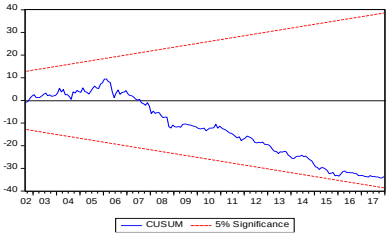
Brazil



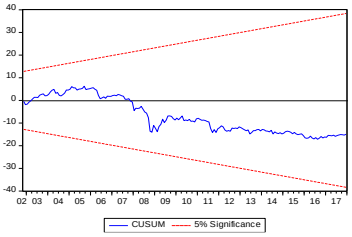
Canada



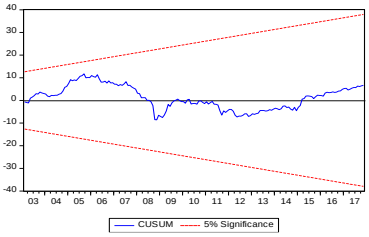
Chile



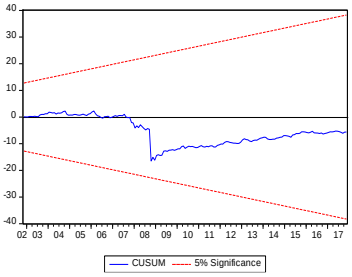
Colombia



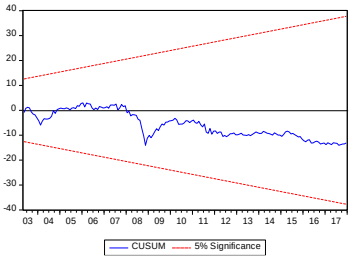
Czech Republic



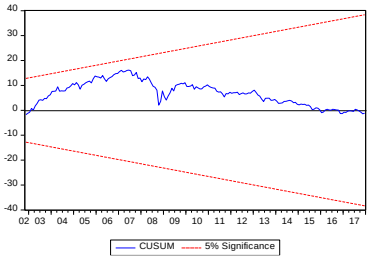
Hungary



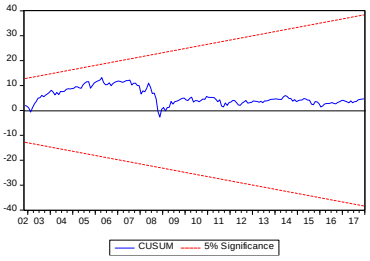
Iceland



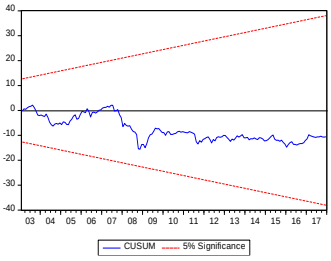
Israel



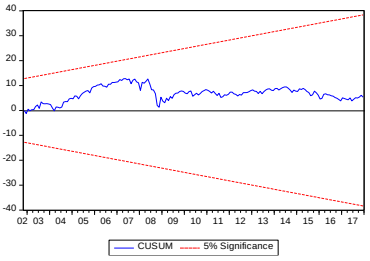
Mexico



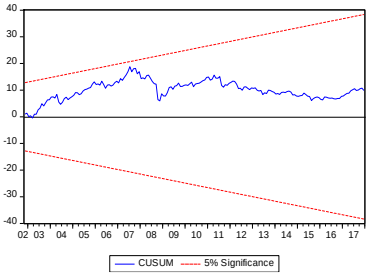
Norway



Poland



South Africa



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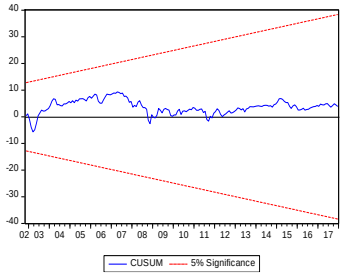

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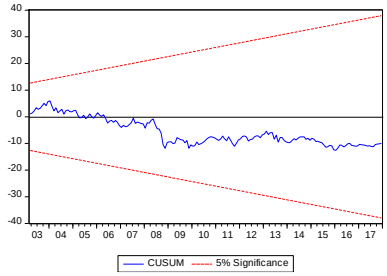
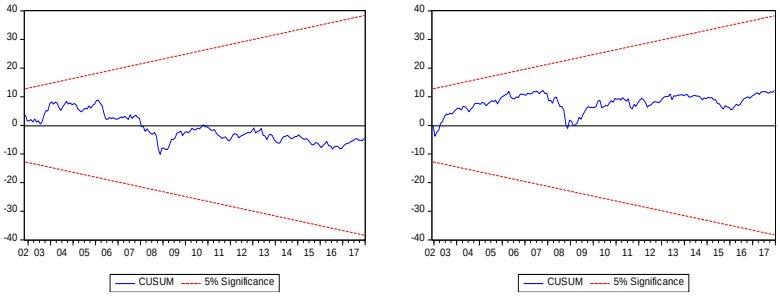


Thailand



Turkey UK

Figure 3. 1. *Cusum test*

The figure shows Cusum test for each ARDL model for every country. Blue line within red lines indicates the stability of the model.

After conducting the diagnostic test and concluding that there is no serial correlation and the models are stable, we perform bound testing for each of the models to check if variables have long-run relationship.

- Null hypothesis is $\theta_0 = \theta_1 = 0$ There is no long-run relationship
- Alterative hypothesis is: H0 is not true;

Table 3. 5. *Bound Testing Results*

Significance	Io Bound	I1 Bound
5%	4.94	5.73
Countries		F-statistic
Brazil		19.932
Canada		34.857
Chile		27.223
Colombia		38.231
Czech Republic		40.405
Hungary		17.783
Iceland		15.370
Israel		19.465
Mexico		24.134
Norway		24.548
Poland		12.523
South Africa		45.307
South Korea		28.871
Sweden		20.377
Thailand		14.352
Turkey		59.144
UK		59.721

The results of the bound testing are summarized in Table 3.5. The results show that F statistic is higher than the upper bound critical value[4], meaning that we can reject the null hypothesis of no long-run relationship between inflation and stock prices. From bound test for co-integration, we conclude that in all countries there is a long-run relationship between inflation and stock returns.

3.3.2.2. Short-run dynamics and long-run coefficients

In this section, we proceed with the estimation of short-run dynamics and long-run coefficients of the model. We use Error Correction Model (ECM) to study the short-run dynamics of the model. ECM contains an Error Correction Term (ECT) known as the speed

[4] The critical value of bound testing are determined by Pesaran and al (2001). We use unrestricted intercept and no trend values, for k=1 and 5% significance.

of adjustment or the speed in which the system goes toward equilibrium. To have a reliable model, error correction term should be significant, negative and have an absolute numerical value which is above zero and below two[5].

Table 3. 6. *Error Correction Term*

	Error Correction Model	
Country	Coefficients	Probability
Brazil	-0.8758	0.0000
Canada	-0.8386	0.0000
Chile	-0.8895	0.0000
Colombia	-0.8631	0.0000
Czech	-0.7573	0.0000
Hungary	-0.8321	0.0000
Iceland	-0.5917	0.0000
Israel	-0.8139	0.0000
Mexico	-0.8702	0.0000
Norway	-0.8177	0.0000
Poland	-0.6557	0.0000
South Africa	-0.8799	0.0000
South Korea	-0.9180	0.0000
Sweden	-0.8057	0.0000
Thailand	-0.6673	0.0000
Turkey	-1.0385	0.0000
UK	-1.0676	0.0000

The results in Table 3.6 show that all error term coefficients are negative and significant, meaning that the models are significant and the model moves to long-run equilibrium after disturbances that may happen in short-run.

As the models are significant, there is no serial correlation and models are stable, the next step is to check whether there is short-run relationship between stock prices and inflation. We use Wald F-statistic that checks for joint significance of short-run coefficients.

[5] Norman Loayza, Romain Ranciere, "Financial Development, Financial Fragility, and Growth, IMF Working Paper WP/05/170, page 12.

- Null hypothesis is: $\beta_{i,} = \gamma_j = 0$ There is not short-run relationship
- Alterative hypothesis is: H0 is not true;

We reject the null hypothesis when the p-value is lower than 5%. The rejection of H0 means that the coefficient of inflation is different from zero, which means it is significant and there is short-run relationship between inflation and stock prices.

Table 3. 7. *Wald Test Results*

Wald Test		
Country	Chi-square	Prob. Chi-square
Brazil	0.9492	0.8135
Canada	1.3103	0.2523
Chile	0.3252	0.8500
Colombia	0.3591	0.5490
Czech	0.2523	0.8815
Hungary	3.2923	0.3487
Iceland	1.2794	0.5275
Israel	3.3789	0.4965
Mexico	3.5246	0.1717
Norway	0.1235	0.9401
Poland	1.0501	0.7891
South Africa	0.5670	0.7532
South Korea	0.5461	0.7611
Sweden	1.7147	0.4243
Thailand	5.1652	0.1601
Turkey	3.4799	0.1755
UK	0.0394	0.9805

Wald test in Table 3.7 shows that p statistic is higher than 5 % for all the countries meaning that the null hypothesis cannot be rejected for any of the countries. As the null hypothesis cannot be rejected for any of the countries, this means that there is not short-run relationship between inflation and stock prices in countries under study. Morover, the coefficients of the models are not significant.

Regarding the evaluation of the long-run coefficients, we find that there is a negative long-run cointegration between inflation and stock prices in all the countries. However, the coefficients for all countries are not significant. The results indicate that there is a negative long-run relationship between inflation and stock return in all the countries, however, inflation is not a significant determinant of stock return. As the relationship between inflation and stock prices is the same in all countries we reject the null hypothesis claiming that the relationship among those variables is not the same in developed and emerging market economies.

Table 3. 8. *Long Run Coefficients*

Long run coefficients		
Country	Coefficient	Prob.
Brazil	-9.0902	0.3940
Canada	-1.1831	0.3627
Chile	-1.5912	0.3445
Colombia	-8.6969	0.2757
Czech	-0.0705	0.9803
Hungary	-0.3100	0.9332
Iceland	-4.1287	0.5933
Israel	-4.0938	0.1403
Mexico	-4.0825	0.5859
Norway	-2.4284	0.2438
Poland	-1.0461	0.7064
South Africa	-0.0974	0.9201
South Korea	-6.4363	0.1191
Sweden	-1.2153	0.5596
Thailand	-1.8424	0.4282
Turkey	-6.3078	0.4958
UK	-3.3605	0.1245

3.4 Conclusions

The relationship between inflation and stock prices is very complex and the subject of many researches. While monetary authorities aim to achieve a stable and low rate of

inflation it is unclear whether low rate of inflation will have a positive or negative effect on stock prices. Some scholars suggest that during inflationary periods investment in stock securities may be used as a hedge to ensure the purchasing power of their funds, thus stock prices will increase due to increased demand. Another group argues that high inflation is evidence of economic downtrend and while the economy is not performing well, stock prices will decline.

The findings of our study suggest that in all the countries, developed and emerging market economies, there is a negative long-run relationship between the rate of inflation and stock prices, although the rate of inflation is not a significant determinant of stock prices. Our tests do not detect any short-run relationship among those variables, however, empirical results and studies such as Geetha et al, (2011); Albulescu et al, (2016) suggest that in long-run stock markets perform better while inflation rate is declining.

4. THE RELATIONSHIP OF MONETARY POLICY WITH STOCK PRICES

4.1. Introduction

In this chapter, we aim to analyze the relationship between short term interest rate as an instrument of monetary policy and stock returns by also considering the inflation rate for the period. The variables used for this analysis are short term interest rate, rate of inflation, the target rate of inflation and stock prices index of selected countries. In this research are included 17 countries, 8 developed economies, and 9 emerging market economies. We compare the achieved rate of inflation with target rate of inflation. If the deviation between achieved rate and target rate of inflation is higher than 0.4% we classify that country in the group of countries that have deviation from target. Thus, emerged economies end emerging market economies are separated into two other groups due to the deviation between the target rate and the achieved rate of inflation. For each of the groups we investigate the relationship of monetary policy with stock prices. We compare the results achieved for each group and try to investigate the factors which contribute to those results.

4.2. Literature Review

Many studies try to examine how monetary policy and financial markets, particularly stock markets are related to each other. Studying the relationship between monetary policy and stock prices is of particular importance because of the role that financial markets have in transmission of monetary policy, as well as the impact that developments in stock markets have in macroeconomic variables.

The studies that investigate the significance of the relationship between those variables suggest different results. Ioannidis & Kontonikas (2008) investigate the impact of monetary policy on stock prices in 13 countries of OECD from 1972-2002. They take into account the nonnormality distribution of data they use, as well as the co-movement of the international stock market. They find out that a change in monetary policy has a significant impact on stock returns not only contemporaneous but also in future stock returns. Because of the difficulty of analyzing the impact of the monetary policy to stock prices that comes from the endogen nature of policy decisions and the fact that stock prices and interest rates

are interrelated with many other variables (Rigobon & Sack, 2004) develop a new estimator that is based on the heteroskedasticity that is common in high-frequency data. According to the results of this study, an unexpected interest rate change brings a significant change in stock prices. Bjørnland & Leitemo (2009), analyze the interaction between US monetary policy and the S&P 500 index. The empirical findings of their study show that there is a significant interdependence between interest rates and shocks to real stock prices in the US. Because of this significant interdependence, they conclude that signals from the stock market are an important source of information for monetary policy decisions, as well as monetary policy is important in determining stock prices.

Stocia, Diaconasu, & Nucu (2012) analyze the impact of monetary policy on stock prices focusing in Eastern European Countries. They implement a Vector Autoregression (VAR) model and use short-term interest rate as an instrument of monetary policy and stock price index for the stock market. They conclude that in developed countries the impact of monetary policy on stock prices is higher compared to emerging market economies. Also, Stoica & Diaconasu (2012) investigate the impact of monetary policy on equity indices in European Union countries from January 2000 to February 2012 by using co-integration and Granger causality tests. The results show the existence of significant long and short term interdependence between interest rates and stock prices. Long-term co-movement during the crisis period is stronger compared with the whole period.

Countries of Euro Area which use Euro as a substitute currency, except the monetary policy of their central bank (domestic monetary policy) are also subject to the monetary policy of the Euro Area. In order to study the impact of double monetary policy on stock prices in Central Europe countries, Pirovano (2012) uses vector autoregressive models. The results suggest that stock prices in the EU countries are much more affected by interest rate changes in Euro Area than by internal changes and also stock price volatility comes particularly due to exchange rate shocks and monetary policy in Euro Area.

Among the studies that suggest a significant relation among variables Mangani (2009) use a GARCH model to study the effect of two macroeconomic variables (discount rate and gold price) on JSE Stock of South Africa. By using weekly data from 1983 to 2007 they find that the discount rate has a significant impact on stock prices and there is an inverse

strong relationship between interest rates and stock prices. Gold prices have an important positive impact on stock prices as well. Also, to investigate the relationship between stock market returns and macroeconomic variables as inflation, industrial production, money supply, exchange rate and interest rate Alam & Rashid (2014) use GARCH model. The results show that the consumer price index, money supply, exchange rates, and interest rates are negatively correlated with the stock returns, while industrial production index is found to be positively correlated with the stock returns in Pakistan. All the variables except inflation are significantly associated with the stock market.

Ozdemir & Otluoglu (2015) which examine the impact of monetary policy decisions on the stock prices (BIST stock indices) during the period of inflation targeting using Johansen cointegration test and VAR/VEC methods demonstrate that interest rate shocks have a negative impact on stock prices and this impact is permanent. Also, Nguyen, Do, & Nguyen (2016) analyze the impact of monetary policy on stock prices in Vietnam by using GJR-GARCH model. They use interest rate, exchange rate and required reserve ratio as proxies for monetary policy and Vietnam Stock Index as a proxy for stock prices. The results of the study suggest that interest rates do not affect stock prices on short-term, but in the long-run changes in interest rate have a negative impact on stock prices. The required reserve is also negatively correlated with stock prices in long-run but not correlated in short-run. While Exchange rate has a negative impact on stock prices in short-run as well as in long-run.

Other studies such as Gu & Gao (2013), which examine the relationship between the Federal Reserve's monetary policy actions and the US stock market, find that even though the federal fund's rate and the S&P 500 Index are positively correlated over the long run, this relationship is not stable. Chen & Wo (2013) use a threshold regression model to study the relationship between monetary policy actions and stock prices. This model determines a nonlinear relationship between stock prices and interest rate and in order to have a clearer analysis of this relationship, data should be separated into periods during which interest rates have a specific upward or downward trend. In this study are used cointegration tests and ECM which identify that there is a significant positive dependence of stock prices on

changes in interest rates. The changes in interest rates start to have an inverse impact on stock indices only after interest rates rich a certain threshold.

On the other side, a number of studies conclude that there is no significant relationship among those variables. Noikokyris & Chortareas (2013) which examine the relationship between monetary policy and equity return in the UK, during an inflation-targeting period (1997-2008), identify the absence of a significant interdependence between unexpected monetary policy changes and stock returns during the post-1997 period. Laopodis (2013) investigates how the interdependence between monetary policy and stock prices varies by using data provided during three different monetary regimes. During the 1980-1990 period, the impact of inflation on stock prices is not significant, while in 1990 stock market responses were not related to the monetary policies of Federal Reserve. The results of the study suggest that the dynamic relationship between monetary policy and the stock market was not consistent and that interaction was of different nature in each of the three monetary regimes. By also using VAR model but different variables as a proxy Belke & Beckmann (2015), which analyze the long-run behavior and short-term dynamics of stock markets across five developed and three emerging economies, reach different results. Their findings show that while in emerging market economies monetary policy and stock prices share the same dynamics, the co-movements between those two variables is very limited in developed markets, which also limits the ability of the central bank to affect stock prices changes through monetary policy.

The literature suggests that the relationship between monetary policy and stock prices can be either significant or not, positive or negative. However, none of the studies we have reviewed includes into analysis the inflation as the main variable aimed to be controlled by monetary policy. Monetary authorities undertake specific policies in order to control inflation which on the other side impact the overall economy and financial markets as well. In order to investigate the relationship between short term interest rate as an instrument of monetary policy and stock prices by considering the effectiveness of the monetary policy on inflation we will test two main hypothesis:

$H_0$1: The relationship of monetary policy with stock prices in developed market economies depends on the effectiveness of the monetary policy on inflation.

$H_0 2$: The relationship of monetary policy with stock prices in emerging market economies depends on the effectiveness of the monetary policy on inflation.

$H_0 3$: The relationship of monetary policy with stock prices is not the same in developed and emerging market economies.

4.3. Data and Methodology

4.3.1. Empirical Methodology

As the stock prices reflect all the available information, every economic, politic or other events cause changes in stock prices. Many authors Hommes (2005), Cont (2010), Dal (2011) agree that financial variables are characterized by high fluctuations and volatility clustering meaning that the conditional volatility is not constant over time. For this reason, while modeling financial variables it is necessary to use models that describe the changes of error variance.

The model that will be used to test those hypotheses is Generalized Auto Regressive Conditional Heteroskedasticity (GARCH) and monthly data from January 1990 to January 2017. GARCH model developed by Bollerslev (1986) can capture simultaneously volatility clustering and leptokurtosis. Brooks (2008) explains that volatility clustering feature of financial asset returns motivates the use of GARCH model. Another advantage of using GARCH model over other linear regression models is that GARCH treats heteroskedasticity as a variance to be modeled, while other models consider heteroskedasticity as a problem to be treated (Engle, 2008). According to Bollerslev, Chou, & Kroner (1992) the main advantage of the GARCH model is allowing for a longer memory of the process, but at the same time, getting along with a much more flexible lag structure.

The simplest and a very useful among GARCH models is GARCH (1,1) model (Hansen & Lunge, 2005). The (1,1) in parentheses is a standard notation in which the first number refers to how many autoregressive lags, or ARCH terms, appear in the equation, while the second number refers to how many moving average lags are specified, which here is often called the number of GARCH terms (Bollerslev T. , 1986). GARCH (1,1) determines the

next period's conditional variance as a combination of weighted: unconditional variance of returns, last period's squared residuals and last period's conditional variance.

$$\sigma_t^2 = \gamma V_L + \alpha u_{t-1}^2 + \beta \sigma_{t-1}^2 \quad (4.1)$$

Or, $$\sigma_t^2 = \omega + \alpha u_{t-1}^2 + \beta \sigma_{t-1}^2 \quad (4.2)$$

Where: V_L- unconditional variance of returns

σ_t- conditional variance

σ_{t-1}^2- last period conditional variance

γ, α, β - weights

u_{t-1}- last period squared residual

Because $V_L = \frac{\omega}{1-(\alpha+\beta)}$, then $\omega > 0$, $\alpha > 0$, $\beta > 0$, and $\alpha + \beta < 1$

The ARCH term αu_{t-1}^2, reflects the impact of events from the previous periods that affect the volatility of the variable under research. When $0<\alpha<1$ events from previous periods does not have a destabilizing effect on volatility. The GARCH term $\beta \sigma_{t-1}^2$ measures the impact of forecast variance from previous periods on current conditional variance. A significant β means a high degree of persistence. The sum of α and β shows the speed of convergence of the forecast of the conditional volatility to steady-state, the closer to one the slower the convergence.

As the presence of ARCH effect is a precondition of using ARCH models, before proceeding with the estimation of GARCH (1:1) it is necessary to test the existence of ARCH effect. ARCH(1) effect requires the estimation of equation (4.3). The significance of b_1 parameter indicates the presence of ARCH effect, under the null hypothesis of no ARCH Effect.

$$u_t^2 = b_0 + b_1 u_{t-1}^2 + e_t \quad (4.3)$$

- Null hypothesis: $b_1 = 0$ $(homoscedastic)$
- Alternative Hypothesis: $b_1 \neq 0$ $(heteroscedastic)$

4.3.2. Empirical Results

4.3.2.1. GARCH Estimation

Before we continue with GARCH(1:1) model estimation it is necessary to make sure that variables under study are stationary. We start by checking the stationarity of time series using unit root test, specifically the Augmented Dickey-Fuller and the Phillips-Perron tests. In chapter three we have checked the stationarity of inflation and stock return. As the variables that will be used in this chapter are the stock return and short term interest rates, we proceed only with the stationarity check of short term interest rate, by testing the hypothesis:

- Null hypothesis: There is a unit root
- Alternative Hypothesis: There is not a unit root.

The rejection of the null hypothesis means that the time series are stationary, while the acceptance of the null hypothesis means that time series are not stationary.

Table 4. 1. *Unit Root Test - Short term interest rate*

	Unit root test	Stationary at level	Short term interest rate	
Tests	Augmented Dickey-Fuller		Philips-Perron	
Country	t-statistic	Probability	t-statistic	Probability
Brazil	-1.955594	0.6212	-2.415193	0.3705
Canada	-1.546517	0.8100	-2.048542	0.5706
Chile	-3.521027	0.0400	-2.905136	0.1633
Colombia	-2.318709	0.4212	-3.399588	0.0547
Czech	0.585680	0.9995	-2.380821	0.3883
Hungary	-2.262160	0.4521	-2.675121	0.2482
Iceland	-2.268918	0.4484	-1.825716	0.6885
Israel	-1.477729	0.5429	-1.307001	0.6262
Mexico	-1.518663	0.8200	-1.517958	0.8203
Norway	-4.203616	0.0054	-2.318829	0.4213
Poland	-2.620434	0.0906	-3.008675	0.0359
South Africa	-1.849816	0.6764	-1.926503	0.6367
South Korea	-2.603354	0.2794	-2.405749	0.3754
Sweden	-3.465592	0.0461	-2.470508	0.3425
Thailand	-1.771640	0.7148	-1.939455	0.6299
Turkey	-2.767059	0.2114	-2.779167	0.2069
UK	-1.859145	0.6717	-1.885655	0.6581

Table 4.1 shows the results of Augmented Dickey-Fuller and Philips-Perron test of stationarity with intercept and trend at level for short term interest rate time series, while Table 4.2 shows the results of the same test at first difference. The results of both Augmented Dickey-Fuller and Philips-Perron tests at level show that as the probability is higher than 5%, we cannot reject the null hypothesis for any of the series, meaning that they are not stationary at level. Table 4.2 shows the result of Augmented Dickey-Fuller and Philips-Perron test of stationarity with intercept and trend at level for short term interest rate time series at first difference. The results of both Augmented Dickey-Fuller and Philips-Perron tests show that time series of short term interest rate are stationary at first difference for all countries. Since stock returns time series are stationary at level and short term interest rate series are stationary at first difference we can proceed with our analysis.

Table 4. 2. *Unit Root Test - Short term interest rate*

	Unit root test	Stationary at 1st Difference	Short-term interest rate	
Tests	Augmented Dickey-Fuller		Philips-Perron	
Country	t-statistic	Probability	t-statistic	Probability
Brazil	-6.191132	0.0000	-12.57833	0.0000
Canada	-12.65079	0.0000	-13.31339	0.0000
Chile	-6.248634	0.0000	-9.250341	0.0000
Colombia	-5.234883	0.0001	-5.848302	0.0000
Czech	-9.460737	0.0000	-10.08129	0.0000
Hungary	-12.67210	0.0000	-12.74408	0.0000
Iceland	-4.046489	0.0000	-8.729688	0.0000
Israel	-7.891705	0.0000	-7.837002	0.0000
Mexico	-9.967163	0.0000	-10.11348	0.0000
Norway	-6.661878	0.0000	-5.732889	0.0000
Poland	-7.394882	0.0000	-7.410097	0.0000
South Africa	-8.206872	0.0000	-8.481453	0.0000
South Korea	-7.672377	0.0000	-6.882448	0.0000
Sweden	-4.912605	0.0004	-7.591913	0.0000
Thailand	-9.442536	0.0000	-9.763922	0.0000
Turkey	-14.12067	0.0000	-14.12080	0.0000
UK	-8.273061	0.0000	-8.363229	0.0000

Before we proceed with estimation of GARCH(1:1) model in order to study the impact of short term interest rate and the impact of unconditional variance of returns, last period's squared residuals and last period's conditional variance on volatility of stock prices we should test whether the models have ARCH effect as GARCH model is generally used to treat heteroscedasticity as a variance to be modeled.

The results of ARCH effect test are shown in table 4.3. For Prob. A chi-square value higher than 5%, the null hypothesis of no ARCH effect is rejected.

Table 4. 3. *Heteroskedasticity-ARCH effect*

	Heteroskedasticity Test: Arch	
	Obs*R-Squared	Prob-Chi Squared
Brazil	1.338726	0.2647
Canada	6.595641	*0.0019
Chile	6.891684	*0.0015
Colombia	6.337585	*0.0129
Czech	8.290976	*0.0005
Hungary	1.406694	0.2446
Iceland	0.329407	0.7164
Israel	9.164871	*0.0000
Mexico	0.742641	0.3872
Norway	8.573274	*0.0000
Poland	0.568185	0.7934
South Africa	9.564320	*0.0001
South Korea	1.137844	0.3191
Sweden	3.728254	*0.0012
Thailand	6.886156	*0.0015
Turkey	1.884480	0.0868
UK	12.07913	*0.0000

The results of tests show that null hypothesis of no ARCH effect can be rejected only for Canada, Chile, Colombia, Czech Republic, Israel, Norway, South Africa, Sweden, Thailand, and UK, meaning that we can estimate GARCH only for those countries.

Canada, Czech Republic, Israel, Sweden, Thailand, UK

GARCH (1:1) model[6] for countries such as Canada, Czech Republic, Israel, and Sweden, shows that short-term interest rate has a positive impact on the volatility of stock returns. Meanwhile, for countries such as Thailand and UK the test indicates a negative impact of short-term interest rate on the volatility of stock returns. For all those countries volatility of previous period and the information for the volatility of previous period have a significant impact on volatility of stock return but the coefficients that show the impact of short term interest rate are not significant. We use Normal Gaussian Distribution. The

[6] Table 4.4 shows test results

coefficients of the model, except short term interest rate are significant; the model does not suffer from serial correlation and heteroscedasticity but the residuals do not have normal distribution which is not considered an important problem in GARCH estimation.

Norway, South Africa, Colombia

GARCH(1:1) model for Norway and South Africa shows that short term interest rate has a negative impact on the volatility of stock return, while in Colombia short term interest rate has a positive impact on volatility of stock return. For all those countries volatility of previous period and the information for volatility of previous period have a significant impact on volatility of stock return and the coefficient that shows the impact of short term interest rate is significant. The model does not suffer from serial correlation and heteroscedasticity but the residuals do not have normal distribution.

Table 4. 4. *GARCH (1:1) test results*

		ARCH effect	Coeff.	P-value	Resid P-value	GARCH P-value
Developed that have deviation	Iceland	-	-	-	-	-
	Sweden	Yes	0.153253	0.4805	*0.0008	*0.0000
	Poland	-	-	-	-	-
	Norway	Yes	-0.795952	*0.0001	*0.0137	*0.0000
Developed that do not have deviation	Israel	Yes	0.011359	0.9300	*0.0017	*0.0000
	South Korea	-	-	-	-	-
	Canada	Yes	0.010828	0.9379	*0.0000	*0.0001
	UK	Yes	-0.089206	0.4072	*0.0000	0.2287
Emerging that do not have deviation	South Africa	Yes	-0.145765	*0.0247	*0.0071	*0.0000
	Chile	Yes	-0.787251	*0.0006	0.1529	0.2121
	Hungary	-	-	-	-	-
	Thailand	Yes	-0.515285	0.1310	*0.0152	*0.0000
Emerging that have deviation	Turkey	-	-	-	-	-
	Brazil	-	-	-	-	-
	Colombia	Yes	0.482435	*0.0204	*0.0005	*0.0000
	Czech Rep	Yes	0.673389	0.0775	*0.0000	0.1636
	Mexico	-	-	-	-	-

Chile

GARCH(1:1) model for Chile shows that short term interest rate has a negative impact on the volatility of stock return. The impact of short term interest rate is significant but the

volatility of previous period and the information for the volatility of previous period on volatility of stock return are not significant. The model does not suffer from serial correlation and heteroscedasticity but the residuals do not have normal distribution.

From GARCH(1:1) estimation by using monthly data of short term interest rate as the main instrument of monetary policy and monthly stock return data we conclude that in countries such as Chile, Norway, and South Africa short term interest rate has a negative significant impact on volatility of stock return. In Colombia short-term interest rate has a positive significant impact on volatility of stock return. In countries such as Canada, Czech Republic, Israel, Sweden, Thailand, and United Kingdom the impact of monetary policy on stock return is not significant.

4.3.2.2. ARDL estimation: The impact of monetary policy on stock prices

In the previous section, we have analyzed the impact of short term interest rates on the volatility of stock prices by using GARCH model. The precondition of using ARCH models is the existence of ARCH effect. As for most of the models we do not find ARCH effect, we cannot use GARCH model to test our hypothesis. To investigate the relationship of short term interest rate with stock return we will proceed with ARDL Bound testing approach[7]. For each of the countries we have found that stock return variable is stationary at level while short term interest rate variable is stationary at first difference. Before proceeding with the estimation of ARDL Bound testing approach, first we determine lag length.

Table 4. 5. *Lag Length*

Country	Bra	Can	Chil	Col	Czch	Hun	Icel	Isr	Mex	Nor	Pol	SAfr	Skor	Swd	Thai	Tur	Uk
Lag	2	2	2	1	2	2	2	3	1	4	8	2	2	7	2	6	2

After determination of the order of integration and lag structure, we can proceed with the estimation of ARDL Bound testing approach in order to investigate the long-run relationship and short-run dynamics between stock return and short term interest rates.
The general shape of the ARDL model we will estimate is as shown in equation (4.4)

[7] ARDL Bound testing approach is explained in chapter three, pages 21-23.

$$Stock\ ret = \delta + \sum_{i=1}^{n} \beta_i * Stock\ Ret_{t-i} + \sum_{j=1}^{n} \gamma_j * Interest_{t-j} + \theta_0 * Stock\ Ret_{t-1} + \theta_1 * Interest_{t-1} + e_t \quad (4.4)$$

Similarly with the third chapter, before we continue with the calculation of long-run coefficients and the derivation of the Error Correction Model, it is necessary for the diagnostic check of the model. We will test the model for the existence of serial correlation and test the stability of the model as well.

To test if the model for each country has or not serial correlation we use Breusch-Godfrey Serial Correlation LM test. If the P-value is lower than 5% then we reject the null hypothesis of no serial correlation. If the P-value is higher than 5 % this means that we cannot reject null hypothesis and the model does not have serial correlation. We run this test for each model and the results are summarized in Table 4.6.

- Null Hypothesis H0: There is no serial correlation
- Alternative hypothesis Ha: Rejection of null hypothesis

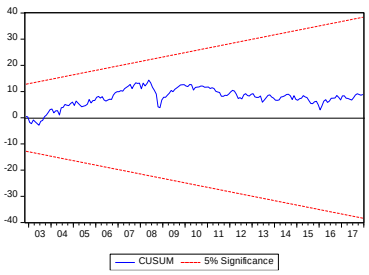
Table 4. 6. *Serial Correlation Test*

	Serial Correlation Test	
	Breusch-Godfrey Serial Correlation LM Test	
Country	F-statistic	Prob. Chi-square
Brazil	0.954785	0.3708
Canada	0.535830	0.5716
Chile	0.604065	0.5326
Colombia	0.012976	0.9077
Czech	0.032089	0.8558
Hungary	0.425781	0.6408
Iceland	0.005336	0.9944
Israel	0.829813	0.4536
Mexico	2.259683	0.1290
Norway	1.045904	0.3497
Poland	0.647967	0.6601
South Africa	0.051619	0.9473
South Korea	1.050079	0.3363
Sweden	0.720374	0.5845
Thailand	0.862145	0.4079
Turkey	1.664665	0.1008
UK	0.636926	0.5148

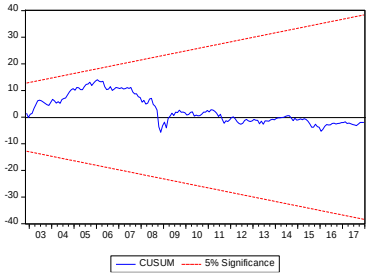
From the Table 4.6 which shows the result of Breusch-Godfrey Serial Correlation LM Test, we see that all probabilities are above 5% meaning that we cannot reject the null hypothesis for any of the models and models are free of serial correlation.

After checking for serial correlation it is necessary to check the stability of the model as well. We use the Cumulative Sum (CUSUM) test to check if the models are stable or not. The null hypothesis cannot be rejected if the plots of the CUSUM remain within the critical bound of a 5% significance level. The results of CUSUM tests are shown in Figure 4.1. As for all the models the blue line is within the two red lines, we cannot reject the null hypothesis of stability, meaning that all the models are stable.

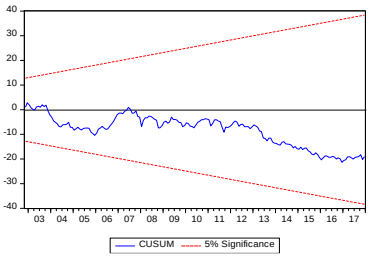
- Null hypothesis: All the coefficients are stable.
- Alternative hypothesis: The coefficients are not stable.



Brazil



Canada



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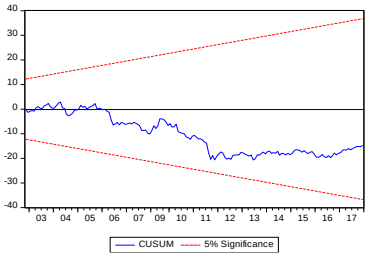
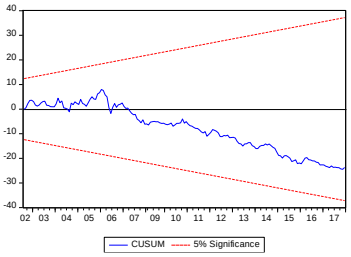
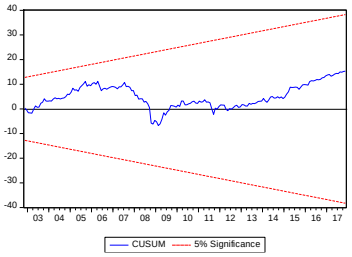


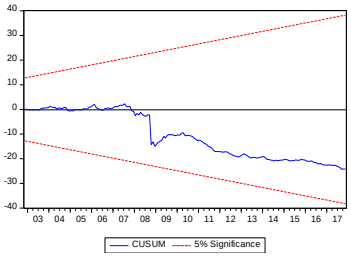
Colombia



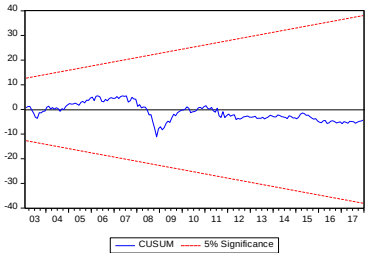
Czech Republic



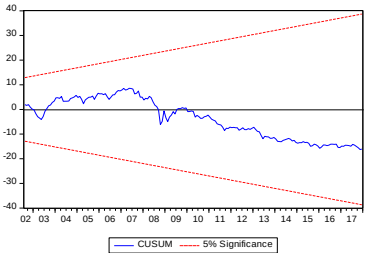
Hungary



Iceland



Israel



Mexico

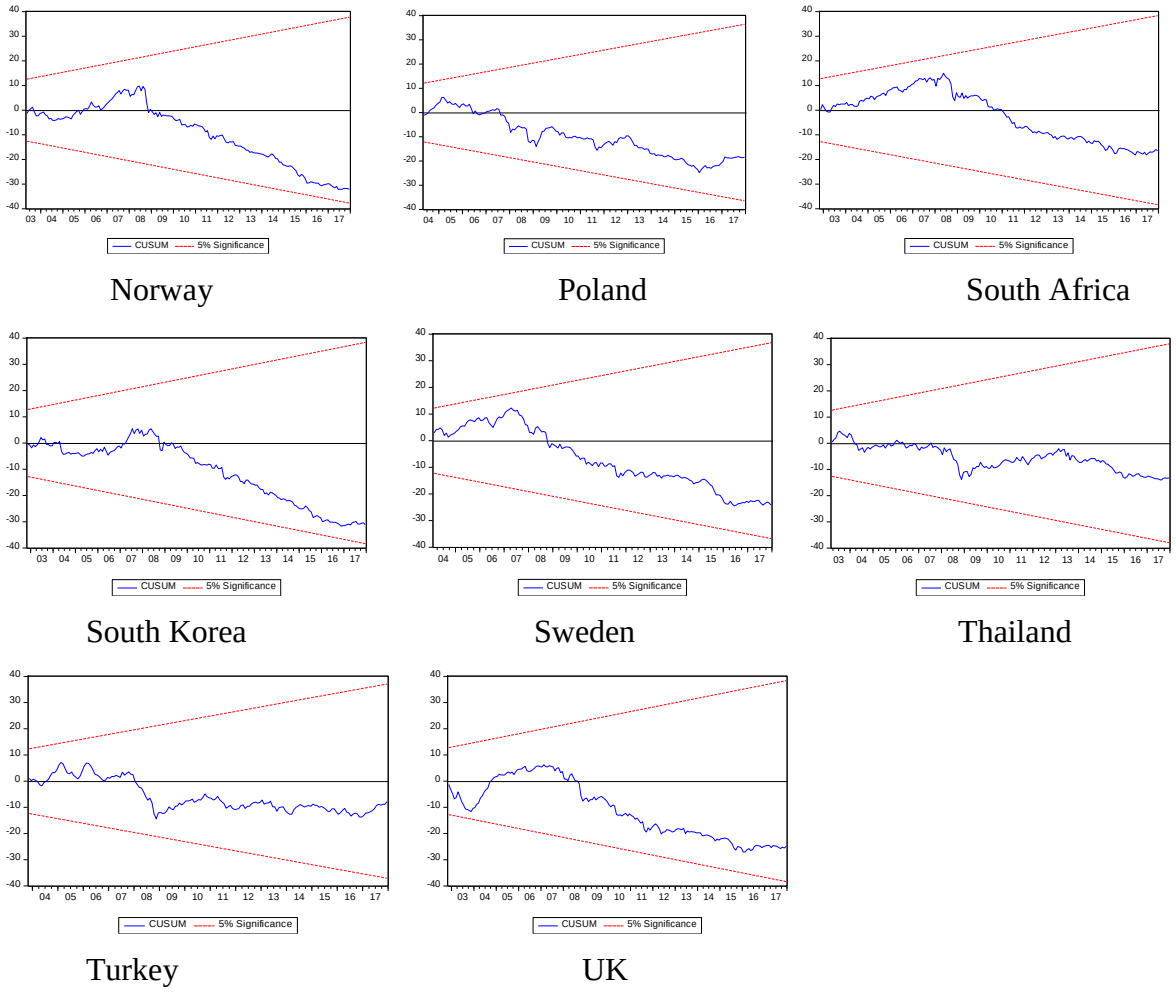


Figure 4. 1.*Cusum test*

The figure shows the Cusum test for each ARDL model for every country. The blue line within red lines indicates the stability of the model.

After checking for the presence of serial correlation and the stability of the model we continue in order to determine whether variables have long-run relationship, we perform bound testing which is a Wald F-statistic which checks for joint significance of long-run coefficients. Null hypothesis supposes that the long-run coefficients jointly are not significant.

- Null hypothesis is $\theta_0 = \theta_1$[8] $= 0$ There is no long-run relationship
- Alterative hypothesis is: H0 is not true;

[8] For θ0 = θ1 see Equation (3.5), page 22.

Table 4. 7. *Bound Testing Results*

Significance	Io Bound	I1 Bound
5%	4.94	5.73
Countries		F-statistic
Brazil		26.89806
Canada		18.84694
Chile		30.64622
Colombia		34.82314
Czech Republic		24.95826
Hungary		21.33458
Iceland		19.27003
Israel		21.40567
Mexico		50.73278
Norway		18.32432
Poland		8.872340
South Africa		29.94556
South Korea		30.99111
Sweden		10.73354
Thailand		23.20963
Turkey		20.53413
UK		22.28471

The results of the tests are summarized in Table 4.7. The results show that F-statistic is higher than the upper bound critical value, meaning that we can reject the null hypothesis of no long-run relationship between inflation and stock prices. From bound test for co-integration, we conclude that in all countries there is a long-run relationship between short term interest rate and stock returns.

4.3.2.3. Short-run dynamics and long-run coefficients

In the previous section, we have analyzed the long-run relationship between short term interest rate and stock return. The results of ARDL Bound testing approach suggest that there is a long-run relationship between variables. In this section, we aim to study the short-run dynamics between variables by using Error Correction Model used previously to study

the short-run dynamics between inflation and stock return. Error Correction Model contains an Error Correction Term which should be significant, negative and have an absolute value above zero and above two in order to have a reliable model.

Table 4. 8. *Error Correction Term*

	Error Correction Model	
Country	Coefficients	Probability
Brazil	-0.8848	0.0000
Canada	-0.7567	0.0000
Chile	-1.0293	0.0000
Colombia	-0.8573	0.0000
Czech	-0.9499	0.0000
Hungary	-0.8403	0.0000
Iceland	-0.7392	0.0000
Israel	-0.7816	0.0000
Mexico	-1.0602	0.0000
Norway	-0.9764	0.0000
Poland	-0.7891	0.0000
South Africa	-1.0271	0.0000
South Korea	-0.9864	0.0000
Sweden	-0.8766	0.0000
Thailand	-0.7916	0.0000
Turkey	-1.3800	0.0000
UK	-0.9815	0.0000

The results show that all error term coefficients are negative and significant, meaning that the models are significant and the model moves to long-run equilibrium after disturbances that may happen in short-run.

As the models are significant the next step is to check whether there is short-run relationship between stock prices and inflation. We use Wald F-statistic that checks for joint significance of short-run coefficients.

- Null hypothesis is: $\beta_{i,} = \gamma_j$[9] = 0 There is not short-run relationship
- Alterative hypothesis is: H0 is not true;

We reject the null hypothesis when the p-value is lower than 5%. The rejection of H0 means that the coefficient of inflation is different from zero, which means it is significant and there is short-run relationship between short term interest rate and stock prices.

Table 4. 9. *Wald Test Results*

Wald Test		
Country	Chi-square	Prob. Chi-square
Brazil	2.173861	0.3373
Canada	1.733542	0.4203
Chile	0.276782	0.8708
Colombia	1.167140	0.2800
Czech	0.153192	0.9263
Hungary	2.154078	0.3406
Iceland	1.445905	0.4853
Israel	13.24160	*0.0041
Mexico	1.350720	0.2452
Norway	14.44270	*0.0060
Poland	17.72463	*0.0234
South Africa	10.92712	*0.0042
South Korea	4.018919	0.1341
Sweden	17.16537	*0.0164
Thailand	3.710806	0.1564
Turkey	29.83756	*0.0000
UK	9.101893	*0.0106

Wald test in Table 4.9 above shows that only p statistic of Israel, Norway, Poland, South Africa, Sweden, Turkey, UK is lower than 5 %, meaning that null hypothesis of no short-run relationship can be rejected only for those countries. For other countries, we cannot reject the null hypothesis, meaning that there is not short-run relationship between

[9]For $\beta_{i,}$ and γ_j see Equation (3.5), page 22.

monetary policy and stock prices in other countries rather than countries whose p statistic is lower than 5%.

Regarding to the evaluation of the long-run coefficients we find that there is a positive long-run cointegration between short term interest rate and stock prices in Brazil, Colombia, Hungary, Israel, Mexico, Turkey and a negative long-run relationship between inflation and stock prices in countries as Canada, Chile, Czech Republic, Iceland, Norway, Poland, South Africa, South Korea, Sweden, Thailand, and UK. The long-run coefficients for countries such as Chile, Colombia, Czech Republic, Iceland, Norway, and South Africa are significant, while for other countries they are not significant. The results indicate that in all countries there is long-run relationship between short term interest rate and stock prices, however short term interest rate is a significant determinant of stock prices only in countries such as Chile, Iceland, Norway, and South Africa.

Table 4. 10. *Long Run Coefficients*

Long run coefficients		
Country	Coefficient	Prob.
Brazil	0.1636	0.2765
Canada	-0.1196	0.7366
Chile	-0.6862	*0.0048
Colombia	0.8538	*0.0134
Czech	0.8367	*0.0478
Hungary	-0.0041	0.9829
Iceland	-0.7403	*0.0057
Israel	0.1122	0.5387
Mexico	0.1343	0.4845
Norway	-0.9043	*0.0044
Poland	-0.1324	0.7053
South Africa	-0.1765	*0.0270
South Korea	-0.5130	0.1553
Sweden	-0.2471	0.4304
Thailand	-0.7806	0.1167
Turkey	0.0383	0.4569
UK	-0.2913	0.0908

4.3 Results analysis

In the section above we have analyzed the relationship between monetary policy and stock prices. In this section, we will include in the analysis the rate of inflation and inflation targeting. The aim of our study is to analyze the relationship between monetary policy and stock prices under inflation targeting regimes. To do this analysis we will divide the countries into two groups, developed markets, and emerging markets economies. Each of the groups, developed and emerging market economies will be divided into two other groups related to the fact whether the target of inflation is achieved or not. If the deviation between achieved inflation and the target is less than 0.4% we will assume that inflation is achieved, while if it is higher than 0.4% we will assume that there is deviation among achieved inflation and target.

Table 4.11 shows the deviation between achieved inflation and inflation target for developed market while Table 4.12 for emerging market economies. The deviation between the achieved rate and target rate of inflation is calculated as the difference between the averages of two series. We do not use the formula of standard deviation because by using that formula we cannot determine whether the deviation comes due to the fact that achieved inflation has mainly been higher or lower than the target.

Table 4. 11. *Developed markets- Deviation from the inflation target*

Developed markets	Deviation from target
Iceland	2.29%
Sweden	-0.81%
Poland	-0.62%
Norway	-0.56%
Israel	-0.18%
South Korea	-0.22%
Canada	-0.18%
UK	0.15%

Table 4. 12. *Emerging markets- Deviation from the inflation target*

Emerging markets	Deviation from target
Czech	-0.46%
South Africa	0.4%
Chile	0.17%
Hungary	0.32%
Thailand	0.1%
Colombia	0.58%
Mexico	1.21%
Brazil	2.15%
Turkey	3.15%

Results in the tables above show that all developed countries aside from Iceland and UK have achieved inflation that is lower than the target. By analyzing the inflation data for Iceland we notice that between the second half of 2006 until the second half of 2010 the achieved inflation was significantly above target especially from April 2008 to September 2009 when Iceland has had a double-digit rate of inflation. The sharp deviation between target and achieved rate of inflation comes due to the fact that financial crisis in Iceland was very deep. According to a publication of European Commission where authors Boehm & Kusen (2018) investigate the economic and financial performance of Iceland from pre-crisis period until nowadays, during the first three quarters of 2008 because of the capital outflow Iceland currency depreciated by 60%. During the crisis period the inflation and the unemployment were very high, while 3 largest banks of Iceland stopped the activity.

Regarding the rate of inflation in the UK, the deviation between the rate of achieved inflation and target rate is less than 0.4%, meaning that we consider there is no deviation of inflation from target. However, different from other developed countries, achieved inflation is higher that target rate. Analyzing the inflation data for UK, we notice that during the second half of 2008 which is the starting point of financial crisis, the inflation in UK has been more than 1.5% higher than the target. Also, during 2011 UK had gone through an inflationary period because the price of utilities increased significantly.

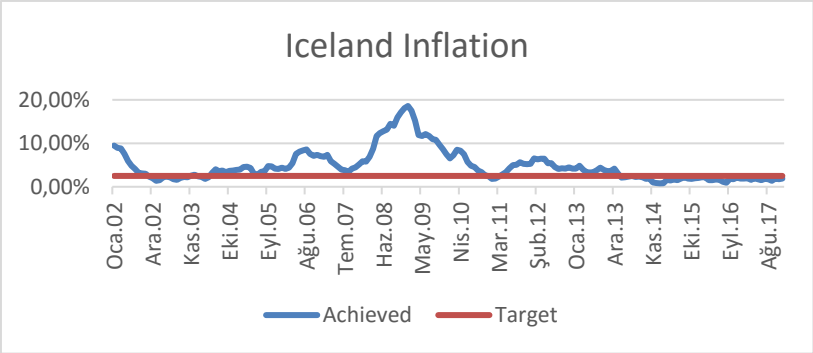


Figure 4. 2. *Iceland rate of inflation*

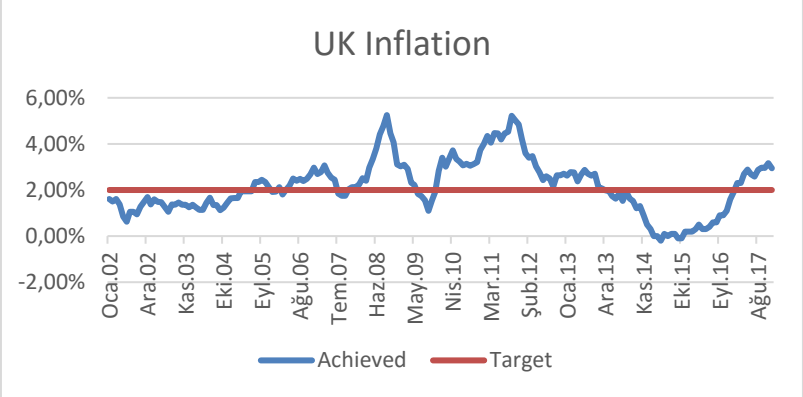


Figure 4. 3. *UK rate of inflation*

Table 4.12 shows that all emerging market economies beside from the Czech Republic have higher achieved inflation compared to the target rate. According to Mishkin (2004) because emerging markets economies have generally weak fiscal, financial and monetary institutions those countries are more exposed to high inflation and currency crisis.

Tables below show the long-run relationship between monetary policy and stock return. Table 4.13 shows the long-run relationship in countries where there is no deviation between achieved inflation and target, while table 4.14 shows the long-run relationship in countries where there is deviation.

Table 4. 13. *Countries that do not have deviation - Long run coefficients*

Developed Countries		Emerging markets economies	
Israel	0.1121	South Africa	-0.1765
South Korea	-0.5130	Chile	-0.6862
Canada	-0.1196	Hungary	-0.0041
UK	-0.2913	Thailand	-0.7806

Table 4. 14. *Countries that have deviation – Long run coefficients*

Developed Countries		Emerging markets economies	
Iceland	-0.7403	Colombia	0.8538
Sweden	-0.2471	Mexico	0.1343
Poland	-0.1324	Brazil	0.1636
Norway	-0.9043	Turkey	0.0383
		Czech	0.8367

From the tables, we see that in developed market economies except for Israel there is a negative long-run relationship between short term interest rate and stock return, despite the fact whether target rate of inflation is achieved or not. Table 4.11 shows that almost all developed countries except Iceland have lower achieved the rate of inflation compared to the target rate, which means that the aim of monetary policy to keep inflation at a low level is achieved.

As explained in the Theoretical Background section, Mishkin (1995) determines other asset prices as one of the transmission channels of monetary policy. When Central Bank follows a contractionary monetary policy it increases its short-term interest rate. As the interest rate will be higher, it means that the return on debt securities will be higher compared to other assets. As fixed income securities offer a relatively higher rate of return, investors will prefer to invest in bond instead of stocks. Lower demand for stocks will decrease their prices and therefore their return. The increase in interest rate will bring a decrease in stock return.

By comparing the index composition of Israel with other developed countries that do not have a deviation from the target, we notice the composition of Israel TA 125 – price index has some differences.

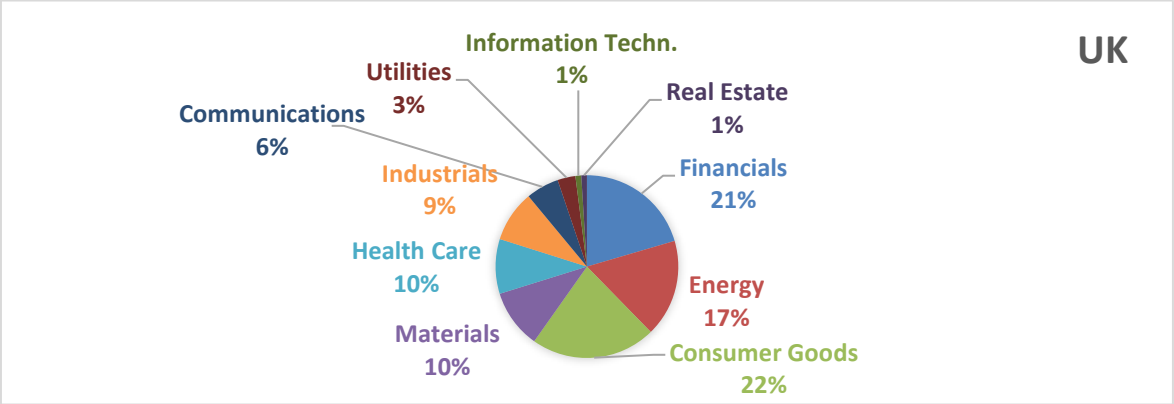


Figure 4. 4. *FTSE 100 – Price Index*

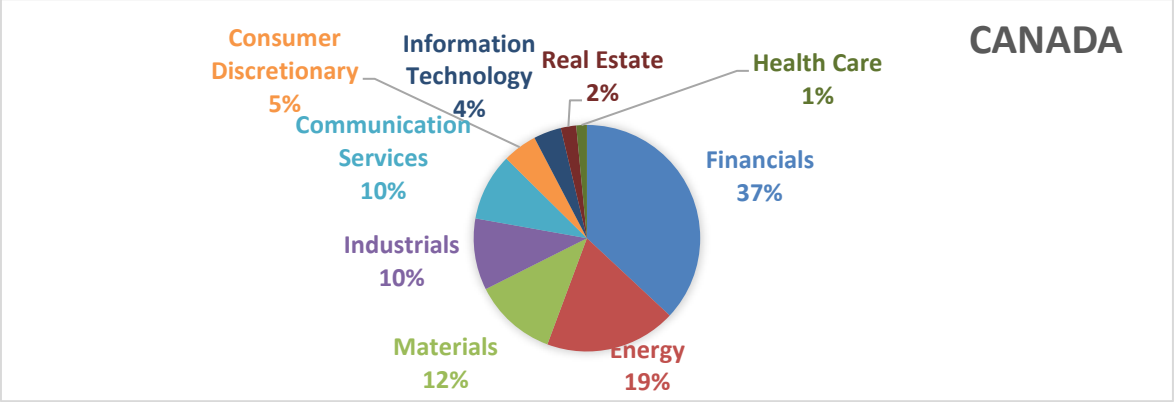


Figure 4. 5. *S&P/TSX Composite Index - Price Index*

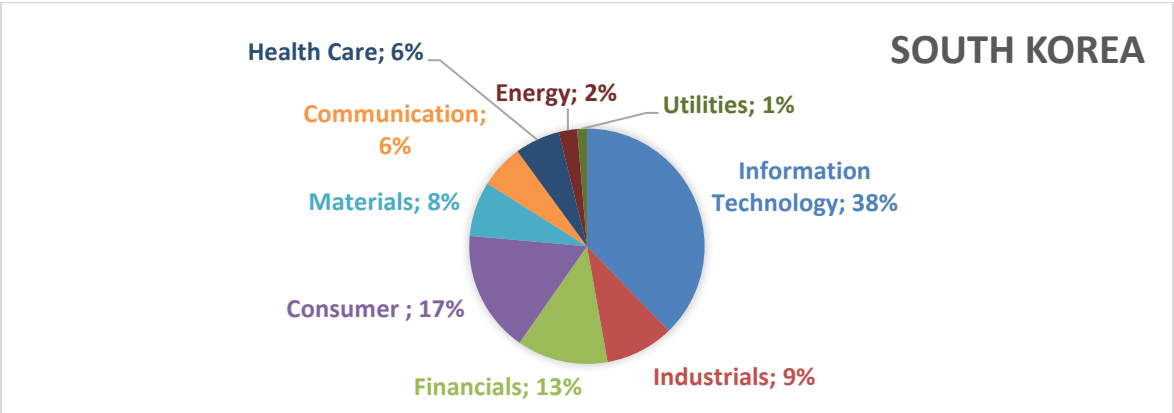


Figure 4. 6. *Korea SE Composite (KOSPI) - Price Index*

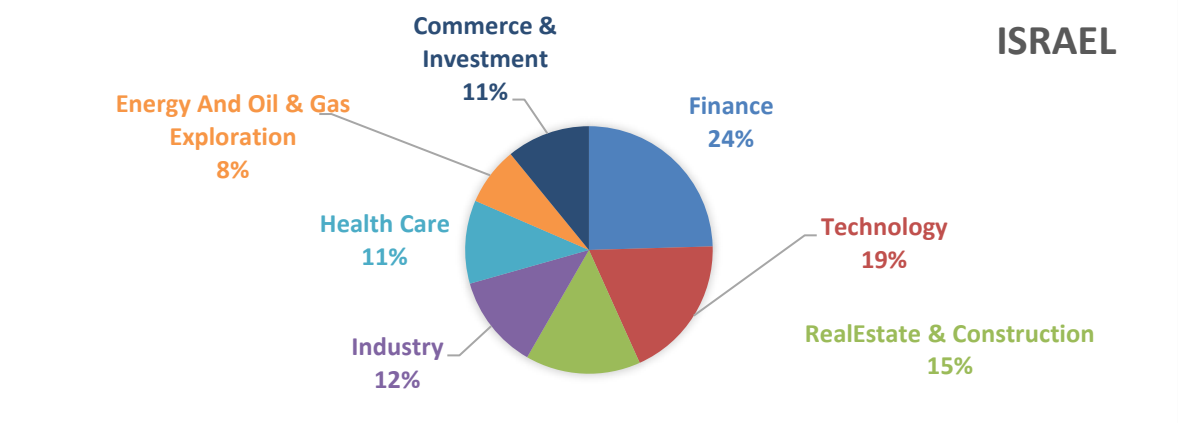


Figure 4. 7. *Israel TA 125 - Price Index*

The figures above show the composition of indices for each developed country that does not have a deviation from the target. From the figures, we see that the composition of Israel price index is less fragmented with high participation of finance, technology, real estate, and construction. Also figure 4.8 shows that 80% of all 2018 exports of Israel are concentrated in four sectors, diamond cutting and trading, manufacture of electric and electronic products, manufacture of pharmaceutical and medical products and, manufacture of petroleum and other chemical products. Senor & Singer (2009) in their book "Start-Up Nation: The story of Israels' economic miracle" state that Israel is creating the more start-up companies per capita compared to all Europe and many Asian countries. Also, after US, Israel has the biggest number of companies listed on the NASDAQ, meaning that investors are interested in investing in Israel companies.

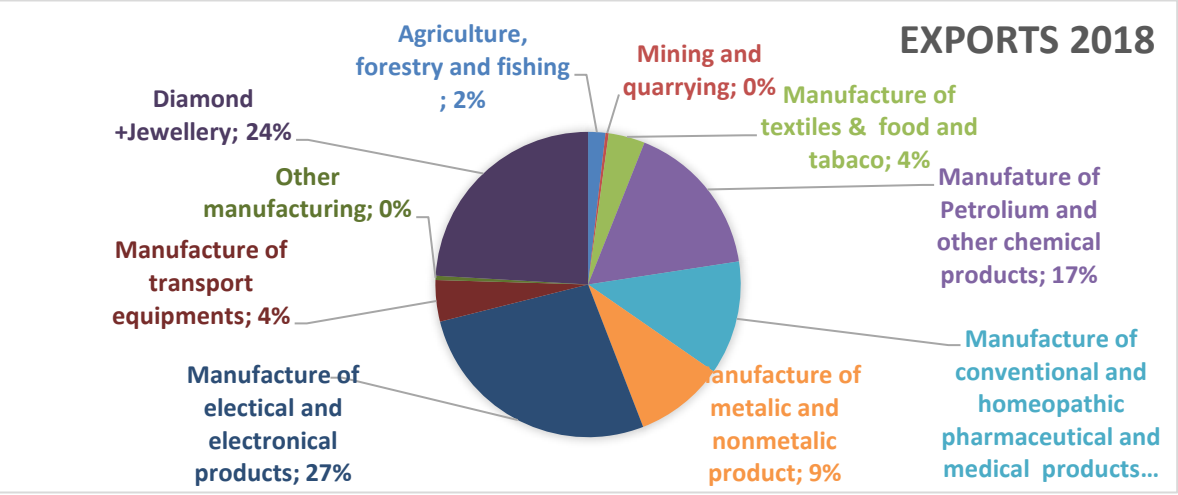


Figure 4. 8. *Exports of Israel 2018*

Regarding the relationship of short-term interest rates and stock prices in emerging market economies, we notice that in countries where there is no deviation among achieved and target rate of inflation, similarly to developed market economies there is a negative relationship between short-term interest rate and stock prices, while there is a positive relationship in countries where there is deviation from inflation targeting. The positive relationship comes due to the fact that stocks may be used as a hedge in countries where inflation is continuously high. As in those countries, monetary policy can not achieve its inflation target and inflation is higher than the target, investors move their funds from fixed income securities to ownership securities, hedging their purchasing power.

The empirical results of our analysis indicate that in emerging market economies, the relationship of monetary policy with stock prices depends on the effectiveness of monetary policy on inflation, however we reject the hypothesis for developed market economies because even though Iceland has an achieved inflation higher than the target rate, the relationship between term interest rate and stock prices is negative as well. Thus, we reject the first hypothesis. The results show that the relationship of monetary with stock prices depends on whether the rate of inflation is achieved or not, and it is not related to the fact whether the economy has developed market or emerging market, thus we reject the third hypothesis as well.

4.4. Conclusions

While central banks follow particular policies to keep inflation stable at low level, it is important the investigation of relationship between monetary policy and stock prices. In this chapter, we have analyzed the relationship of short term interest rate, as the main instrument of monetary policy with stock prices, by including into analysis the rate of inflation as well.

We have divided the countries into two main groups aiming to analyze whether the relationship among those variables is the same in developed and emerging market economies. The empirical results of our study suggest that there is long-run relationship among short term interest rate in all countries. The relationship is negative in all developed market economies regardless whether the target rate of inflation is achieved or not.

Although, it is positive in developing market economies that have not achieved the target rate of inflation, it is negative in countries that have achieved the target rate of inflation.

5. DEVELOPING AN INVESTMENT STRATEGY

In the previews sections, we have analyzed the relationship between inflation and the stock market and the relationship of monetary policy with stock prices. Many countries, such as Turkey, in different periods of time have suffered high inflation. As the main aim of central banks is to keep inflation under control, monetary authorities implement policies in order to achieve this aim. Although keeping inflation under control is the main objective of all central banks in this study we are focused only in countries that have implemented inflation targeting regime. We have investigated the impact of monetary policy on the rate of inflation and we have analyzed whether the relationship of monetary policy with stock prices is the same in countries where inflation target is achieved and in countries where there is deviation.

In this section, we aim to investigate diversification opportunities between stock markets of emerging markets economies, where achieved inflation is higher than the target and stock returns of all other countries under study. To investigate the cointegration between markets and diversification opportunities we use Johanson Cointegration test. In order to study the cointegration between markets in the presence of structural break we also apply Gregory and Hansen cointegration test which is developed to test conintegration in the presence of structural shifts. At the end we proceed with a simple version of CAPM model to investigate short run diversification opportunities.

5.1. Empirical Methodology

5.1.1. Long run cointegration

As we are using time series to study the cointegration relationship among stock markets it is necessary to ensure that data we are using are stationary. In order to check the stationarity we use Augmented Dickey-Fuller unit root tests. The formulation of Augmented Dickey-Fuller model is given in equation (5.1).

$$\Delta\, y_t = \theta y_{t-1} + \sum_{t=1}^{p} \theta_i \Delta y_{t-i} + u_{it} \qquad (5.1)$$

The null hypothesis of the ADF test is H_0: $\theta = 0$, meaning that there is a unit root, and series are not stationary, otherwise the alternative hypothesis H_a: $\theta < 0$, that states that there is not a unit root and series are stationary.

To test for cointegration among stock indices we use VAR-based cointegration tests such as Johansen Test 1988. The long-run cointegration relationship between stock indices is described by the equation below that represents a VAR of order p:

$$y_t = \alpha_1 y_{t-1} + \ldots + \alpha_n y_{t-p} + \beta x_t + u_t \quad (5.2)$$

The bivariate long-run relationship between stock indices is:

$$y_t = \alpha_1 y_{t-1} + \beta x_t + u_t, \quad (5.3)$$

Where, yt is the log value of the stock price of Turkey, Czech Republic, Brazil, Mexico, Colombia and xt is the log of stock price of i-th country (Canada, Chile, Hungary, Iceland, Israel, Norway, Poland, South Africa, South Korea, Sweden, Thailand, UK)

We use (SC) Schwarz Information Criterion under VAR to determine lags. Johansen (1991) determines Trace and Maximum Eigenvalue tests (shown in equation x and y) to investigate the existence of cointegration between stock markets. Numerous studies investigate and compare Trace and Maximum Eigenvalue Criteria. Lutkepohl, Saikkonen, & Trenkler (2001) argue that the local power of maximum Eigenvalue and Trace criteria is very similar but may have some differences in a small sample. The authors conclude that Trace test tend to have more distorted sizes but in some situations this test is superior compared to maximum eigenvalue test. The Trace test tests the null hypothesis that the number of cointegrating vectors is less than or equal to r, against the alternative that there are more than r. The maximum Eigenvalue test conducts separate tests on the individual eigenvalues, where the null hypothesis is that the number of cointegrating vectors is r, against an alternative of (r+1).

$$\lambda_{Trace}(r) = -T\sum_{i=r+1}^{g} in(1-\lambda_i) \quad (5.4)$$

$$\lambda_{Max}(r, r+1) = -Tln(1-\lambda_{r+1}) \quad (5.5)$$

Where, r= number of cointegrating vectors under the null

λ_i= estimated i-th ordered eigenvalue

Johansen Cointegration test has limited use in the presence of structural change when cointegration relationship has changed over time. In order to model time series in the presence of structural breaks, Gregory & Hansen (1996) have developed residual-based tests for cointegration in models with regime shifts. They have designed three tests ADF, Zα-, and Zt to test the null hypothesis of no cointegration against the alternative of existence of cointegration in the presence of single unknown timing structural break. Their test is developed for cases which are level shift, level shift with trend, and intercept with slope shifts. The models with their assumptions and two variables can be shown as below:

Model 1: Level Shift (C)

$$Y_t = \mu_1 + \mu_2 q_{tk} + \alpha_1 X_1 + e_t \quad (5.6)$$

Model 2: Level Shift with Trend (C/T)

$$Y_t = \mu_1 + \mu_2 q_{tk} + \beta_1 t + \alpha_1 X_t + e_1 \quad (5.7)$$

Model 3: Regime Shift where Intercept and Slope coefficients change (C/S)

$$Y_t = \mu_1 + \mu_2 q_{tk} + \beta_1 t + \alpha_1 X_t + \alpha_2 X_t q_{tk} + e_t \quad (5.8)$$

Where, μ_1, α_1, β_1denote intercept, slope coefficients and trend coefficients before shift and $\mu_2, \alpha_2,$ denote the corresponding changes after the shift.

5.1.2. Short-run cointegration

After testing long-run cointegration we also want to test for short-run diversification opportunities. To investigate short-run diversification opportunities we use sensitivity analysis based on Capital Asset Pricing model. This analysis is also previously used by Antiri & Quansah (2017), Khan (2011). We use daily data of stock index for each country and daily data of the global index S&P Global 1200[10], for the period Jan 1st, 2002 until Dec

[10] S&P Global 1200 is a composition of seven stock indices from 29 countries, used as a benchmark for global equity markets.

31st, 2017. In order to obtain sensitivity analysis we use log price of each index. The model for each stock index is:

$$r_i = \alpha + \beta r_g + \varepsilon_i \quad (5.9)$$

Where, r_i is the rate of return for each country index, r_g is the rate of return for the global index, β is the exposure of each country index to the global index. It shows how much sensitive is every country index from the movements of global index. After determining β value for each country we will rank them based on its value.

5.2. Empirical results

5.2.1. Long run diversification opportunities

We use daily stock index data of Bovespa (BVSP), S&P TSX Canada, S&P CLX IPSA Chile, FTSE Colombia, FTSE Czech Republic, FTSE Hungary, ICEX Main Iceland, TA 125, S&P BMV IPC, OSE Benchmark, FTSE JSE, KOSPI, OMX Stockholm, SET Index, FTSE 100, BIST 100, WIG30. The data consist of the daily prices of the indices form January 1st 2001 to December 31st 2017. There are a total of 4174 observations for each index. The log values of all series are shown in figure 5.1.

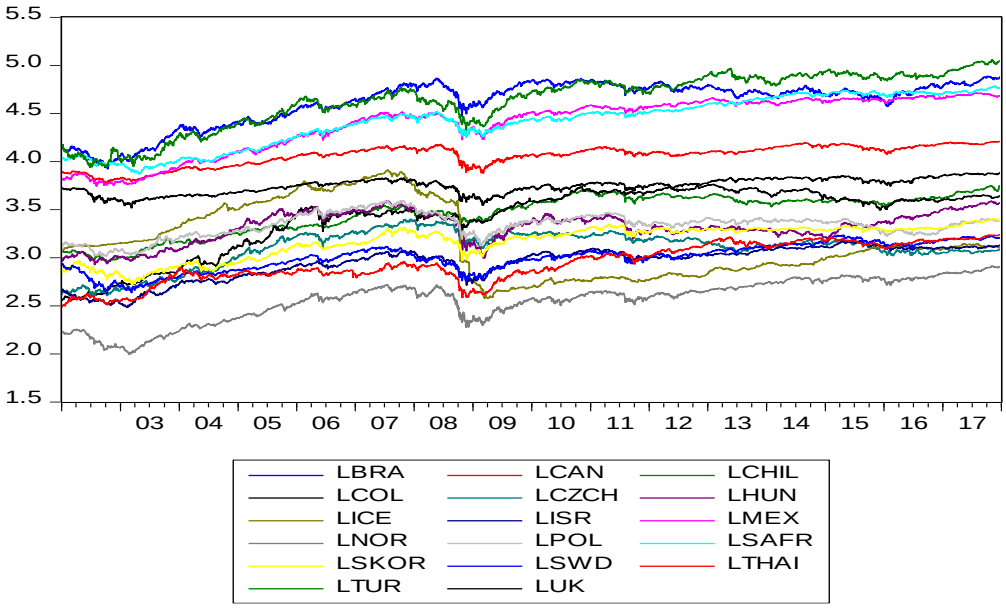


Figure 5. 1: *Log value of stock indices*

We conduct Augmented Dickey-Fuller to test if the series are stationary or not. Johannsen Cointegration test holds under the assumption that time series have the same order of cointegration, different from level. Null hypothesis supposes that series are not stationary, while we need stationary series to proceed with cointegration test.

- Null hypothesis: There is a unit root
- Alternative Hypothesis: There is not a unit root.

For level series we can not reject the null hypothesis as probability is higher than %5, but for first difference we reject null hypothesis meaning that series are stationary at the first difference. Table 5.1 shows the results of unit root test.

Table 5. 1.*Unit Root Test – Stock return*

	Unit root test Stationary at level		Stationary at1st Difference	
Tests	Augmented Dickey-Fuller		Augmented Dickey-Fuller	
Country	t-statistic	Probability	t-statistic	Probability
Brazil	-1.747435	0.7299	-65.26640	0.0000
Canada	-2.046419	0.5750	-29.11125	0.0000
Chile	-1.694553	0.7538	-55.38536	0.0000
Colombia	-1.733034	0.7365	-57.71191	0.0000
Czech	-1.777036	0.7159	-47.70662	0.0000
Hungary	-1.949341	0.6281	-31.07189	0.0000
Iceland	-1.116931	0.9248	-63.73442	0.0000
Israel	-1.718423	0.7432	-62.21386	0.0000
Mexico	-1.533674	0.8181	-59.88015	0.0000
Norway	-1.930819	0.6380	-65.07760	0.0000
Poland	-2.080356	0.5561	-46.75631	0.0000
South Africa	-2.058540	0.5683	-62.81920	0.0000
South Korea	-2.392807	0.3832	-63.53473	0.0000
Sweden	-3.089660	0.1088	-66.65367	0.0000
Thailand	-2.632946	0.3622	-43.10820	0.0000
Turkey	-2.132737	0.5267	-64.09036	0.0000
UK	-2.915567	0.1575	-31.50465	0.0000

As the series are stationary at first difference we can proceed with the estimation of Johanseen Cointegration Test. The results of bivariate Johansson Cointegration Test are shown in the appendix.

5.2.1.1. Johansson Cointegration Results

BIST-Other indices

Trace test indicates there are two cointegration equation between stock market of Turkey and stock market of Colombia, While Maximum Eigenvalue criteria indicates there is not any cointegration equation among those indices. Both Trace and Eigenvalue confirm cointegration between stock index of Turkey and stock index of Israel, South Korea, Canada, UK, South Africa, Sweden and Mexico, while there is not cointegration relationship between BIST and stock indices of Chile, Hungary, Thailand, Iceland, Poland, Norway, Brazil, Colombia, and Czech Republic.

BOVESPA- Other indices

Trace test indicates there are two cointegration equation between stock market of Brazil and stock market of Colombia, while there is not bivariate long run cointegration relationship between stock prices of Brazil and stock indices of other countries.

FTSE Colombia – Other Indices

Cointegration test shows that there is long-run bivariate cointegration relationship among stock index of Colombia and stock indices of Sweden, South Africa, and UK. As mentioned earlier we have used Johansen Cointegration with two criteria Trace and Maximum Eigenvalue criteria. Trace criteria indicates there are two cointegration equations, among stock index of Colombia, and stock indices of Turkey, Brazil, Canada, Chile, Israel, Mexico, Norway, South Korea, Poland, while according to Maximum Eigenvalue criteria there is not any cointegration equation among those indices. There is not long-run bivariate relationship between stock index of Colombia and stock index of Hungary, Thailand, Iceland, Czech Republic.

FTSE Czech Republic-Other Indices

Cointegration test shows there is no bivariate long run cointegration relationship between relationship stock index of the Czech Republic and other indices.

S&P BMV ICP Mexico –Other Indices

Trace test indicates there are two cointegration equation between stock market of Mexico and stock market of UK, South Africa, Colombia and one cointegration equation between stock market of Mexico and stock market of Israel, while Maximum Eigenvalue criteria indicates there is not any cointegration equation among those indices. Both Trace and Eigenvalue confirm cointegration between stock index of Mexico and stock index of South Korea, Sweden, Poland, Turkey, while there is no bivariate long run cointegration relationship between stock index of Mexico and stock index of Canada, Chile, Hungary, Thailand, Iceland, Norway, Brazil, and Czech Republic.

Table 5. 2. *Johansson Cointegration Results*

ALL COUNTRIES		Emerging markets that have deviation				
		Turkey	Brazil	Colombia	Czech Rep	Mexico
Developed that have deviation	Iceland	-	-	-	-	-
	Sweden	Coint	-	Coint	-	Coint
	Poland	-	-	Trace	-	Coint
	Norway	-	-	Trace	-	-
Developed that do not have deviation	Israel	Coint	-	Trace	-	Trace
	South Korea	Coint	-	Trace	-	Coint
	Canada	Coint	-	Trace	-	-
	UK	Coint	-	Coint	-	Trace
Emerging that do not have deviation	South Africa	Coint	-	Coint	-	Trace
	Chile	-	-	Trace	-	-
	Hungary	-	-	-	-	-
	Thailand	-	-	-	-	-
Emerging that have deviation	Turkey	/	-	Trace	-	Coint
	Brazil	-	/	Trace	-	-
	Colombia	Trace	Trace	/	-	Trace
	Czech Rep	-	-	-	/	-
	Mexico	Coint	-	Trace	-	/

The results of Johansson Cointegration test indicate that investors from Czech Republic can take long-run diversification benefits by investing in all countries, while investors from Brazil can have long run diversification benefits in all countries apart from Colombia.

Investors from Colombia can benefit from long-run diversification by investing in countries such as Iceland, Hungary, Thailand, and Czech Republic. Investors from Turkey can have long-run diversification benefits by investing in Iceland, Poland, Norway, Chile, Hungary, Thailand, Brazil, and Czech Republic. Investors from Mexico may benefit from long-rung diversification opportunities by investing in countries such as Iceland, Norway, Canada, Chile, Hungary, Thailand, Brazil, and Czech Republic.

5.2.1.2. Gregory and Hansen test results

After Johansson Cointegration we proceed with the results of Gregory and Hansen test which take into consideration a structural shift in the time series. The results of Gregory Hansen are shown in appendix.

Gregory and Hansen's test indicates there is long-run relationship between stock market of emerging market economies that have deviation from target and markets of developed countries that do not have deviation from inflation target. The only markets that are not cointegrated are stock market of Colombia and stock market of South Korea. Cointegration analysis between stock markets of emerging markets economies that have deviation from target and developed countries that also have deviation from target shows that there is bivariate long-run relationship among most of markets of those two groups. The bivariate long-run relationship is not detected only between stock market of Brazil and Norway, and between stock market of Czech Republic and Poland.

The cointegration analysis between stock markets of emerging market economies that have deviation from the target and emerging market economies that do not have deviation from market shows that there is not bivariate long-run relationship between stock markets of South Africa and Thailand with markets of our focus group. The only market that behaves differently from group is stock market of Mexico which has a bivariate long-run relationship with stock market of South Africa and Thailand while does not have long-run co movement with stock markets of Chile and Hungary. The cointegration test for stock markets of emerging market economies among each other shows that there is bivariate long-run relationship between stock markets of this group. The only market that behaves differently is Colombia which does not have long-run relationship with stock markets of

Brazil and Mexico. Table 5.3 shows the summarized results of Gregory Hansen test. The test indicates that the long-run diversification benefits are very low.

Our results are the same as Öztürk (2018) who studies the cointegration relationship between BIST 30 and MSCI emerging market index which consists of the indices from 24 emerging countries, from January 2003 to July 2017. The author finds there is a significant long term relationship between BIST and MSCI index. Also Geyikci (2017), who studies the diversification opportunities among stock market of Turkey and stock markets of 12 other countries including Brazil, Poland, Hungary, Czech Republic, Thailand, and South Korea concludes that there is long run relationship between those markets. In accordance with our results are Coleman, Leon, & Medeiros (2018), who investigate the co movement and dynamics between Latin American markets such as stock markets of Mexico, Brazil, Chile, Peru, Argentina, and Venezuela. The authors find evidence of co movement among those markets, especially between Mexico and all other stock markets.

Table 5. 3. *Gregory and Hansen test results*

ALL COUNTRIES		Emerging markets that have deviation				
		Turkey	Brazil	Colombia	Czech Rep	Mexico
Developed that have deviation	Iceland	Coint	Coint	Coint	Coint	Coint
	Sweden	Coint	Coint	Coint	Coint	Coint
	Poland	Coint	Coint	Coint	-	Coint
	Norway	Coint	-	Coint	Coint	Coint
Developed that do not have deviation	Israel	Coint	Coint	Coint	Coint	Coint
	South Korea	Coint	Coint	-	Coint	Coint
	Canada	Coint	Coint	Coint	Coint	Coint
	UK	Coint	Coint	Coint	Coint	Coint
Emerging that do not have deviation	South Africa	-	-	-	-	Coint
	Chile	Coint	Coint	Coint	Coint	-
	Hungary	Coint	Coint	Coint	Coint	-
	Thailand	-	-	-	-	Coint
Emerging that have deviation	Turkey	/	Coint	Coint	Coint	Coint
	Brazil	Coint	/	-	Coint	Coint
	Colombia	Coint	Coint	/	Coint	Coint
	Czech Rep	Coint	Coint	Coint	/	Coint
	Mexico	Coint	Coint	-	Coint	/

5.2.2. Short-run diversification opportunities

In the last part of this section, we aim to investigate the short-run diversification opportunities by analyzing the exposure of every stock index to S&P 1200 Global index. By using equation (5.9)[11] we determine β value for each stock index which represents the sensitiveness of each index to the global index. Values of β are shown in Table 5.4.

Table 5. 4. *Value of Beta*

Country	Beta	Probability
Brazil	*0.087269	0.001
Canada	*0.102159	0.000
Chile	*0.125798	0.000
Colombia	0.393512*	0.000
Czech Rep	0.559462*	0.000
Hungary	0.797150*	0.000
Iceland	*0.131162	0.000
Israel	*0.177191	0.000
Mexico	*0.074977	0.000
Norway	0.289869	0.000
Poland	0.238037	0.000
S. Africa	0.297464	0.000
S. Korea	0.46743*	0.000
Sweden	0.211982	0.000
Thailand	0.299849	0.000
Turkey	0.255882	0.000
UK	*0.18915	0.000

The p-value for all coefficients is lower than 5% meaning that all the coefficients are significant. Betas values show that stock markets of countries such as Hungary, Czech Republic, South Korea, and Colombia have relatively high exposure to the global index. Countries such as Mexico, Brazil, Canada, Chile, Iceland, Israel, and UK have very low exposure to the global index. Countries that have a low expose to global market offer very good short term diversification opportunities.

[11] Page 65

CONCLUSIONS

The main objective of monetary policy is to keep inflation at low levels. Since 1990 many countries have implemented inflation targeting regime by defining a specific or an interval rate of inflation that should be achieved. Despite the efforts of monetary policy to keep inflation at low levels, many countries such as Turkey, Brazil, Mexico are going through inflationary periods. While monetary authorities are following contractionary monetary policy by increasing interest rates and the impact of their policy in the rate of inflation is low, it is important to analyze the relationship between monetary policy and stock prices.

In the first chapter of this thesis we introduce a theoretical background regarding the monetary policies' objectives, transmission channels, the relationship of monetary policy and inflation with economic growth, the impact of inflation targeting on overall economic performance and so forth. Monetary policy has four main transmission channels such as interest rate, exchange rate, credit channel and other assets price transmission channel. Previous studies suggest that inflation targeting ensures a more effective and a high credibility of monetary policy, and lower inflation in long run. However, inflation targeting is not a significant determinant of overall economic performance.

In the second chapter we investigate the relationship between inflation and stock prices. We use ARDL Bound testing approach to analyze the relationship between monthly data of rate of inflation and stock return for seventeen countries, eight developed and nine emerging market economies. The empirical results of our study suggest that that in all the countries, developed and emerging market economies, there is a negative long-run relationship between the rate of inflation and stock prices, even though the rate of inflation is not a significant determinant of stock prices. Our tests do not find any short-run relationship among those variables, however, empirical results show that in long-run stock markets perform better while inflation rate is declining.

Our findings suggest that during inflationary periods, while central banks tend to control inflation by increasing interest rate, the investors move their funds toward fixed

income securities. A lower demand for ownership securities, will have a negative impact on their prices.

In the third chapter we analyze the relationship between interest rate, as the main instrument of monetary policy, and stock return. We separate the countries into two main groups developed and emerging market economies and further on into two other groups due to the deviation between achieved and target rate of inflation. In the third chapter we aim to investigate if the relationship between monetary policy and stock prices is the same in developed and emerging market economies and in the countries that have and do not have deviation between achieved rate of inflation and target rate of inflation.

By using ARDL Bound testing approach the empirical results of our study suggest that in all developed countries apart from Israel and in emerging market economies in which there is not deviation between achieved and target rate of inflation, there is a negative relationship between short term interest rate and stock prices. In emerging market economies where there is deviation between achieved and target rate of inflation there is a positive relationship between short term interest rate and stock prices. However, in all the countries short term interest rate is not a significant determinant of stock prices.

In emerging market economies where there is deviation between target and achieved rate of inflation the investors tend to move their funds to ownership securities because equity investments may be used as hedge during inflationary periods. Thus, despite the contractionary monetary policy and higher short term interest rate investors will not choose fixed income securities. In all developed markets and emerging market economies where there is not deviation between achieved and target rate of inflation when interest rate are increased, investors invest in fixed income securities and stock prices decline.

In the last chapter we investigate the diversification opportunities between countries. We use Johansen Cointegration and Gregory & Hansen for structural change, to analyze whether there is long run cointegration among stock markets. Our results suggest that investors from Brazil and Czech Republic have very good diversification opportunities as the Brazilian and Czech index are not cointegrated with almost all other indices; investors from Colombia and Turkey may diversify their portfolio by investing in markets, with which their indices do not share the same dynamics, while investors from Colombia have

very limited diversification opportunities as Colombia stock index has cointegration relationship with almost other indices. By investigating the exposure of every country index to a global index we find that in short run investors may benefit by investing in stock markets of Mexico, Brazil, Canada, Chile, Iceland, Israel, and UK.

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APPENDIX

Table A 1. *Johansson Cointegration test - Brazil*

Countries	Hypothesis	Trace	Critical value 0.05	Max Eigenvalue	Critical value 0.05
Brazil-Israel	r=0	8.927315	15.49471	6.697593	14.26460
	r=1	2.229722	3.841466	2.229722	3.841466
Brazil-S.Korea	r=0	12.00039	15.49471	9.051964	14.26460
	r=1	2.948430	3.841466	2.948430	3.841466
Brazil-Canada	r=0	8.178822	15.49471	5.127516	14.26460
	r=1	3.051306	3.841466	3.051306	3.841466
Brazil-UK	r=0	10.22808	15.49471	6.531204	14.26460
	r=1	3.696875	3.841466	3.696875	3.841466
Brazil-S.Africa	r=0	6.653393	15.49471	5.163075	14.26460
	r=1	1.490319	3.841466	1.490319	3.841466
Brazil-Chile	r=0	9.207415	15.49471	7.151445	14.26460
	r=1	2.055970	3.841466	2.055970	3.841466
Brazil-Hungary	r=0	7.061964	15.49471	4.265719	14.26460
	r=1	2.796245	3.841466	2.796245	3.841466
Brazil-Thailand	r=0	4.396673	15.49471	2.941449	14.26460
	r=1	1.455224	3.841466	1.455224	3.841466
Brazil-Iceland	r=0	5.156353	15.49471	4.022331	14.26460
	r=1	1.134021	3.841466	1.134021	3.841466
Brazil-Sweden	r=0	8.327295	15.49471	6.704358	14.26460
	r=1	1.622938	3.841466	1.622938	3.841466
Brazil-Poland	r=0	6.546265	15.49471	4.500525	14.26460
	r=1	2.045740	3.841466	2.045740	3.841466
Brazil-Norway	r=0	5.215779	15.49471	3.793450	14.26460
	r=1	1.422328	3.841466	1.422328	3.841466
Brazil-Colombia	r=0	17.91964	15.49471	11.75646	14.26460
	r=1	6.163184	3.841466	6.163184	3.841466
Brazil-Mexico	r=0	8.645783	15.49471	5.605042	14.26460
	r=1	3.040741	3.841466	3.040741	3.841466
Brazil-Turkey	r=0	7.069061	15.49471	5.515722	14.26460
	r=1	1.553339	3.841466	1.553339	3.841466
Brazil-Czech	r=0	7.927993	15.49471	6.239486	14.26460
	r=1	1.688506	3.841466	1.688506	3.841466

Table A 2. *Johansson Cointegration test - Colombia*

Countries	Hypothesis	Trace	Critical value 0.05	Max Eigenvalue	Critical value 0.05
Colombia-Israel	r=0	22.86430	15.49471	12.10296	14.26460
	r=1	10.76134	3.841466	10.76134	3.841466
Colombia-S.Korea	r=0	22.58173	15.49471	12.05275	14.26460
	r=1	10.52898	3.841466	10.52898	3.841466
Colombia-Canada	r=0	22.49269	15.49471	13.88757	14.26460
	r=1	8.605123	3.841466	8.605123	3.841466
Colombia-UK	r=0	26.48622	15.49471	16.57917	14.26460
	r=1	9.907048	3.841466	9.907048	3.841466
Colombia-S.Africa	r=0	22.32826	15.49471	15.68016	14.26460
	r=1	6.648101	3.841466	6.648101	3.841466
Colombia-Chile	r=0	17.41290	15.49471	12.42046	14.26460
	r=1	4.992445	3.841466	4.992445	3.841466
Colombia-Hungary	r=0	13.11742	15.49471	10.39945	14.26460
	r=1	2.717966	3.841466	2.717966	3.841466
Colombia-Thailand	r=0	12.13688	15.49471	10.79482	14.26460
	r=1	1.342059	3.841466	1.342059	3.841466
Colombia-Iceland	r=0	12.24242	15.49471	11.32243	14.26460
	r=1	0.919996	3.841466	0.919996	3.841466
Colombia-Sweden	r=0	25.77154	15.49471	17.61553	14.26460
	r=1	8.156017	3.841466	8.156017	3.841466
Colombia-Poland	r=0	15.65199	15.49471	11.23149	14.26460
	r=1	4.420492	3.841466	4.420492	3.841466
Colombia-Norway	r=0	18.88034	15.49471	14.14330	14.26460
	r=1	4.737045	3.841466	4.737045	3.841466
Colombia-Brazil	r=0	17.91964	15.49471	11.75646	14.26460
	r=1	6.163184	3.841466	6.163184	3.841466
Colombia-Mexico	r=0	19.90297	15.49471	11.09630	14.26460
	r=1	8.806674	3.841466	8.806674	3.841466
Colombia-Turkey	r=0	20.16942	15.49471	13.13861	14.26460
	r=1	7.030811	3.841466	7.030811	3.841466
Colombia-Czech	r=0	13.67517	15.49471	11.54066	14.26460
	r=1	2.134504	3.841466	2.134504	3.841466

Table A 3. *Johansson Cointegration test- Mexico*

Countries	Hypothesis	Trace	Critical value 0.05	Max Eigenvalue	Critical value 0.05
Mexico-Israel	r=0	15.81890	15.49471	12.98542	14.26460
	r=1	2.833480	3.841466	2.833480	3.841466
Mexico-S.Korea	r=0	25.13828	15.49471	20.58188	14.26460
	r=1	4.556393	3.841466	4.556393	3.841466
Mexico-Canada	r=0	13.86719	15.49471	8.729898	14.26460
	r=1	5.137290	3.841466	5.137290	3.841466
Mexico-UK	r=0	18.04506	15.49471	11.77394	14.26460
	r=1	6.271112	3.841466	6.271112	3.841466
Mexico-S.Africa	r=0	15.74353	15.49471	10.81032	14.26460
	r=1	4.933210	3.841466	4.933210	3.841466
Mexico-Chile	r=0	11.08284	15.49471	8.711815	14.26460
	r=1	2.371028	3.841466	2.371028	3.841466
Mexico-Hungary	r=0	6.995853	15.49471	3.801048	14.26460
	r=1	3.194805	3.841466	3.194805	3.841466
Mexico-Thailand	r=0	5.899632	15.49471	3.803197	14.26460
	r=1	2.096435	3.841466	2.096435	3.841466
Mexico-Iceland	r=0	5.277851	15.49471	4.454836	14.26460
	r=1	0.823014	3.841466	0.823014	3.841466
Mexico-Sweden	r=0	18.98262	15.49471	16.66228	14.26460
	r=1	2.320347	3.841466	2.320347	3.841466
Mexico-Poland	r=0	18.98262	15.49471	16.66228	14.26460
	r=1	2.320347	3.841466	2.320347	3.841466
Mexico-Norway	r=0	9.276098	15.49471	6.201075	14.26460
	r=1	3.075023	3.841466	3.075023	3.841466
Mexico-Brazil	r=0	8.645783	15.49471	5.605042	14.26460
	r=1	3.040741	3.841466	3.040741	3.841466
Mexico-Colombia	r=0	19.90297	15.49471	11.09630	14.26460
	r=1	8.806674	3.841466	8.806674	3.841466
Mexico-Turkey	r=0	19.39213	15.49471	17.28760	14.26460
	r=1	2.104525	3.841466	2.104525	3.841466
Mexico-Czech	r=0	8.836242	15.49471	7.257345	14.26460
	r=1	1.578897	3.841466	1.578897	3.841466

Table A 4. *Johansson Cointegration test- Turkey*

Countries	Hypothesis	Trace	Critical value 0.05	Max Eigenvalue	Critical value 0.05
Turkey-Israel	r=0	19.15667	15.49471	18.18418	14.26460
	r=1	0.972491	3.841466	0.972491	3.841466
Turkey-S.Korea	r=0	22.62103	15.49471	21.62669	14.26460
	r=1	0.994341	3.841466	0.994341	3.841466
Turkey-Canada	r=0	16.47193	15.49471	15.41654	14.26460
	r=1	1.055389	3.841466	1.055389	3.841466
Turkey-UK	r=0	18.36551	15.49471	16.34987	14.26460
	r=1	2.015639	3.841466	2.015639	3.841466
Turkey-S.Africa	r=0	17.34321	15.49471	16.48132	14.26460
	r=1	0.861889	3.841466	0.861889	3.841466
Turkey-Chile	r=0	12.15023	15.49471	10.76363	14.26460
	r=1	1.386606	3.841466	1.386606	3.841466
Turkey-Hungary	r=0	5.235701	15.49471	4.329119	14.26460
	r=1	0.906582	3.841466	0.906582	3.841466
Turkey-Thailand	r=0	9.232235	15.49471	7.544102	14.26460
	r=1	1.688133	3.841466	1.688133	3.841466
Turkey-Iceland	r=0	2.425977	15.49471	2.045691	14.26460
	r=1	0.380286	3.841466	0.380286	3.841466
Turkey-Sweden	r=0	17.12098	15.49471	16.10784	14.26460
	r=1	1.013144	3.841466	1.013144	3.841466
Turkey-Poland	r=0	4.922790	15.49471	4.423718	14.26460
	r=1	0.499072	3.841466	0.499072	3.841466
Turkey-Norway	r=0	13.51300	15.49471	12.60342	14.26460
	r=1	0.909583	3.841466	0.909583	3.841466
Turkey-Brazil	r=0	7.069061	15.49471	5.515722	14.26460
	r=1	1.553339	3.841466	1.553339	3.841466
Turkey-Colombia	r=0	20.16942	15.49471	13.13861	14.26460
	r=1	7.030811	3.841466	7.030811	3.841466
Turkey-Mexico	r=0	19.39213	15.49471	17.28760	14.26460
	r=1	2.104525	3.841466	2.104525	3.841466
Turkey-Czech	r=0	6.955667	15.49471	6.560146	14.26460
	r=1	0.395521	3.841466	0.395521	3.841466

Table A 5. *Johansson Cointegration test- Czech Republic*

Countries	Hypothesis	Trace	Critical value 0.05	Max Eigenvalue	Critical value 0.05
Czech-Israel	r=0	8.360000	15.49471	6.648792	14.26460
	r=1	1.711208	3.841466	1.711208	3.841466
Czech-S.Korea	r=0	9.674922	15.49471	8.259206	14.26460
	r=1	1.415716	3.841466	1.415716	3.841466
Czech-Canada	r=0	7.989148	15.49471	6.563945	14.26460
	r=1	1.425203	3.841466	1.425203	3.841466
Czech-UK	r=0	10.29798	15.49471	7.756801	14.26460
	r=1	2.541181	3.841466	2.541181	3.841466
Czech-S.Africa	r=0	10.11257	15.49471	9.198877	14.26460
	r=1	0.913690	3.841466	0.913690	3.841466
Czech-Chile	r=0	7.848051	15.49471	7.038249	14.26460
	r=1	0.809801	3.841466	0.809801	3.841466
Czech-Hungary	r=0	7.558820	15.49471	6.405810	14.26460
	r=1	1.153010	3.841466	1.153010	3.841466
Czech-Thailand	r=0	8.046704	15.49471	7.975993	14.26460
	r=1	0.070711	3.841466	0.070711	3.841466
Czech-Iceland	r=0	12.31958	15.49471	9.537871	14.26460
	r=1	2.781705	3.841466	2.781705	3.841466
Czech-Sweden	r=0	8.951082	15.49471	7.918235	14.26460
	r=1	1.032847	3.841466	1.032847	3.841466
Czech-Poland	r=0	14.92791	15.49471	10.46004	14.26460
	r=1	4.467869	3.841466	4.467869	3.841466
Czech-Norway	r=0	6.884262	15.49471	6.864071	14.26460
	r=1	0.020191	3.841466	0.020191	3.841466
Czech-Brazil	r=0	7.927993	15.49471	6.239486	14.26460
	r=1	1.688506	3.841466	1.688506	3.841466
Czech-Colombia	r=0	13.67517	15.49471	11.54066	14.26460
	r=1	2.134504	3.841466	2.134504	3.841466
Czech-Mexico	r=0	8.836242	15.49471	7.257345	14.26460
	r=1	1.578897	3.841466	1.578897	3.841466
Czech-Turkey	r=0	6.955667	15.49471	6.560146	14.26460
	r=1	0.395521	3.841466	0.395521	3.841466

Table A 6. *Gregory and Hansen Test: Emerging Market with deviation-Developed markets with no deviation*

Country		ADF	Break Date	Zt	Break Date	Za	Break Date
	C	-3.32757	4/23/2013	-4.29955	6/24/2013	-34.9246	6/24/2013
	C/T	-4.30442	4/25/2013	-4.88995**	4/17/2013	-46.7519***	4/17/2013
Brazil-Israel	C/S	-4.59243	1/7/2009	-5.46936**	11/25/2008	-57.2614*	11/25/2008
	C	-3.74135	2/11/2011	-4.46936***	11/26/2008	-35.3107	2/9/2011
	C/T	-3.78303	2/15/2011	-4.18986	2/9/2011	-34.6803	2/9/2011
Brazil-Skorea	C/S	-3.77815	3/6/2009	-4.18921	2/9/2011	-34.6358	2/9/2011
	C	-2.76482	3/6/2006	-3.08322	10/11/2013	-18.0687	10/11/2013
	C/T	-4.28502	10/22/2008	-4.73651***	10/13/2008	-41.9507	10/13/2008
Brazil-Canada	C/S	4.633135	3/10/2009	-5.24415**	11/20/2008	-52.831**	11/20/2008
	C	-3.03657	10/17/2005	-3.13148	10/3/2005	-18.1699	10/3/2005
	C/T	-3.48302	2/25/2013	-3.65426	2/21/2013	-25.1595	2/21/2013
Brazil-UK	C/S	-4.57844	10/27/2008	-4.93941***	10/22/2008	-41.8908***	10/22/2008
	C	-4.09345	12/18/2014	-3.98042	10/14/2014	-26.6354	10/14/2014
Colombia-	C/T	-4.551	10/17/2008	-4.50701	12/10/2013	-35.2575	12/10/2013
Israel	C/S	-4.94808***	1/6/2009	-4.87182***	11/21/2008	-41.2739	11/21/2008
	C	**-3.90471**	**12/19/2014**	**-4.00742**	**12/22/2014**	**-28.9038**	**12/22/2014**
Colombia-	**C/T**	**-3.85661**	**9/16/2008**	**-4.00904**	**10/9/2008**	**-27.7529**	**10/9/2008**
Skorea	**C/S**	**-3.98245**	**4/28/2015**	**-3.97092**	**4/23/2015**	**-28.7601**	**4/23/2015**
	C	-3.27463	10/17/2008	-3.75559	9/16/2008	-20.9729	9/16/2008
Colombia-	C/T	-4.92185***	10/21/2008	-5.25304**	9/16/2008	-46.7716***	9/16/2008
Canada	C/S	-4.89891***	3/2/2009	-5.33716**	11/20/2008	-50.861**	11/20/2008
	C	-3.57036	8/24/2005	-3.83873	9/16/2008	-20.4914	3/11/2005
	C/T	-3.75442	8/28/2008	-4.02232	7/16/2008	-21.9429	6/17/2013
Colombia-UK	C/S	-5.38941**	10/21/2008	-5.50077*	10/16/2008	-46.2962	10/16/2008
	C	-4.72144***	4/4/2008	-4.85568***	3/19/2008	-43.914***	3/19/2008
	C/T	-5.16083*	6/6/2006	-5.55288*	10/25/2013	-58.5661*	10/25/2013
Mexico-Israel	C/S	-4.8461***	10/10/2008	-5.22627**	7/10/2008	-51.7581**	7/10/2008
	C	-4.1929	5/24/2004	-4.89741***	6/6/2012	-45.3879***	7/21/2008
Mexico-	C/T	-4.25653	5/24/2004	-5.52127*	5/26/2004	-56.8714**	5/26/2004
Skorea	C/S	-4.62887	10/30/2008	-4.97801**	10/28/2008	-48.1091**	10/28/2008
	C	-4.96419**	10/22/2008	-5.65831*	10/15/2008	-57.4769*	10/15/2008
Mexico-	C/T	-4.86797	10/17/2008	-5.69018*	11/26/2013	-57.588*	11/26/2013
Canada	C/S	-6.73285*	10/20/2008	-7.19657*	10/16/2008	-96.5549*	10/16/2008
	C	-4.30708	3/9/2007	-4.76644	12/18/2007	-33.8169	12/18/2007
	C/T	-3.58041	5/31/2006	-4.51772	3/22/2013	-31.7762	3/22/2013
Mexico-UK	C/S	-6.17382*	10/27/2008	-6.28109*	10/16/2008	-63.9837*	10/17/2008
Turkey-Israel	C	-4.78481***	2/12/2008	-5.49633*	4/5/2010	-57.5742*	4/5/2010

	C/T	-5.31714**	11/9/2013	-5.95031*	9/12/2013	-68.563*	9/12/2013
	C/S	-4.86847***	10/19/2011	-5.93128*	7/17/2012	-66.0621*	7/17/2012
	C	-4.8059**	8/8/2012	-5.00934**	8/8/2006	-49.3368**	8/8/2006
Turkey-Skorea	C/T	-5.38593**	5/14/2007	-5.46233*	11/5/2007	-58.4134*	11/5/2007
	C/S	-4.80382***	8/8/2012	-5.01231**	4/10/2006	-49.4726**	4/10/2006
	C	-5.24313*	12/30/2008	-5.49125*	10/14/2008	-59.4164*	10/14/2008
Turkey-Canada	C/T	-5.14724**	12/27/2013	-5.21171**	9/12/2013	-53.6076**	9/12/2013
	C/S	-5.27003**	12/30/2008	-5.49287*	10/14/2008	-59.4213*	10/14/2008
	C	-4.52275***	10/21/2008	-4.89167**	10/16/2008	-42.4956**	10/16/2008
	C/T	-4.41337	5/6/2013	-4.71814	11/7/2013	-42.9649	11/7/2013
Turkey-UK	C/S	-5.36502**	10/21/2008	-5.7393*	10/16/2008	-59.2038*	10/16/2008
	C	-4.10223	12/18/2012	-4.12302	12/20/2012	-30.025	12/20/2012
	C/T	-5.22717**	3/11/2005	-5.12108**	3/15/2005	-46.4991***	3/14/2005
Czech-Israel	C/S	-4.79535***	3/6/2009	-4.98117	11/19/2008	-45.7719***	11/19/2008
	C	-3.39627	12/6/2004	-4.0544	8/9/2010	-28.872	8/9/2010
	C/T	-4.61511	8/5/2004	-4.90168	10/1/2004	-45.328***	10/1/2004
Czech-Skorea	C/S	-4.07611	3/11/2009	-4.87033	10/24/2008	-46.0583***	10/24/2008
	C	-3.72446	4/3/2013	-4.53216	4/10/2013	-35.5695	4/10/2013
Czech-Canada	C/T	-4.68974	10/17/2008	-5.32616**	9/16/2008	-48.7131**	9/16/2008
	C/S	-5.09417**	12/11/2008	-6.15844*	11/20/2008	-71.1984*	11/20/2008
	C	-3.68655	12/8/2004	-3.95866	1/31/2013	-26.1479	12/7/2004
	C/T	-4.41068	12/8/2004	-4.40514	12/8/2004	-36.3506	12/8/2004
Czech-UK	C/S	-5.42757**	10/15/2008	-5.81636*	10/16/2008	-54.8945**	10/16/2008

Table A 7. *Gregory and Hansen Test: Emerging market with no deviation - Emerging market with deviation*

Country		ADF	Break Date	Zt	Break Date	Za	Break Date
Brazil-Safrica	**C**	**-3.31463**	**3/28/2013**	**-3.49016**	**2/21/2013**	**-22.9615**	**2/21/2013**
	C/T	**-3.43554**	**12/10/2012**	**-3.51751**	**2/21/2013**	**-23.7499**	**2/21/2013**
	C/S	**-3.1694**	**7/19/2013**	**-3.99827**	**4/22/2009**	**-28.6649**	**3/4/2009**
Brazil-Chile	C	-5.54728*	5/25/2010	-5.65096*	5/19/2010	-62.8123*	5/19/2010
	C/T	-5.54728*	5/25/2010	-5.65034*	5/19/2010	-62.802*	5/19/2010
	C/S	-5.56092*	5/25/2010	-5.55854*	5/19/2010	-61.2552*	5/19/2010
Brazil-Hungary	C	-3.65694	7/23/2007	-4.13456	8/9/2007	-33.6722	8/9/2007
	C/T	-3.84028	12/3/2007	-4.39905	12/10/2007	-38.0894	12/10/2007
	C/S	-3.99528	11/18/2008	-4.80009	10/21/2008	-45.1132***	10/21/2008
Brazil-Thailand	**C**	**-3.22462**	**10/13/2005**	**-3.36447**	**10/3/2005**	**-22.313**	**10/3/2005**
	C/T	**-3.23968**	**6/7/2012**	**-3.47463**	**10/3/2005**	**-23.6786**	**10/3/2005**
	C/S	**-4.50059**	**1/12/2007**	**-4.8654**	**12/19/2006**	**-40.9986**	**12/19/2006**
Colombia-Safrica	**C**	**-3.72787**	**12/4/2013**	**-3.87864**	**12/9/2013**	**-23.3508**	**12/9/2013**
	C/T	**-3.81633**	**10/15/2008**	**-3.84373**	**10/8/2008**	**-22.5273**	**12/9/2013**
	C/S	**-3.6766**	**6/17/2010**	**-3.80281**	**7/1/2010**	**-21.548**	**7/1/2010**
Colombia-Chile	C	-3.93019	12/1/2004	-4.35801***	1/24/2005	-31.4641	1/24/2005
	C/T	-4.02182	5/26/2005	-4.4241	7/26/2005	-31.9454	1/24/2005
	C/S	-4.17134	8/23/2005	-4.46002	8/22/2005	-33.6605	8/22/2005
Colombia-Hungary	C	-3.20447	3/11/2005	-3.57812	10/10/2008	-21.8691	10/10/2008
	C/T	-4.12413	3/27/2015	-4.54689	3/30/2015	-38.7708	3/30/2015
	C/S	-5.40547**	11/6/2008	-5.41594**	11/21/2008	-57.8507*	11/21/2008
Colombia-Thailand	**C**	**-3.67988**	**6/24/2005**	**-3.75592**	**7/26/2005**	**-26.66**	**4/29/2005**
	C/T	**-3.82423**	**7/25/2005**	**-3.86993**	**7/26/2005**	**-28.6595**	**7/26/2005**
	C/S	**-3.89161**	**7/12/2005**	**-3.99424**	**7/12/2005**	**-3.99424**	**7/11/2005**
Mexico-Safrica	C	-4.55311***	6/26/2013	-5.28708*	6/28/2013	-48.2601**	6/27/2013
	C/T	-4.5116	6/24/2013	-5.368**	6/28/2013	-50.4752**	6/28/2013
	C/S	-4.38399	6/25/2013	-5.06702**	6/7/2009	-44.3257***	6/7/2009
Mexico-Chile	**C**	**-3.3399**	**10/10/2005**	**-4.05226**	**7/15/2013**	**-27.8698**	**7/15/2013**
	C/T	**-3.93411**	**7/10/2005**	**-4.55631**	**10/29/2008**	**-36.4708**	**4/10/2005**
	C/S	**-3.81159**	**8/16/2013**	**-3.87313**	**8/23/2013**	**-28.3165**	**8/23/2013**
Mexico-Hungary	**C**	**-3.05911**	**7/23/2008**	**-3.57391**	**10/22/2008**	**-24.415**	**10/22/2008**
	C/T	**-3.55005**	**4/8/2015**	**-4.53792**	**4/14/2015**	**-37.1235**	**7/31/2015**
	C/S	**-4.02221**	**10/28/2008**	**-4.29082**	**10/22/2008**	**-36.4951**	**10/22/2008**
Mexico-Thailand	C	-4.45157***	2/12/2005	-4.55891***	5/12/2005	-41.1214**	5/12/2005
	C/T	-4.36599	12/10/2005	-4.53859	4/10/2005	-40.5517	4/10/2005
	C/S	-4.81435***	12/6/2006	-4.98609**	8/6/2006	-47.2603**	8/6/2006
Turkey-Safrica	C	-3.70436	4/6/2004	-3.85596	4/6/2004	-29.0283	4/6/2004
	C/T	-3.78951	8/6/2004	-3.85683	4/6/2004	-29.1586	4/6/2004

	C/S	-3.85164	4/5/2006	-4.79376***	3/28/2008	-44.8304***	3/28/2008
Turkey-Chile	C	-4.13796	5/31/2013	-4.12508	1/25/2013	-33.9081	1/25/2013
	C/T	-4.71247	7/17/2008	-4.79376	3/28/2008	-44.8304***	3/28/2008
	C/S	-4.12235	5/31/2013	-4.09517	11/14/2012	-33.351	11/14/2012
Turkey-Hungary	C	-3.87429	11/26/2008	-3.99103	10/30/2008	-30.9639	10/30/2008
	C/T	-6.26066*	6/19/2015	-6.45635*	7/27/2015	-74.8904*	7/27/2015
	C/S	-4.55324	3/23/2009	-4.7986	3/16/2009	-44.3896	3/16/2009
Turkey-Thailand	C	-5.57329*	5/18/2005	-5.75802*	7/8/2005	-59.7681*	7/8/2005
	C/T	-5.52515*	5/20/2005	-5.61935*	7/8/2005	-57.5862*	7/8/2005
	C/S	-5.85758*	8/9/2005	-5.99421*	7/8/2005	-62.8092*	7/8/2005
Czech-Safrica	**C**	**-4.10709**	**3/14/2005**	**-4.01893**	**3/14/2005**	**-30.8414**	**3/14/2005**
	C/T	**-4.43099**	**12/10/2004**	**-4.52801**	**12/7/2004**	**-36.5116**	**12/7/2004**
	C/S	**-4.3571**	**5/12/2008**	**-4.51328**	**3/3/2009**	**-35.4241**	**5/15/2008**
Czech-Chile	C	-3.39297	12/6/2004	-4.60885	1/18/2010	-36.426	1/18/2010
	C/T	-4.56833	12/3/2004	-4.96299	12/7/2004	-45.7225***	12/7/2004
	C/S	-3.78869	1/15/2010	-4.40595	1/18/2010	-36.5583	1/18/2010
Czech-Hungary	C	-2.67788	11/9/2004	-3.26619	12/8/2004	-18.9678	12/8/2004
	C/T	-3.91675	12/6/2004	-4.01571	12/8/2004	-30.5957	12/8/2004
	C/S	-4.0902	11/19/2008	-4.70729***	10/23/2008	-44.0036***	10/23/2008
Czech-Thailand	**C**	**-4.00591**	**12/8/2004**	**-3.98406**	**12/7/2004**	**-29.7789**	**12/7/2004**
	C/T	**-4.47177**	**3/14/2005**	**-4.39261**	**3/14/2005**	**-37.3051**	**3/14/2005**
	C/S	**-4.11348**	**12/6/2004**	**-4.14975**	**12/8/2004**	**-34.2331**	**12/8/2004**

Table A 8. Gregory and Hansen Test: *Developed with deviation-Emerging markets with deviation*

Country		ADF	Break Date	Zt	Break Date	Za	Break Date
Brazil-Iceland	C	-3.517739	11/12/2008	-3.7448	10/21/2008	-27.9368	10/21/2008
	C/T	-4.114734	10/24/2008	-4.76161	10/21/2008	-45.0741	10/21/2008
	C/S	-5.524997*	10/24/2008	-6.36088*	10/21/2008	-78.4918*	10/21/2008
Brazil-Sweden	C	-3.411156	4/9/2013	-3.72592	6/19/2013	-19.5186	6/19/2013
	C/T	-4.035091	11/30/2007	-4.32788	11/23/2007	-27.2327	3/5/2013
	C/S	-4.326595	11/21/2008	-4.91036***	1/16/2008	-37.248	10/22/2008
Brazil-Poland	C	-4.409043	3/19/2008	-4.83598	11/16/2007	-45.2445**	11/16/2007
	C/T	-4.192589	3/20/2008	-4.66333	11/16/2007	-42.6839	11/16/2007
	C/S	-4.132717	3/7/2008	-5.11727**	1/16/2008	-49.3884**	1/16/2008
Brazil-Norway	**C**	**-2.801218**	**11/4/2005**	**-2.90348**	**10/3/2005**	**-16.252**	**10/3/2005**
	C/T	**-3.961653**	**8/21/2008**	**-4.05267**	**9/18/2008**	**-29.7506**	**3/5/2013**
	C/S	**-4.132537**	**3/5/2009**	**-4.58076**	**11/20/2008**	**-39.7963**	**11/20/2008**
Colombia-Iceland	C	-3.9661	10/24/2008	-4.28583	9/10/2008	-35.0483	9/10/2008
	C/T	-5.166*	10/24/2008	-5.86604*	9/10/2008	-67.3697*	9/10/2008
	C/S	-7.112097*	10/24/2008	-7.5675*	10/16/2008	-112.99*	10/16/2008
Colombia-Sweden	C	-4.404759***	6/10/2014	-4.41811***	6/10/2014	-24.0411	9/12/2013
	C/T	-4.292371	5/13/2008	-4.30745	9/12/2013	-27.9966	9/12/2013
	C/S	-5.573337*	10/29/2008	-5.45853**	10/27/2008	-41.3454	11/21/2008
Colombia-Poland	C	-5.187502*	10/28/2008	-5.36494*	9/16/2008	-55.0649*	9/16/2008
	C/T	-4.84957***	9/17/2008	-5.15263***	9/16/2008	-49.8192***	9/16/2008
	C/S	-5.516781*	10/28/2008	-5.66508*	10/24/2008	-61.974*	10/24/2008
Colombia-Norway	C	-3.21113	8/24/2005	-3.31256	8/10/2008	-16.989	8/26/2005
	C/T	-4.940101***	8/20/2008	-5.25079**	9/16/2008	-44.0048***	9/16/2008
	C/S	-4.66467	12/16/2008	-4.70163***	11/20/2008	-37.8414	11/20/2008
Mexico-Iceland	C	-5.85069*	6/11/2008	-6.29949*	10/21/2008	-78.5557*	10/21/2008
	C/T	-4.80408***	10/24/2008	-5.41041**	10/21/2008	-57.7155**	10/21/2008
	C/S	-6.972614*	10/24/2008	-7.62081*	10/21/2008	-114.569*	10/21/2008
Mexico-Sweden	C	-4.751836***	10/30/2007	-4.9065***	11/9/2007	-31.9451	8/14/2007
	C/T	-4.859318***	10/30/2007	-5.02759***	11/22/2007	-36.9954	6/27/2013
	C/S	-6.701428*	2/21/2008	-6.88015*	1/15/2008	-60.8844*	1/15/2008
Mexico-Poland	C	-3.381005	9/30/2008	-3.58051	10/23/2008	-25.2824	10/23/2008
	C/T	-4.402908	11/2/2008	-5.91731*	7/2/2008	-64.6444*	7/2/2008
	C/S	-4.684472***	2/27/2009	-4.80725***	2/26/2009	-45.373***	2/26/2009
Mexico-Norway	C	-3.887947	11/1/2007	-4.44704***	12/27/2007	-32.7085	12/14/2006
	C/T	-4.839555***	8/20/2008	-5.56678*	9/17/2008	-52.642*	9/17/2008
	C/S	-5.847378*	10/27/2008	-6.23903*	10/17/2008	-71.0186*	10/17/2008
Turkey-Iceland	C	-6.794107*	11/7/2008	-6.64924*	10/15/2008	-86.4589*	10/15/2008

	C/T	-5.461586*	11/5/2008	-5.5589*	10/15/2008	-60.6615*	10/15/2008
	C/S	-5.461586*	11/5/2008	-5.5589*	10/15/2008	-60.6615*	10/15/2008
Turkey-Sweden	C	-4.569045***	8/20/2007	-4.79768**	9/26/2007	-38.3829	9/26/2007
	C/T	-5.558266*	9/30/2013	-5.5686*	11/12/2013	-58.0078*	11/12/2013
	C/S	-5.069279**	2/2/2009	-5.34038**	10/15/2008	-46.8746***	10/15/2008
Turkey-Poland	C	-3.32506	5/29/2009	-3.76494	2/6/2009	-26.3498	5/29/2009
	C/T	-6.460275*	6/17/2009	-6.5257*	5/29/2009	-79.7988*	5/29/2009
	C/S	-4.238536	7/9/2009	-4.96972**	7/7/2009	-45.4856***	7/7/2009
Turkey-Norway	C	-4.808145**	10/15/2008	-4.79141**	10/16/2008	-45.2936**	10/16/2008
	C/T	-5.353302**	10/15/2008	-5.36175**	10/16/2008	-56.4949**	10/16/2008
	C/S	-5.359472**	4/10/2009	-5.41418**	4/10/2009	-57.5385*	4/10/2009
Czech-Iceland	C	-3.596602	12/6/2004	-3.73224	12/8/2004	-26.3833	12/8/2004
	C/T	-5.106436**	10/27/2008	-5.9982*	10/9/2008	-70.8616*	10/9/2008
	C/S	-6.107759*	10/24/2008	-7.19275*	10/16/2008	-102.233*	10/16/2008
Czech-Sweden	C	-4.159091	2/5/2013	-4.41554	2/5/2013	-27.7014	12/7/2004
	C/T	-4.823365***	12/3/2007	-4.78547***	11/26/2007	-36.8194	12/8/2004
	C/S	-5.414684**	10/8/2008	-5.61564*	10/24/2008	-46.4821***	10/24/2008
Czech-Poland	**C**	**-3.198462**	**12/1/2004**	**-3.9152**	**12/7/2004**	**-28.3487**	**12/7/2004**
	C/T	**-4.205885**	**12/10/2004**	**-4.49589**	**12/7/2004**	**-38.5101**	**12/7/2004**
	C/S	**-3.129004**	**11/11/2008**	**-3.94761**	**10/24/2008**	**-29.7711**	**10/24/2008**
Czech-Norway	C	-3.642103	12/8/2004	-4.08683	12/19/2012	-26.693	12/19/2012
	C/T	-4.71013	7/17/2008	-4.87453***	7/25/2008	-37.0259	7/25/2008
	C/S	-5.096454**	11/24/2008	-5.49071*	10/24/2008	-54.6393**	10/24/2008

Table A 9. Gregory and Hansen Test: *Emerging Markets with deviation among each other*

Country		ADF	Break Date	Zt	Break Date	Za	Break Date
Colombia-Brazil	**C**	**-3.409382**	**6/9/2010**	**-4.014349**	**2/11/2011**	**-26.04336**	**2/11/2011**
	C/T	**-3.551645**	**3/28/2011**	**-4.131551**	**5/3/2011**	**-28.02931**	**5/23/2011**
	C/S	**-3.665721**	**7/2/2010**	**-3.811284**	**8/8/2011**	**-25.02373**	**8/8/2011**
Colombia-Mexico	**C**	**-3.831101**	**1/26/2015**	**-3.872674**	**12/19/2014**	**-27.17837**	**12/19/2014**
	C/T	**-3.957928**	**10/31/2008**	**-4.109427**	**10/10/2008**	**-30.23402**	**10/10/2008**
	C/S	**-3.80118**	**1/28/2015**	**-3.823996**	**12/19/2014**	**-26.48059**	**12/19/2014**
Colombia-Turkey	C	-5.314158*	11/4/2014	-5.479766*	11/3/2014	-49.81074	11/3/2014
	C/T	-5.800867*	5/29/2008	-5.91483*	7/28/2008	-56.66676*	7/28/2008
	C/S	-5.482312*	11/4/2014	-5.530065*	11/20/2008	-53.09818**	11/20/2008
columbia-czch	C	-4.269572	6/11/2010	-4.338943	7/1/2010	-36.35652***	7/1/2010
	C/T	-4.13177	10/26/2009	-4.134196	5/7/2010	-33.40459	5/7/2010
	C/S	-4.648196	7/9/2009	-4.664389	7/7/2009	-42.42285***	7/7/2009
Mexico-Brazil	C	-4.204856	4/12/2012	-5.015831**	6/4/2012	-46.47242**	6/4/2012
	C/T	-3.382681	2/20/2012	-4.812691***	4/12/2012	-40.64888	4/12/2012
	C/S	-4.669353	6/4/2012	-5.218354**	10/4/2011	-52.29151**	10/4/2011
Mexico-Turkey	C	-6.990032*	8/7/2006	-7.405906*	8/7/2006	-100.2574*	8/7/2006
	C/T	-6.859608*	8/7/2006	-7.34787*	8/7/2006	-98.0432*	8/7/2006
	C/S	-7.284488*	8/30/2006	-7.590021*	8/7/2006	-106.7764*	8/7/2006
Mexico-Czech	C	-3.08271	7/18/2011	-3.559469	9/20/2011	-24.65065	9/20/2011
	C/T	-3.910507	10/23/2009	-4.800618***	10/23/2009	-44.24812***	10/23/2009
	C/S	-5.500808*	2/27/2009	-6.198153*	7/6/2009	-75.39269*	7/6/2009
Brazil-Turkey	C	-4.402408***	8/3/2012	-4.457355***	9/10/2012	-38.99798***	9/10/2012
	C/T	-4.579154	12/12/2007	-4.688999	1/14/2008	-41.23544	1/14/2008
	C/S	-4.308009	9/5/2012	-4.638678	3/11/2009	-41.20078	3/11/2009
Brazil-Czech	C	-3.125908	6/9/2009	-4.587273***	7/6/2009	-37.26613***	7/6/2009
	C/T	-4.02295	12/15/2004	-5.183181**	12/9/2004	-49.69158**	12/9/2004
	C/S	-3.840887	2/24/2009	-5.162236**	2/19/2009	-48.6167**	2/19/2009
Turkey-Czech	C	-5.344137*	7/3/2009	-5.914027*	7/7/2009	-63.63082*	7/7/2009
	C/T	-3.325668	5/17/2012	-3.88779	8/2/2010	-26.57914	5/18/2012
	C/S	-4.620452	2/8/2008	-4.571768	12/20/2007	-37.32338	12/20/2007