University of Economics, Prague

Faculty of Finance and Accounting

Finance and Accounting

MASTER THESIS

Dynamics of Exchange Rates in Selected Emerging Markets in Risk-on/Risk-off Periods

Author: Bc. David Ivanov

Thesis supervisor: doc. Ing. Karel Brůna, Ph.D.

Academic year: 2016/2017

Declaration of Authorship

The author hereby declares that he compiled this thesis independently, using only the listed resources and literature, and the thesis has not been used to obtain a different or the same degree.

The author grants to University of Economics in Prague permission to reproduce and to distribute copies of this thesis document in whole or in part.

Prague, May 2017 Signature

Acknowledgement

I would like to express my sincere gratitude to my supervisor doc. Ing. Karel Brůna, Ph.D. for the continuous support, for his patience, motivation, and immense knowledge. His guidance helped me all the time in my research and writing of this thesis.

Abstract

This thesis focuses on exchange rates dynamics in Mexico, Turkey and South Korea. We examine the capital flow development in mentioned countries and currency dynamics of the Mexican Peso, Turkish Lira and Korean Won. The main goal of the paper is to evaluate the performance of these currencies in risk-on and risk-off episodes on a sample period from 1997 until 2016. We use analysis and comparison as a methodology for this paper, emphasizing on the relationship and causality between capital flow and exchange rates. We shall reveal that the examined currencies depreciate in risk-off periods and only the Korean Won appreciates in risk-on periods.

Key words: Exchange Rates, Risk-On/Risk-Off, Balance of Payments, Capital Flow, Emerging Markets

JEL classification: F31, F32, F33, G01, G10

List of Abbreviations:

BIS ..... Bank for International Settlements
BoJ ..... Bank of Japan
BoK ..... Bank of Korea
BoP ..... Balance of Payments
BPM6 ..... Balance Payments Manual, sixth edition
CA ..... Current Account
CBOE ..... Chicago Board Options Exchange
CBRT ..... Central Bank of the Republic of Turkey
CPI ..... Consumer Price Index
ER ..... Exchange Rate
EM ..... Emerging Market
FA ..... Financial Account
FDI ..... Foreign Direct Investment
FPI ..... Foreign Portfolio Investment
FX ..... Foreign Exchange
GDP ..... Gross Domestic Product
HDI ..... Human Development Index
IIP ..... International Investment Position
IMF ..... International Monetary Fund
IRP ..... Interest Rate Parity
M&A ..... Mergers and Acquisitions
MA ..... Moving Average
MNE ..... Multinational Enterprise
NEER ..... Nominal Effective Exchange Rate
OI ..... Other Investment
OTC ..... Over-The-Counter
PPP ..... Purchasing Power Parity
RA ..... Reserve Assets
RW ..... Random Walk
TA ..... Technical Analysis
TR ..... Taylor's Rule
UIRP ..... Uncovered Interest Rate Parity
UNCTAD ..... United Nations Conference on Trade and Development

Table of Contents

Introduction

This paper focuses on the behaviour of three emerging market (EM) currencies during risk-off and risk-on periods. Author's motivation for choosing such topic is the rising importance of exchange rates in today's globalised economy and emerging markets, as well as providing more economic rather than econometric approach. The applied methodology is analysis (relationship and causality) and comparison, in which the core part is based on analytical research using both quantitative and qualitative measures. The geographical locations of selected countries are completely different, helping us to avoid positive correlation caused by geographical similarities. The currencies chosen are the Mexican Peso, the Turkish Lira and the Korean Won. These currencies are closely connected to three major markets (U.S., European, Asian). We set three main goals of this paper: (i) investigate the causality between capital flow and exchange rates, (ii) measure performance of selected currencies and (iii) test our hypothesis. The first one says that the EM currencies shall depreciate in the time of a financial turmoil (risk-off periods), the alternative hypothesis is that the EM currencies do not depreciate at that time. The second hypothesis is that EM currencies appreciate at the time of low volatility (risk-on periods). The alternative hypothesis is no H_0.

The work is divided into two major parts. The first part consists of chapters one and two and sets the theoretical background, which is then used in the empirical part. Chapter one is an introduction to the financial markets and fundamental exchange rate determinants such as the interest rate parity, purchasing power parity and the Balance of Payment theory. Second chapter deals with the capital flow and setting the risk-off events and risk-on/risk-off episodes. Chapters three, four and five are then focused on Mexico, Turkey and South Korea. In these three chapters, we firstly do a research of the exchange rate regime, local economic crises and the Current Account balance. These three factors have a very significant impact on the capital flow and especially on the exchange rate development. Then we focus on the examination of the financial account and the performance of the individual EM's currency. The practical part is then finalized by a chapter that concludes out findings and compares the performance of the EM's currencies.

1 Theory Behind Exchange Rates Dynamics

This chapter shall introduce the topic of exchange rates (ER) to the readers of this paper. The first subchapter shall acquaint the reader with some basics of exchange rates and financial market and highlight their importance in modern economy. This introduction will be followed by a detailed explanation of two main concepts of ER, Purchasing Power Parity and Interest Rate Parity. Next, we will bring the topic of market efficiency and the approach developed by Eugene Fama in 1970's. In that sub-chapter, ER forecasting will be also discussed. The last part of this chapter will be dedicated to the balance of payment as its detailed examination in the selected countries is the core aim of this paper.

1.1 Introduction to Exchange Rates and Financial Markets

Copeland (2000) defines exchange rate simply as a price. It is a price of one currency that an entity has to pay to get a certain amount of other currency. Therefore, it is the same concept as a price of a book or gold. Contrary to the simple definition of ER, the foreign exchange (FX) market is quite complex. Therefore, we will use next paragraphs to briefly describe the FX market based on the participants, trading places and transactions.

According to Eun and Resnick (2012), financial markets can be divided by participants into 2 tier groups. The first group is the wholesale (interbank market), where international banks can be seen as the core of financial markets as they exercise the majority of transactions that are settled on FX market. The other tier group is the retail/client market. Moreover, Witzany (2012) describes particular entities that are mainly present on the foreign exchange market. In the following table, you can see the list of these entities and their main purpose of participation.

Table 1: Main Participants of International Financial Markets

Entity	Main purpose
Exporting and importing firms	Money exchange, hedging
Multinational corporations	Foreign direct investments, hedging
Private and institutional investors	Portfolio investments
Commercial and investment banks	Exchange intermediaries
Central banks	Regulation and interventions

Source: International Financial Markets (Witzany, 2012)

Witzany (2011) and many other authors also divide FX market into OTC (Over-the-Counter) market and Trade Exchange. Contracts on OTC market are directly entered between any two market participant, for example a bank and its client or between two banks or they can be

mediated through brokers. This market is very flexible and not as regulated as Trade Exchange. However, in recent years there is raising pressure on increasing the regulation in order to protect customers. We will focus only on the OTC market as all entities that we are concerned about are present there.

It is also crucial to distinguish between different types of exchange rates quotations. Most of the sources, including Eun and Resnick (2012) reveal that ER can be quoted in direct or indirect terms. This division is based on the country perspective. From a U.S. perspective, the price of one unit of the foreign currency in USD is called a direct quotation. For example, in February 2017 we could exchange 1 USD for 25 CZK on the spot market. Therefore, an exchange rate of 25 CZK/USD would be a direct quotation from the perspective of a Czech company. If we go back to the perspective of a U.S. company, the price of one USD in the foreign currency is called indirect quotation. The ER of 25 CZK/USD would be an indirect quotation from a perspective of a U.S. company.

It would be quite difficult to use either direct or indirect quotation as we would have to permanently clarify, from which counterparty position we are quoting the ER. Therefore, we will use international conventions, which are used on financial markets. In case of a quotation A1/A2, these conventions refer to the A1 as to a base currency and to A2 as to a foreign currency. To make it clear, please see next three examples (these examples are made in accordance with international conventions):

- 1.065 EUR/USD means 1.065 USD for 1 EUR
- 1.24 GBP/USD means 1.24 USD for 1 GBP
- 0.86 EUR/GBP means 0.86 GBP for 1 EUR

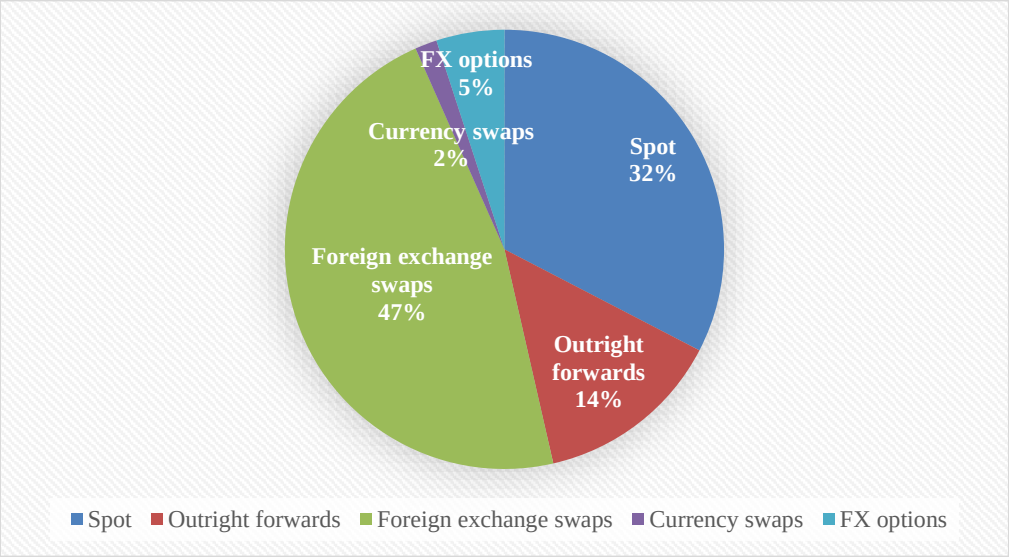
According to these conventions, the base currency is set based on the "maturity" of the currency. The Following list represents currencies' maturity. The currency that is higher on that list is always quoted as a base currency.

1. Euro
2. British pound and the other currencies of the Commonwealth
3. US Dollar

The history of exchange rates goes together with the history of currencies in general. According to Chown, the silver drachma coined in ancient Athens in the 5th century B.C. can be viewed as first international money. Dwyer Jr. And Lothian add that the gold aureus and silver denarius coined in ancient Rome became the successor of drachma (in the era of Augustus). Aureus and denarius were used not only in the Mediterranean region, but also throughout the whole Europe and even in Asia.

In the previous paragraph, we pointed out that the history of international currencies is very old. However, the focus of this paper is not the history, but the most recent situation and development. To highlight the importance of exchange rates, we can review the statistics provided by the Bank for International Settlements (BIS). In April 2016, BIS revealed a statistic, according to which the daily average turnover on over-the-counter market was 5,067 billion US dollars. The pie graph (1) shows components of this daily turnover.

Graph 1: Daily average turnover on OTC market



Source: Bank for International Settlements

To put it in a broader context, the world merchandise trade in the whole year 2015 according to World Trade Statistical Review published by World Trade Organization was slightly above 16,000 billion USD. Thus, a yearly turnover of merchandise trade is just slightly above 3-day average on FX market. Statistics of BIS also show extremely high importance of US Dollar as it comprises 88% of the daily turnover on OTC market, followed by Euro (31%) and Japanese Yen (22%). When we sum up USD and EUR, we come to a figure that already exceeds 100%. These statistics records every transaction as a double entry. In case of an exchange of USD to EUR, the statistics records the amount of the transaction in both currencies.

Exchange Rates Regimes

To a large extent, the capital inflow to a certain country and investor behaviour is determined by the ER regime of that country. In this section, we will provide a brief overview of ER regimes based on the classification of the International Monetary Fund. A more detailed description will be added when examining selected countries.

Table 2: Classification of Exchange Rate Arrangements

Type	Categories				
Hard pegs	Exchange arrangement with no separate legal tender	Currency board arrangement			
Soft pegs	Conventional peg	Pegged exchange rate within horizontal bands	Stabilized arrangement	Crawling peg	Crawl-like arrangement
Floating regimes	Floating	Free floating			
Residual	Other managed arrangement				

Source: Annual Report on Exchange Rate Arrangements and Exchange Restrictions 2014

Hard pegs and *soft pegs* are frequently called fixed rates. Under these regimes, the domestic currency is pegged/fixed to either a foreign currency (mostly USD), currency basket, or a commodity. The Bretton-Woods system is a perfect example. This system was enforced after the World War II and lasted until the year 1972. Under the Bretton Wood system, each country was responsible for maintaining ER in a 1% band against USD parity and the USD was pegged to gold at $35 per ounce. (Eun and Resnick, 2012)

Floating and *free floating* exchange rates are mainly determined by market. Under floating regime, intervention serves to moderate the ER and prevent undue fluctuation. A free floating is an ER, where interventions are even more limited.

Other managed arrangement is a category for exchange rates systems, when the ER regime does not meet the criteria for any other categories.

1.2 Purchasing Power Parity and Interest Rate Parity

Purchasing power parity (PPP) and interest rate parity (IRP) represent two of the most known and recognised doctrines in terms of exchange rates dynamics. Both are very well documented and are mentioned in every book that relates to international finance or financial markets. If not otherwise stated, the explanation of PPP and IRP will be based on Eun and Resnick (2012) and Copeland (2000).

Purchasing Power Parity

The original idea of purchasing power parity can be tracked back to the 16th century. At that time, Spain experienced a high domestic inflation and depreciation of the Spanish escudo against foreign currencies. This event brought the idea of PPP to the scholars at the University of Salamanca (Spain). However, the doctrine was formulated and popularized in the 1920s by the Swedish economist and professor Gustav Cassel. During that time, countries like Germany, Hungary or the Soviet Union were hit by hyperinflation. Consequently, their domestic currencies depreciated sharply against stable currencies like USD.

Purchasing power parity is connected to the law of one price. This law is based on a hypothesis that if two goods are identical, they must be for sale for the same price. The question is, how we ensure that these goods are sold for the same price in different locations/markets. Traders or more precisely arbitrageurs are those subjects who exploits price variations and earn profit by buying goods on undervalued market and sell it on overvalued one. They continue doing so to the point when prices are equal on both markets. On the other hand, there are many shortcomings of arbitrage. For instance, the arbitrageurs have to take transaction costs into account. Moreover, there are many non-tradable goods and especially services. These goods and services cannot be relocated and therefore the arbitrage is not possible.

Absolute purchasing power parity is the above-mentioned law of one price applied internationally to a commodity basket. Thus, the exchange rate between currencies of two countries should be equivalent to the countries' price levels. We can demonstrate the PPP principle on an example of the UK and the USA. If a standard commodity basket would cost $150 in the U.S. and £100 in the UK, then the GBP/USD exchange rate should be 1.5 (one pound is equal to 1.5 dollar). In a case that the ER and the PPP ER would differ, the arbitrageurs would enter the market and set a new equilibrium. Mathematically, we can express it by the following equation:

$$P_{\$} = S * P_{£}$$

- S is the dollar price of one pound
- $P_{£}$ is commodity basket price in pounds
- $P_{\$}$ is commodity basket price in dollars

We have already mentioned transactions costs and non-tradable goods and services as shortcomings of this theory. Moreover, PPP is international application of the law of one price and therefore we should anticipate even larger transaction costs and additional barriers like different tax regimes, tariffs or cost of living differences.

Relative purchase power parity compares inflation rate, usually the consumer price index (CPI) between given countries and represents the "rate of change" between time T and T-1. *Relative PPP declares that country's inflation rate can be higher than other country´s inflation rate to the extent that its exchange rate depreciates and vice versa*. This hypothesis/law is very important in international trade. In case of higher inflation rate of country A compared to country B and zero or marginal ER change, companies from country B would gain competitive advantage against those from country A. This is due to rising prices in country A, which would negatively affect its export. The depreciation of currency A would resolve this imbalance and set the market back into its equilibrium. Let's consider an example in which the inflation rate in the U.S. is 2% and in the U.K. is 5%. If relative PPP holds, then the British Pound would depreciate against the American Dollar. The level of GBP depreciation can be calculated based on the following equation,

$$1 + e = (1 + \pi_{£})/(1 + \pi_{\$})$$

$$1 + e = 1.05/1.02$$

$$e = 2.94\%$$

- e is level of ER change
- $\pi_{£}$ is inflation rate in the U.K.
- $\pi_{\$}$ is inflation rate in the U.S.

Thus, if relative PPP holds, then the GBP would depreciate by 2.94% per year against the USD. In case of low inflation rate, the ER change can be simply calculated by subtracting one inflation rate from the other one. In our example, this approach would lead us to the ER change of 3%.

The PPP doctrine has important implications for international trade and on countries' balance of payment (BoP). In the empirical part, we will be deeply focused on the examination of BoP. Therefore, it is crucial to understand the PPP deviations, real exchange rate and the

effect on BoP. There are many indices based on which we can measure the PPP deviation. Probably the most known one is the Big Mac Index. This index compares prices of Big Mac between a given country and the base country (usually the U.S.). The index is regularly updated by The Economist. The following example will be based on the January 2017 data. At that time, the average price for a Big Mac was $5.06 in the U.S. and £3.09 in the U.K. When we consider the standard commodity basket to consist only of Big Mac and assume that the absolute PPP holds, then we would get the exchange rate 1.6375 GBP/USD. This ER is also known as the real exchange rate as it compares the price of foreign and domestic goods and services. However, the actual exchange rate at that time was 1.2048 GBP/USD. When we calculate the price of a Big Mac in the U.K. based on actual ER ($3.72) and divide it by the real ER ($5.06), we get to the conclusion that the British Pound was undervalued by 26.5%. To the large extent, such a high deviation number is due to a significant depreciation of the British Pound after the so-called Brexit decision.

On the other hand, the PPP deviations that are based on the price of one commodity can be highly inaccurate when comparing whole economies. Therefore, for the purpose of this thesis a deviation calculated based on the inflation rates differential will be much more appropriate. In case of deviations from PPP, we use the term real exchange rate. The real exchange rate changes, when the relative PPP theory does not hold. This happens when the nominal exchange rate does not completely compensate the inflation rate differential. The change in real exchange rate affects the international competitiveness of countries. To measure the change of competitive position, we firstly calculate the "q" as shown in the following equation and then we compare it to 1. This may result into 3 scenarios:

- $q = 1 \rightarrow$ competitiveness of the domestic country stays unchanged
- $q > 1 \rightarrow$ competitiveness of domestic country decreases
- $q < 1 \rightarrow$ competitiveness of domestic country improves.

$$q = \frac{1 + \pi_{\$}}{(1 + e)(1 + \pi_{£})}$$

If we go back to the example mentioned in the section about relative PPP, where inflation rate was 5% in the U.K. and 2% in the U.S. and assume that the British Pound depreciated only by 1%, we get to q equal to 0.98. In these terms, the competitiveness of British companies on the international market decreased against those that operate in the U.S. as prices are relatively

higher in the U.K. than in the U.S. Consequently, the export of British companies could diminish and import to U.K. increase, which would impact the trade deficit and overall balance of payment.

Interest Rate Parity

The core principle behind the *interest rate parity (IRP)* is quite connected to the purchasing power parity. The law of one price, arbitrage and differentials between countries (not inflation but interests) are essential fundamentals of this theorem. Levich (2011) mentions that the origins of IRP can be tracked back to the time of David Ricardo or David Hume, in early 19th century. However, he adds that the first, who popularized this theory was John Maynard Keynes in 1923. We differentiate between two IRP theorems, uncovered and covered. Although they are very closely linked with each other.

Uncovered interest rate parity is based on arbitrage condition that must hold, otherwise international financial markets would not be in equilibrium. In our case, we will assume that all interest rates are linked to a default-free instruments, e.g. U.S. Treasury notes. Hence, we take the risk premium out of the "equation". Investors started to consider investing on foreign markets due to growth of international financial markets. Beforehand, we could decide purely on the domestic interest rate. However, when investing on foreign markets, we should base our decision on foreign interest rate, exchange rate at time T and exchange rate at time T+1 as all these variables determine the overall profitability. Financial markets are in equilibrium when expected profitability of domestic and foreign markets is equal. *In other words, the domestic interest rate can be higher than the foreign one by an amount equal to the expected depreciation of the domestic currency and vice versa*. The equilibrium can be mathematically expressed as follows,

$$\frac{(1+i_{\$})}{(1+i_{£})} = \frac{ER_{T+1}}{ER_T}$$

or

$$(1+i_{\$}) = \frac{ER_{T+1}}{ER_T}(1+i_{£})$$

For instance, assume the interest rate in the U.S. is 2%, in the U.K. is 5% and the spot ER (current exchange rate) 1.25 GBP/USD. Then the expected ER at time T+1 must be equal to 1.2142 for the interest rate parity to hold. We always refer to the ER_{T+1} as to an expected ER

in case of uncovered IRP. Thus, we refer to the investors as to speculators. In case the speculator expects the ER_{T+1} to be lower (higher depreciation of GBP), then he would take the following steps:

1) Borrow money in the U.K. (this action puts pressure on increase of interest rates in the U.K.)

2) Exchange GBP to USD and deposit in the U.S. (increases demand for USD and supply of GBP, which may result in immediate appreciation of USD at time T)

3) At time T+1 withdraw USD, then exchange to GBP, pay the loan and if the expectations meet reality, the speculator would earn profit

Covered interest rate parity is based on the same principle as uncovered IRP with one, but crucial change. Instead of "expected ER" we refer to the ER_{T+1} as to a forward price. Hull (2012) defines a forward as an agreement that obliges the holder to buy or sell an asset for a predetermined delivery price at a predetermined future time. Thus, the ER at time T+1 is known and the investor can even calculate the actual profit from this arbitrage. These arbitrageurs set the market to equilibrium as in the case of PPP. Consider an example, where the GBP/USD forward price is mispriced in a way that the GBP price on the forward is cheaper than the one calculated based on IRP. In that case, the arbitrageur would take the following steps,

1) Borrow money in the U.K.

2) Buy GBP on forward at a delivery time T+1

3) Exchange GBP to USD and deposit in the U.S.

4) At time T+1 withdraw the deposit, exercise the forward, pay back the loan in GBP and earn profit

Since every arbitrageur would follow this strategy, the financial markets would have to adjust due to change in supply and demand. Consequently, following adjustments to IRP variables would occur,

1) Increase of interest rate in the U.K.

2) Decrease of interest rate in the U.S.

3) Appreciation of USD on the spot market

4) Depreciation of USD on the forward market

1.3 Market Efficiency and Forecasting

In the previous chapter, we explained two major approaches for exchange rates dynamics. According to the PPP doctrine, exchange rates are adjusted in accordance with the inflation rate differential. The crucial question for this chapter is, whether the exchange rates dynamics follows one of the above-mentioned paths or if it is a mixture of them or if there are any other variables that determine the ER.

To understand the exchange rate dynamics as well as the impact of market efficiency on capital market, we cannot think about currencies (and money as general) only as a medium of exchange. Currencies are also assets that speculators and arbitrageurs invest in. From this point of view, there is no major difference between exchange rates and shares or capital markets and FX markets. Therefore, the following hypothesis that was originally developed for capital markets is also applicable to FX markets.

Efficient Market Hypothesis

In 1965, a Ph.D. student Eugene Fama wrote a dissertation *The Behavior of Stock-market prices*. Fama (1965) defines efficient market as a market where are large numbers of rational profit-maximizers actively competing to predict future market values of securities and where important current information is freely available to all participants. Furthermore, the competition among the many participants leads to a situation when, at any point in time, actual prices of securities already reflect every information that has occurred and every information that market expects to take place in future. Fama (1970) formulated the following three forms of market efficiency:

- Weak form, where prices of securities reflect all past data
- Semi-strong form, where prices of securities reflect all publicly available data
- Strong form, where prices of securities reflect all data, even the publicly unknown

In 1900, Louis Bachelier, a French mathematician, successfully defended his dissertation *The Theory of Speculation*. Courtault et al. (2000) consider Bachelier's work as the birthdate of mathematical finance. This thesis is also considered as a cornerstone of *random walk*, a theory that describes the price changes on efficient markets. Fama (1965) defines random walk

market as a market, where successive price changes of securities are independent. Simply said, the theory of random walks means that a series of stock price changes has no memory.

Nowadays, we distinguish between three approaches of exchange rates forecasting, technical analysis, fundamental analysis and methods developed by behavioural finance. Following subchapters will be dedicated to these approaches with the main focus on fundamental analysis as the closest one to this thesis topic.

Technical analysis

Neely and Weller (2012) mention technical analysis (TA) as a method, which can be tracked back to 1700. However, it was Charles Dow, who popularized it by proposing the so-called Dow Theory in Wall Street Journal at the beginning of 20th century. Fama (1965) refers to professionals using technical analysis as "chartists" due to a frequent usage of charts. These chartists are attempting to predict the future behaviour of price series based on the past behaviour. Technical analysis was originally developed for the stock market. However, it was largely adopted by traders on FX market. Park and Irwin (2007) conclude that TA is profitable on FX and commodity futures market, but not on stock markets.

Neely and Weller (2012) describe three traditional technical rules used on FX market: filter, double moving average (MA), and channel. A filter produces a buy/sell signal whenever the ER rises/falls by more than a given percentage from its most recent low/high. Size of the filter is essential in this method. Typically, the filter is set between 0.5% and 10%. Setting a low filter size may result in producing many fake signals, whereas a high filter size may limit profit due to a time gap between a trend change and a signal. A moving average rule compares two moving averages of past prices (exchange rates). For instance, MA (5,20) compares 5-day and 20-day MA. According to the channel rule we buy the asset when its price exceeds the maximum over the previous days and vice versa. Recently technicians developed even more rules like relative strength indicator (RSI) or moving average convergence divergence (MACD).

If we confront the technical analysis and Fama's efficient market hypothesis, we conclude that it can be profitable only on inefficient markets.

Fundamental Analysis

Della Corte and Tsiakas (2012) mention well-known puzzles that are behind exchange rates dynamics. The first one, exchange rate disconnect puzzle, says that exchange rate movement

is based on economic fundamentals such as money supply and real output. Second, forward premium puzzle, implies that the interest rate differentials between given countries is not offset by a depreciation of the currency with higher interest rate. This puzzle violates the uncovered interest rate parity. The third puzzle is based on evidence that purchasing power parity holds in the long run. Furthermore, they point out high inconsistency of research papers that are answering the question whether the exchange rate is predictable or not. Some of them find ER predictable both in short and long term, some only in one of the time-horizon and some conclude that there is no predictability at any horizon.

In their work, Della Corte and Tsiakas, assess the short-horizon forecasting performance of widely used models, including random walk model, uncovered interest parity, purchasing power parity, monetary fundamentals and Taylor's rules. They represent empirical analysis, which is based on six predictive regressions for ER return. First regression is the random walk, which has become the benchmark in assessing exchange rate predictability. The second one is based on uncovered interest parity that was already explained in previous subchapters. Interestingly enough, they mention three research papers proving that high interest currencies tend to appreciate rather than to depreciate due to a trading strategy called "carry trade". The third regression is the implication of PPP hypothesis, stating that national price levels should be equal when expressed in a common currency. Monetary fundamentals are represented by domestic money supply as a function of domestic price level, domestic national income and domestic nominal interest rate. Theoretically, the money supply shall increase with higher price level and national income and decrease with the raising interest rate. In the fourth regression, they suggest that a deviation of the nominal exchange rate from its long-term equilibrium will require the ER to move in the future so that to converge toward its long-term equilibrium. Taylor's rule says that the country's authority (usually central banks) set short-term nominal interest rate based on target interest rate, output gap (deviation of actual GDP from the potential level), deviation between actual, target inflation rate and a shock. Last two regressions are based on this regression. As a result, they found strong statistical and economic evidence against the RW. The best performing are models based on uncovered IRP, PPP and TR_a (TR_a assumes that the foreign central bank also targets real exchange rate). The final remark is that combined forecasts, using a variety of models, perform even better than individual ones.

Furthermore, Durčáková and Mandel (2010) say that exchange rate dynamics can be also explained by the current state and changes of the balance of payments or by the debt adjusted

real exchange rate model. We will examine these theories in the following subchapter, Balance of Payments. Nonetheless, exchange rates are highly impacted by macroeconomic events; for instance, release of CPI data, Non-farm Payrolls, GDP or decisions on interest rates taken by central banks. The impact on ER depends on the deviation of actual data from the consensus.

Behavioral Finance

Usually, the year of 1979 is considered as a starting point of behavioural finance. Daniel Kahneman and Amos Tversky wrote an article called *Prospect Theory: An Analysis of Decision Under Risk*, which established the foundation of modern behavioural finance. The highest attention was brought to behavioural finance in 2002, when Daniel Kahneman won the Bank of Sweden Prize in Economic Sciences in Memory of Alfred Nobel for his work on prospect theory. Daniel Kahneman was awarded by this prize, despite being a research psychologist and not an economist. (Sewell, 2010)

We can say that the existence of financial crises and lack of their explanation by traditional theories, created the necessary space for behavioural finance. Behavioral finance can be simply described as a theory which focuses on understanding and explaining actual investor and market behaviour. The word "actual" is crucial in this definition. The traditional finance explains, how investors and markets *shall* behave. Whereas behavioural finance describes the actual behaviour or why the traditional theories fail in some cases. Meir Statman, professor of Finance at Santa Clara University, said "People in standard finance are rational. People in behavioural finance are normal". (Statman, p.15, 1995)

Behavioral finance provides two main approaches that help its users better understand the market; herd instinct and overreaction. Herd instinct is characterized by lack of individual decision-making process. In these cases, investors rely on copying strategies of other investors. It is very similar to the behaviour of animals, when the herd of animals follows their leader. Thaler and De Bondt (1995) concluded that people tend to "overreact" to unexpected and dramatic news events. They also argued that investors overreact to good and bad news. The overreaction principle mainly applies to fundamental news (release of quarter earnings/sales; consumer price index, non-farm payrolls, etc.).

1.4 Balance of payments

International Monetary Fund defines the balance of payments (BoP) as *a statistical statement that summarizes transactions between residents and non-residents during a period, usually a year*. It comprises following accounts:

- Current Account
- Capital Account
- Financial Account

The balance of payments is kept under the double-entry accounting system, which assures the equality between credit and debit size. Each transaction in the BoP is recorded as consisting of two equal and opposite entries. For instance, we can find exports of goods and services, income receivable, reduction in assets, or increase in liabilities on the debit side with negative sign, whereas example of credit entry is import of goods and services, income payable, increase in assets, or reduction in liabilities.

Current Account

Current Account is split into three accounts; goods and services account, primary income account, and secondary income account. *The goods and services account shows transactions in items of economic activities (production).* The balance of goods' export and import is called balance of trade or trade deficit and forms one of the most important macroeconomic indicators. *The primary income account captures flow of income between institutions (residents vs. non-residents)*. In general, primary income is compensation that institutions get for their contribution to the production process. Compensation of employees, dividends, reinvested earning, rent or taxes are examples of such an income. *The last, secondary income account, comprises current transfers between residents and non-residents.* For instance, current taxes on income, social contribution, social benefits, etc. would be recorded in this account.

Capital Account

Capital Account shows (1) capital transfers of receivables and payables and (2) the acquisition and disposal of non-produced and nonfinancial assets. This part of the BoP is quite confusing as it shows a major inconsistence between the Balance of Payments Manual published by the IMF and other economic literature. This inconsistency is caused by terminology change of IMF. In our paper, we will use the actual IMF terminology. However,

the reader should be aware of the fact that capital flow described in chapter 2 is referring to Financial Account of BoP and not to the Capital Account.

Financial Account

The main focus of our empirical research will be the examination of countries' Financial Accounts. Once again, we have to alert the reader that when describing capital or capital flow later on, we will refer to Financial Account – IMF's terminology. *The Financial Account tracks records of transaction between residents and non-residents that involve financial and real assets and liabilities.* The Financial Account is split into following groups,

- Direct investment
- Portfolio investment
- Financial derivatives
- Other investment
- Reserve assets

Direct investment can be defined as a cross-border transaction in which a resident in one economy takes a control of a significant degree on the management of an enterprise that is resident in another economy. To be considered as direct investment, the investor must directly own entity's equity that is equal at least to the 10 percent of the voting power. This is also a threshold between direct and portfolio investment. *Portfolio investments are cross-border transactions involving debt or equity securities that are not included in direct investment*. A financial derivative is a financial instrument that is derived from another financial asset or indicator like exchange rate, commodities, shares or bonds. Other investments is a category for those investments that are neither included in direct investment nor in portfolio investment; for instance other equity, currency and deposits, trade credit and advances, etc. Reserve assets are those assets that are in possession of monetary authorities and are used for intervention or for meeting BoP financing need; such as foreign currency or gold.

International Investment Position

One considers international investment position (IIP) as a balance sheet. The IIP has also assets and liabilities sides. Financial assets are claims of residents of an economy on non-residents and gold bullion held as reserve assets. The other side consists of liabilities of residents to non-residents. However, in the case of IIP the assets side is not equal to the

liabilities side. When we subtract liabilities from assets, we get the economy's net IIP, which can be positive or negative.

Balance of Payments impact on exchange rates

According to some theories, exchange rates movement can be explained or even forecasted by the balance of payments. Thus, the exchange rate is a function of the balance of payments. An active balance of payments results into higher demand for a given currency and its appreciation and vice versa. Mandel and Durčáková (2010) mention flow approach as one of the possible methods of explaining the ER movement. In this case, we measure the impact of trade, services and capital flow on the demand for a given currency. On the other hand, a country can have a passive BoP, but its currency still does not have necessarily to depreciate. Therefore, we constantly must confront this method with the current state approach. In this approach, we examine for example the international investment position, which is a cumulative balance unlike the flow approach.

Makin (2002) also supports the Balance of Payments theory of exchange rates. He explains the exchange rate movement based on the interaction of supply and demand for a given currency. If we consider two-country model (European and Japanese market), we can explain this theory on the following examples. For import of goods and services from Japan, the European consumer (entity) has to buy Japanese Yens, resulting into increased demand for JPY and higher supply of EUR, leading to JPY appreciation and EUR depreciation. Hence, the country with higher export than import (the trade balance represents the largest portion of Current Account balance) shall appreciate against its counterparty. Same applies to the circumstance, when a Japanese investor wishes to purchase assets in Europe. In such a case, he/she would have to exchange JPY for EUR, thus surging demand for EUR and puts this currency under appreciation pressure. The flow of this capital is recorded in the Financial Account balance.

2 Capital Flow and Investors

First chapter was constructed with the purpose to explain core elements of international finance that the reader must be familiar with, in order to understand problematics of this paper. Next, we can proceed to the real point of this thesis and that is the behaviour of exchange rates and capital flow in risk-on and risk-off periods. In this chapter, we will explain (i) carry trade and the overall capital flow, (ii) volatility and its measurement, (iii) risk-on/risk-off episodes, (iv) safe havens currencies. These terms together with the balance of payments will play key role in the empirical part.

2.1 Foreign Direct and Portfolio Investments

Foreign investments represent the most significant part of capital flows among countries. Foreign investments can be split into *foreign direct investments (FDI)* and *foreign portfolio investments (FPI)*. The 10% threshold is crucial in separating these two types, as it was discussed in the balance of payments subchapter.

Calderón et al. (2004) distinguish between two types of FDIs (i) greenfield investment, which is a transaction involving mainly newly-created assets that comes under control of foreign firm, for instance building a new factory in a host country and (ii) mergers and acquisitions (M&As), which is only an ownership transfer of existing assets from a local firm to the foreign one. Majority of M&As are in the form of full acquisitions. Generally, foreign direct investment is considered as the most stable form of capital flows regardless of the time period. Therefore, FDIs are stable even during financial crisis. This was confirmed by empirical research conducted by Sula and Willett (2006), who examined capital flow in 35 emerging economies from 1990 to 2003. There are also logical arguments that support these findings. Firstly, multinational enterprises (MNEs) realise FDI as a part of their long-term strategy. These MNEs do not seek a short-term, but rather a long-term profitability. Secondly, once the investment is made, it is nearly impossible for the company to reverse it. Simply said, the company cannot build a factory in a foreign country and then move it back home. On the other hand, the parent company still has the leverage to get back at least some assets of its subsidiary by reducing subsidiary's liabilities toward the mother company as much as possible. However, the inability of capital withdrawal does not mean that the FDI flow will not be affected. A financial crisis would probably discourage MNEs to invest in emerging markets as they would be worried about the market condition and future development of these markets. Sarno and Taylor (1999) also concluded that FDIs are very large permanent

components and that they are relatively more sensitive to the long-term structural forces. Moreover, they added that a large portion of FDIs emerge as a consequence of competition and rising cost in developed countries. Therefore, FDIs play a crucial role in developing countries. Sarno and Taylor also discuss the irreversibility of FDI as we did above. They argue that in most cases the flow of investment is one-off, resulting in temporary capital flow. However, one could question such "irreversibility of FDI", as the foreign company could resell its investment to a local investor. And last but not least: a large irreversible investment of one firm can signal the other ones that the particular country is safe to invest in and thus attract new FDIs.

In the previous paragraph, we mentioned two papers that give evidence of relative stability of FDI. Therefore, one can think that capital outflow from a country will be significantly dependant on portfolio investments. The purpose of portfolio investments significantly differs from FDIs. Portfolio investors are mainly seeking a balance between return on investment and its risk. They also use FPI as a diversification tool. For the purpose of this paper, we can distinguish between two major FPIs. The first are the regular portfolio investments in companies. Sarno and Taylor (1999) stated that entities from developed economies are targeting developing economies as they get higher return from such investment than they would get on their domestic market. This applies even after return risk adjustment. The risk adjustment is necessary as firms in developing countries are generally riskier than the ones in developed countries. Moreover, foreign investments are necessary for the expansion of firms in developing countries as they might not be able to raise enough capita from their domestic sources. The second type of FPI that we will discuss is carry trade. Carry trade mainly consists of foreign portfolio investments and also of other investments.

Brunnermeier et al. (2008) described currency carry trade as selling low interest rate currencies and investing in high interest currencies. Generally, it means to borrow a capital in a developed country like the USA and investing in a developing country like Turkey. Based on data from Trading Economics, the March 2017 interest rate in the U.S.A was 1%, whereas the interest rate in Turkey was 8%. One would expect, based on uncovered interest rate parity (UIRP), that in a one year period, the USD should appreciate against the TRY by almost 7% in order to offset the interest rate differential. Many researchers tested the UIRP theory, but failed to come with a strong evidence of either confirmation or rejection of this theory. Generally, their conclusions differ due to testing a different time-horizon or currencies. Lothian and Wu (2005) analysed the UIRP over a very long-time period, two centuries. They

found out that the hypothesis of UIRP cannot be rejected in a long-term horizon and that the forecasting power largely depends on the size of interest rate differential, meaning that the one with large interest rate differential correspond relatively better to the theory. On the other hand, they point out poor predictive performance of UIRP. This finding was also confirmed by Bekaert et. al (2002), who concluded that the random walk model is marginally better than UIRP. In the real world, a Turkish company could make a loan denominated in USD and then use these resources to finance its business in domestic market.

Generally, researchers do not distinguish between capital flows based on the time-horizon but rather use the "temperature" of the capital. In this case, they distinguish between "cold" and "hot" capital flows or money in general. "Hot" money is seen as the speculative capital, which is highly dependent on the current situation and represents high risk of reversal. On the other side, "cold" money is very stable and to some extent (almost) completely irreversible. Therefore, one could refer to FDIs as "cold" capital flows and to FPIs as "hot" capital flows.

Emerging economies quite often run Current Account deficit. To have balance of payments in equilibrium, such deficit has to be offset by a net capital inflow. Therefore, equilibrium is largely dependent on the FDI, FPI and OI inflow. If we consider FDI as "cold" money, then we could assume that in the short time horizon the Financial Account is a function of FPI. One could argue that the equilibrium does not have to be necessarily reached by net capital inflow as the central bank could intervene. In this particular case, the central bank would sell its foreign reserve in order to increase the demand and consequently the price of its home currency. Although this scenario is possible and sometimes also used, we have to stress out that the reserves of a central bank are limited and it is unlikely that the bank could survive under this regime for a long time. In a case of sudden stop of FPIs inflow or even unwind of FPIs, one would expect strong depreciation of the local currency, if not its complete crash.

The relationship between carry trade and currency crashes was examined by Brunnermeier et al. (2008). First of all, they point out that there are many researches confirming the violation of UIRP and even stating that the investment currency (the one with higher interest rate) tend to appreciate against the funding currency (the one with lower interest rate). This would increase the carry trade strategy as the investor would gain profit not only from the interest rate differential, but also from the appreciation of the investing currency against the funding currency. Brunnermeier et al. (2008) delivered following findings; (i) currency crash risk is strongly connected to currency carry trade, (ii) positive correlation of currency crashes with

market volatility, (iii) currencies with low interest rate differential have similar ER development.

2.2 Volatility

Volatility is one of the most important factors in today's economy. We track volatility both on micro- and macro-economic levels. One can understand volatility as an uncertainty of the future. High level of volatility therefore means high level of uncertainty. Simple microeconomic example is firm's expected revenues or cash flows. Basically, we should calculate the volatility when estimating something that will take place in the future. For instance, an investor calculates the return of investment volatility, which helps him/her to decide whether the investment should or should not be made. We will examine volatility from the macroeconomic point of view. In our paper, volatility of financial markets will play a crucial role as it is one of the main drivers for capital flow, especially capital outflow. The reason behind that will be precisely described later.

Hull (2012) demonstrated volatility and its calculation on the standard deviation of stock prices. He highlights the importance of time horizon in volatility calculation, stating that the uncertainty approximately increases with the square root of time. Hull provides two approaches of volatility calculation; (i) estimating volatility from historical data, (ii) implied volatilities.

To calculate the volatility based on the first approach, we would have to calculate firstly the daily return of stock prices. This can be done by logarithm the daily price changes as shown by the following equation;

$$u = \ln(\frac{S_i}{S_{i-1}})$$

- u is the daily return of stock
- S_i is stock price at time *i*

After calculating the (daily, weekly, monthly) return of stocks, we can proceed to the actual calculation of the historical volatility by calculating commonly known formula of standard deviation;

$$s = \sqrt{\frac{1}{n-1}\sum_{i=1}^{n}(u_i - \bar{u})^2}$$

This would result into a decimal number, which can be then converted to percentage. The daily volatility can be then converted to 30-day, 60-day volatility based on Hull's time horizon approximation. In case of 60-day conversion, the daily volatility would be multiplied by square root of 60.

Implied volatility is derived from the value of an option. Thus, we can calculate implied volatility of a stock, currency or any other underlying asset, which options are traded. Values of European options are calculated based on Black-Scholes-Merton formula. The call and put of an option is a function of (i) spot price, (ii) strike price, (iii) time, (iv) interest rate, (v) volatility. It is impossible to invert the formula, so that volatility is a function of all the remaining variables. To get the volatility, we have to use the "trial and error" method by trying different figures for volatility and calculating if the value of the option equals to the one given by the market. There are more sophisticated but complicated methods than "trial and error", like Newton-Raphson. In this paper, we will rather use implied volatility, as it is based on market's future anticipation, whereas volatility estimated on historical data is backward-looking method. (Hull, 2012)

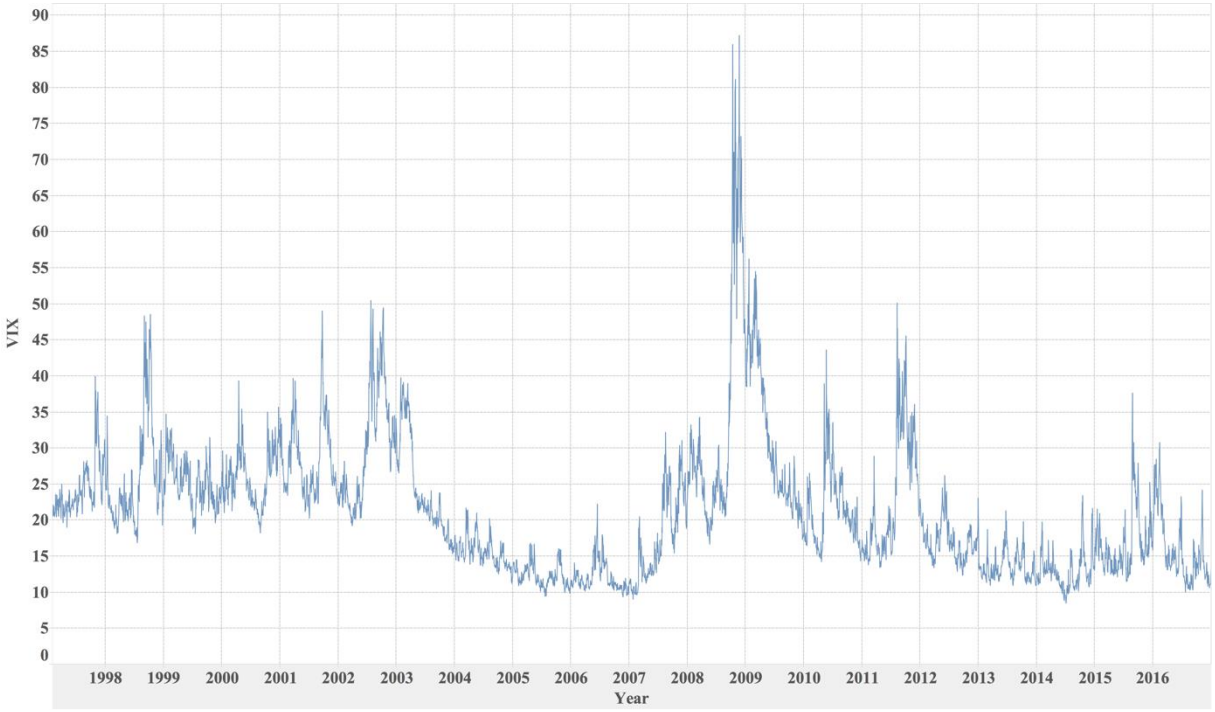
VIX index

VIX index is probably the most frequently used measure of global volatility. Smales (2014) or Whaley (2000) refer to the VIX index as the "investor fear gauge". "The market volatility index [VIX] expresses a consensus view about expected future stock market volatility; the higher the VIX, the greater the fear in the market." (Smales, 2014, p. 2) VIX was introduced in 1993 by the Chicago Board Options Exchange (CBOE). Initially, VIX measured 30-day implied volatility on S&P 100 stock index option prices. Currently is calculated based on S&P 500 index and measures 30-day expected volatility. VIX is calculated by averaging the weighted price of calls and puts on S&P 500. This calculation includes options with maturity longer than 23 days and shorter than 37 days. In 2004, the CBOE introduced exchange-traded VIX futures and in 2006 launched VIX options. (CBOE, 2014)

There is a very strong but imperfect positive correlation between VIX and VIX futures of 88.15% and strong negative correlation between S&P 500 and VIX of -75.43%. (Liu, 2014)

The graph (2) shows the development of VIX from the beginning of 1997 until the end of 2016.

Graph 2: VIX between 1997 and 2016



Data Source: CBOE

2.3 Risk-on / Risk-off

Now, we will build up on last two sub-chapters to define risk-on and risk-off phenomenon. In those two sub-chapters, we concluded that foreign portfolio investments and other investments are more volatile than foreign direct investments and that VIX represents the most accurate index of market volatility. Schadler (2008) examined volatility of capital flows in Asian markets from 1990s until 2007. Findings of her work are consistent with already mentioned paper from Sula and Willet (2006). Her study proved that economies with higher non-FDI capital flow are more vulnerable to sudden stop of capital inflow and more likely end up in crisis.

McCaluey (2008) examined hot money inflows in Asian market at the beginning of 2000s. According to his research, the promising performance of Asian countries led to the increase of equity inflow and expecting appreciation of Asian currencies attracted foreign carry traders, bank flows, and investors in local (Asian) bonds. On the contrary, in times of market downturns, he observed massive portfolio investments outflow. One could conclude that in a period of market low volatility, investors tend to be attracted by emerging markets and in a period of high volatility they withdraw their capital.

Risk-on and risk-off could be simply seen as the market's anticipation in the future. In times of good "mood" and strong expectations for good prospects, the risk is turned on, whereas in case of bad anticipation, the risk is off. (HSBC, 2010)

McCauley (2012) provides a deeper and more sophisticated explanation of these periods. He describes the risk-on period by the following three consequent steps of fund flows: (i) capital inflow by foreign investors, who invest mainly in equity and bonds. This puts the local currency under appreciation pressure. (ii) Domestic investors, who sold their assets to foreign investors either deposit money they received or buy assets that are not demanded by foreign investors, which leads to rise of these assets value. (iii) The appreciation of domestic currency triggers interventions from the local central bank. These interventions are usually provided by buying a foreign currency (usually USD) and then investing it in low-risk financial instruments like U.S. bonds. However, it is not necessary to be USD and U.S. bonds. A central bank can use whichever currency it considers safe. Furthermore, McCauley highlights various studies confirming that official investments in US bonds push down global bond yields and thus encouraging further risk-on.

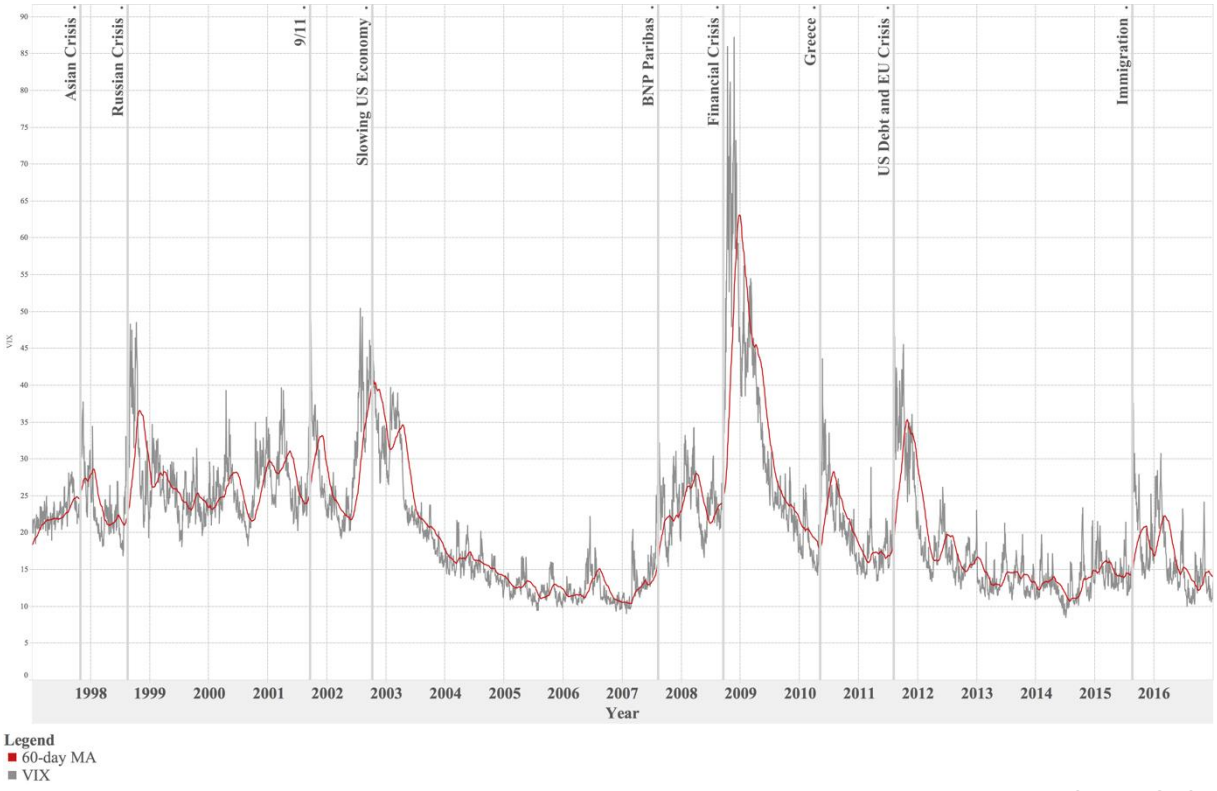
McCauley describes the risk-off period by the same mechanism as the risk-on, but in reverse. Firstly, foreign investors quickly liquidate their positions in emerging markets by selling their assets to local investors and move their capital to safe havens, this process is also known as "flight to quality". This sell-off causes a slump in asset price on local market. In addition, sudden outflow of capital puts the local currency under depreciation pressure. There is no clear consensus, whether the central bank should step in and defend its currency or not. Therefore, we can see examples of central banks selling their reserves and also examples when they let the currency to depreciate. The term safe haven will be explained in the following subchapter.

Risk-Off and Risk-On Episodes

To be able to track the exchange rates dynamics and capital flow, we have to set the risk-on and risk-off episodes. For this purpose, we will adopt to a large extent a method proposed and used by De Bock and De Carvalho Filho (2013). They recognise the beginning of the risk-off episode "… when the VIX is 10 percentage points higher than its 60-day backward-looking moving average (MA). (De Bock and De Carvalho Filho, p.7, 2013) According to their findings, it is nearly impossible to calculate the precise duration of the risk-off periods.

Unsurprisingly, we found the same crises events as De Bock and De Carvalho Filho. However, we excluded two events they have mentioned. Those are "disruption in USD money market (November 2007)" and "uncertainty over impact of Japan's earthquake (March 2007)". In the course of these events, the 60-day MA exceeded the 10-percentage points threshold slightly and for a very short period of time. Also, we found out that "immigration crisis (August 2015)" suits our criteria as well. This risk-off period was not captured by De Bock's and De Carvalho Filho's paper as it was out of their time horizon range. The graph (3) shows all nine risk-off periods that will be examined by our paper. These are (i) Asian crisis, (ii) Russian economy crisis, (iii) Attacks on World Trade Center, (iv) Fear of slowing US economy, (v) BNP Paribas, (vi) Fall of Lehman Brothers, (vii) Greek crisis, (viii) US debt ceiling and euro area crisis, (ix) immigration crisis.

Graph 3: VIX vs. VIX 60-day MA in Risk-off Periods



Data Source: CBOE

In the following text, we will give a brief overview of the above-mentioned events. We do not find it necessary to describe these events in more details as they are well-known and therefore majority of them should be familiar to the reader.

The First event is the financial crisis that hit Asia in October 1997, mainly Thailand, Malaysia, Indonesia, Philippines and South Korea. It led to a series of currency devaluations.

As a result, many countries started to protect more their domestic currencies, mainly by buying U.S. Treasuries. (Investopedia)

The Second event is the economic crisis in 1998 that took place in Russia. Firstly, the Russian economy seemed ultimately to start to recover in the middle of 1998, after several years of decline. But suddenly a financial crisis hit the Russian economy in August 1998, resulting in devaluation of rubble, crash of stock market and default on domestic and foreign debts. This happened less than one year after the Asian crisis, amid rising concerns about stability of Asian currencies. (Lokshin and Ravallion, 2000)

The Third event is the crisis and uncertainty on financial markets (September 2001) that was triggered by a terrorist attack on World Trade Center in New York, also known as "9/11". It is probably the most popular event of last decades. The NYSE and NASDAQ were shut down until the 17th of September. However, this did not prevent the market to set record breaking decline of 7.1% during the first post-attack trading day. (Investopedia)

The Fourth event is not even close to the magnitude of the previous one, however it meets our criteria. In July 2002, Department of Commerce released report on US GDP growth. Surprisingly, it revised the 1Q annualised GDP growth from 6.1% to 5% and first reading of 2Q showed annualised GDP growth of 1.1%, in contrast with the consensus of 2.3%. This led to increased uncertainty on markets, and highlighted the impact of U.S. economy issues on the world. (CNN Money)

The Fifth event was the crisis initiated by BNP Paribas with freezing of three of their funds worth at that time 1.6 billion EUR. This measure was executed as a response to the rapid decline in size of these funds. Investors on the market started to panic and the ECB had to step in and provide liquidity. Despite the liquidity provided by ECB, this event initiated the so-called credit crunch crisis or also known as "credit squeeze". (Mizen, 2008)

The Sixth event is the largest crisis that struck within our examined period. The bankruptcy of the well-established American bank Lehman Brothers was a huge catalyst for the crisis known as "financial crisis 2007-2008" or just "global financial crisis". Failure of this bank was caused by rating agencies, debt of American households, Wall Street traders, Fed's action and deregulation. Consequences of this crisis were huge and Lehman Brothers' bankruptcy divided capital market to pre- and post-Lehman period. On November 2008, the VIX index hit a record breaking 87.24. (Azadinamin, 2012)

The Seventh risk-off period is connected to Greece's debt crisis. From 2009, investors started to be more concerned on whether the debt of Greece is sustainable. Greece was also hit by the global financial crisis. Moreover, the new government (late 2009) revealed that their predecessor was not quite honest in terms of the 2009 budget deficit to GDP ratio. The actual ratio was 12.7% contrary to previously reported 6.7%. Consequently, rating of Greek bonds was downgraded, resulting into higher interest rates demanded by investors to buy Greek bonds. In May 2010, IMF and the Eurozone stepped in and announced a loan for Greece. However, the volatility on market remained high as there was still a lot of uncertainty about the future of Greek´s debt. (Nelson et. al, 2011)

The Eighth period was connected to more events. Firstly, there were concerns over US debt ceiling. Secondly, sovereign debt crisis and high debt of some European countries like Spain, Portugal, or Italy led to a higher level of volatility. According to our calculation, the 10-percentage points threshold was breached on the August 4, 2011. On this date, Japanese central bank (BoJ) strongly intervened to depreciate its currency and stock markets plunged significantly. (Investopedia)

The last period is related to the migration crisis in Europe. Despite not being directly connected to stock market, event like this has a strong impact on financial markets.

Table 3: Risk-off Periods

No.	Name of the event	Threshold day
1	Asian crisis	27-Oct-1997
2	Russian crisis	4-Aug-1998
3	Attack on World Trade Center	17-Sep-2001
4	Fear of slowing US economy	10-Jul-2002
5	BNP Paribas	9-Aug-2007
6	Financial crisis	17-Sep-2008
7	Greece	6-May-2010
8	US Debt and EURO crisis	4-Aug-2011
9	Immigration crisis	21-Aug-2015

Source: own creation

It is very difficult to determine when a risk-on period began. Kick offs can be triggered by many different factors. We will not set a measurement of these periods, but rather determine them based on the capital flow changes. On the other hand, one could expect a risk-on period to take place in time of low and stable volatility.

2.4 Safe Haven Currencies

We have already touched the topic of safe haven currencies when describing the risk-off mechanism. Previously, we have also mentioned "flight to quality" term. One can think about safe haven as of destination of this "flight". In this section, we will define safe haven currencies, determine their fundamental characteristics and specify those that will be used in the empirical research.

There are many studies dedicated to this topic. Researchers are either trying to specify safe currencies in general or testing whether a specific currency shows safe haven characteristics. Menkhoff et. al (2011) studied correlation between high-interest rate currencies and volatility. They found out that high-interest rate currencies, also known as "investment currencies" in carry strategies, are negatively correlated to high changes in global FX volatility. Therefore, one could refer to safe currencies as closely linked to carry trade and "funding currencies" being a safe haven. Campbell et. al (2009) also used one variable measure, when determining safe currencies. They studied correlation between world stock market and seven developed economies' currencies. The outcome of this research was that currencies like AUD, CAD, surprisingly JPY and GBP were positively correlated to world stock market (on 1975 – 2005 data sample), whereas USD, CHF and EUR were negatively correlated, which makes them safe assets. On the contrary, when revising their work from 2007, they found out that reserve currencies like USD and low-interest rate currencies like JPY appreciated against other currencies during financial crisis of 2008 (this event was not included in the original sample).

Another group of researchers sees more than one determinant of safe haven currencies. In particular Ranaldo and Söderlind (2009) define safe haven asset as the one that holds following signs (i) performing well during markets' downturn, (ii) low traditional risk exposure, (iii) resistant to high volatility and low liquidity periods. This definition more or less combines findings of Menkhoff et. al (2011) and Campbell et. al (2009), adding exposure of traditional risk. Consistency of these studies is logical, considering high level of negative correlation between stock markets and VIX, as mentioned in sub-chapter 2.2. Moreover, the study by Ranaldo and Söderlind (2009) describes CHF and JPY as safe haven, EUR as marginally safe currency and rejects safe haven characteristics in case of GBP, using high-frequency data on bilateral exchange rates.

Hossfeld and MacDonald (2014) tested G10 currencies (top 10 traded currencies) to answer, which of them can be referred to as safe haven currencies. They used monthly data of

effective exchange rates and VXO (older version of VIX) as a determinant for financial stress periods. Their findings clearly stipulate CHF as safe currency, followed by USD. Although the evidence confirming USD as safe haven is not as strong as in case of CHF. They refer to JPY as to a funding currency instead of safe haven, describing carry trade reversal as the driver for JPY appreciation during financial stress periods. Last, but not least, EUR did not reach the required threshold to be considered as a safe haven currency.

Habib and Stracca (2011) tested a basket of 52 currencies from developed and emerging economies between 1986 and 2009. The main goal of their paper was to find fundamental drivers of safe haven currencies. Firstly, they rejected hypothesis of interest rate differential being a fundamental driver, stating that this hypothesis holds in advanced countries only. They tested the following three possible drivers for safe haven currency; (i) low country risk and vulnerability, (ii) size and liquidity of financial market, (iii) financial openness. When testing the first driver, they found out statistical significance of net foreign asset (NFA) position and Current Account, meaning that currencies with stronger external position appreciate in times of high volatility. Secondly, in terms of size and liquidity of financial market, absolute stock market size and GDP were significant. Thus, country with relatively large share of stock market and GDP when compared to the rest of the world shall have characteristics of safe haven. Ultimately, they found out that countries with lower exposure to global financial markets are more likely to be safe haven as they would not be that strongly influenced by global financial turbulences. However, this hypothesis is unlikely to be realistic in nowadays' globalisation time. Many other indicators like (i) inflation rate, (ii) FX reserves to imports ratio, (iii) country risk rating, (iv) bid-ask spread and others were statistically insignificant. According to Habib and Stracca (2011) the best explanatory variables of safe haven currency are:

1. Exchange rate regime to USD or EUR (whether the currency is pegged)
2. NFA position
3. Stock market size
4. Public debt to GDP (advanced economies only)
5. IR spread against the U.S. (advanced economies only)

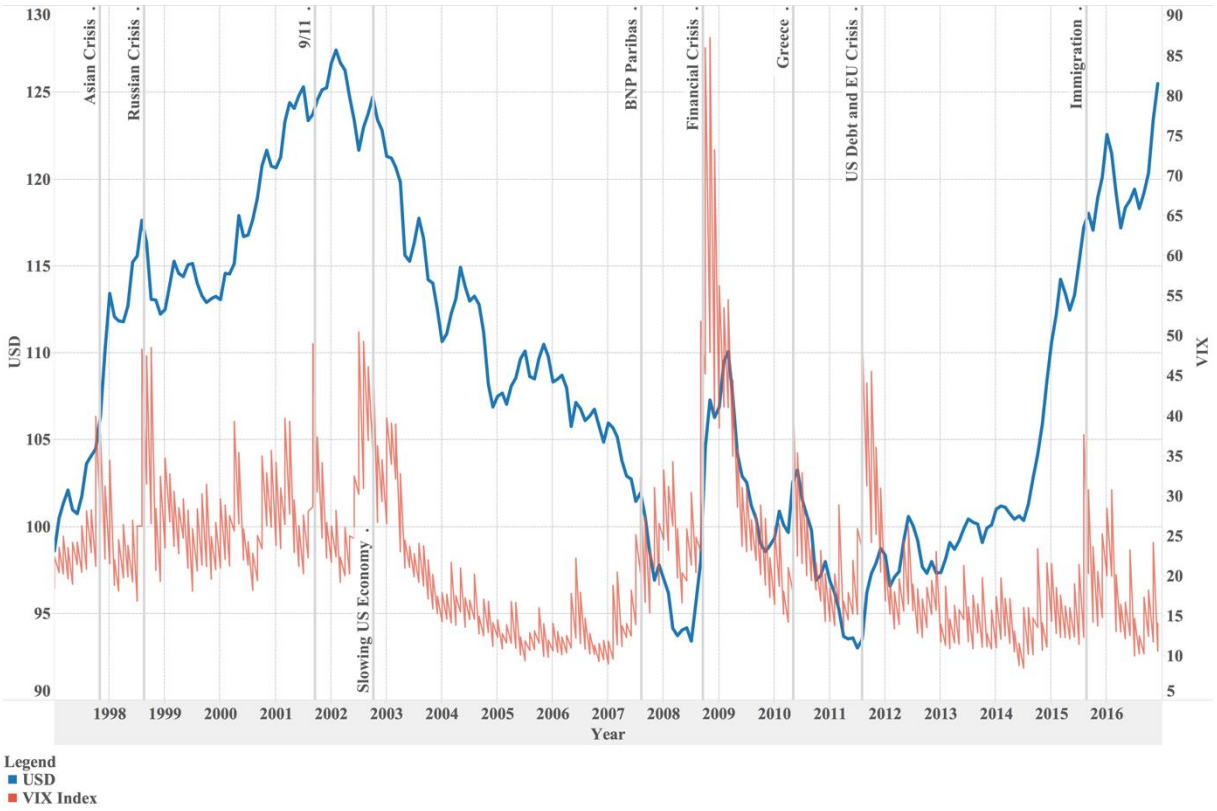
We already mentioned three studies that tested currencies to gather evidence of their safe haven characteristics. Results of these studies are similar but not completely consistent as they use different methodology and time period. Fatum and Yamamoto (2014) studied exchange

rate development of what they considered as safe haven currencies (USD, JPY, CHF, EUR, GBP, SEK, CAD) during global financial crisis. The main aim of that study was to determine, which currency can be considered as the safest one. They defined the safest currency in the following order; JPY, CHF, USD. We use these three currencies as safe haven currencies in our empirical study. They are also convenient from the point of view that they represent three different markets; American, European and Asian. Next, we will give some more insights on these currencies based on literature review and their performance during risk-off periods that we have previously chosen. We selected the nominal effective exchange rate (NEER) as a key performance indicator. It represents the exchange rate between a selected currency and a broad basket of currencies. An increase of NEER means an appreciation of a given currency against the basket of foreign currencies.

U.S. dollar as Safe Haven Currency

McCauley and McGuire (2009) studied reasons behind surprising appreciation of USD in time of global financial crisis. One would expect the USD to depreciate at that time as the U.S. market was the source of that crisis. They came with the following reasons that caused the appreciation of USD (i) high demand for US Treasury bonds, (ii) USD being a "funding" currency in carry trade, (iii) USD shortage, run on US money market funds, (iv) overhedging in USD, institutions had to close their short forward positions in USD.

Graph 4: U.S. Dollar Nominal Effective Exchange Rate in Risk-off Periods

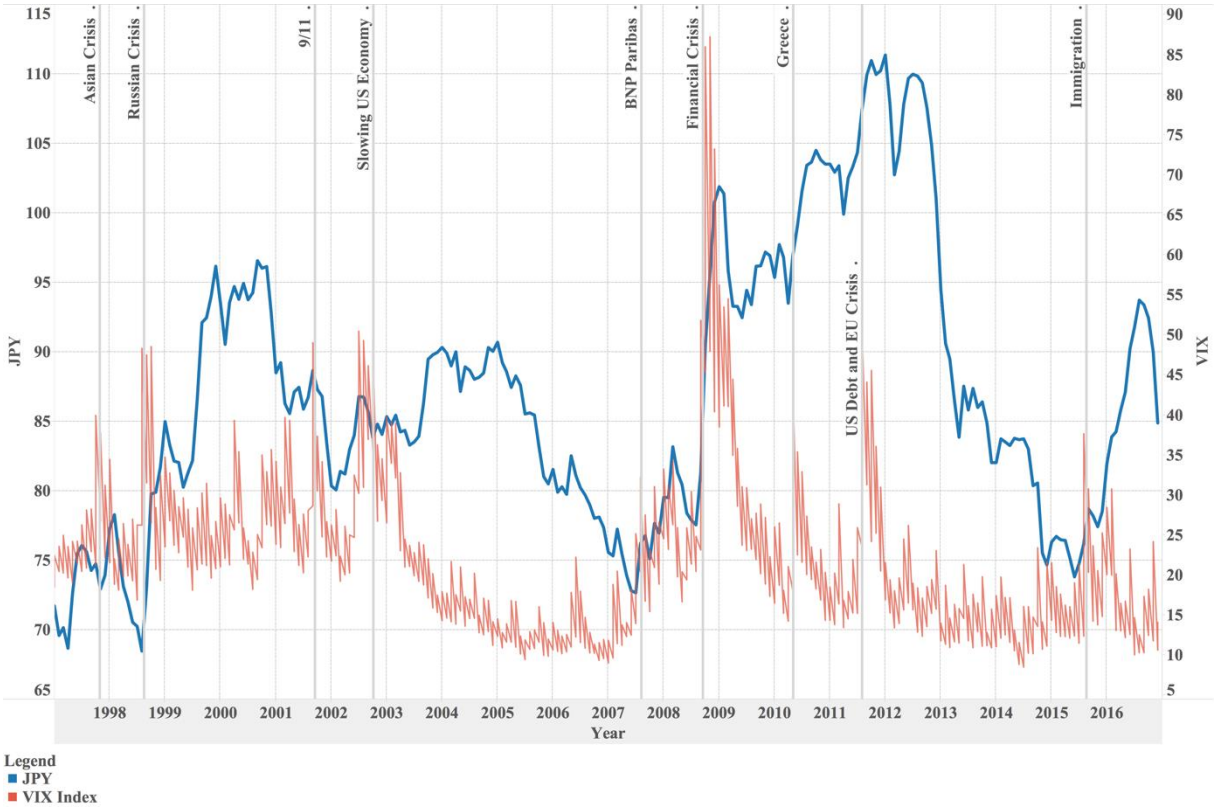


Data Source: Reuters and CBOE

Japanese yen as Safe Haven Currency

Botman et al (2013) provided a complex study on JPY performance during risk-off periods from 1990 to 2011. They found out that the JPY on average outperforms the USD. Furthermore, they presented evidence of JPY acting as safe haven currency. Portfolio rebalancing through offshore derivative seems to be likely the cause for JPY outstanding performance.

Graph 5: Japanese Yen Nominal Effective Exchange Rate in Risk-off Periods

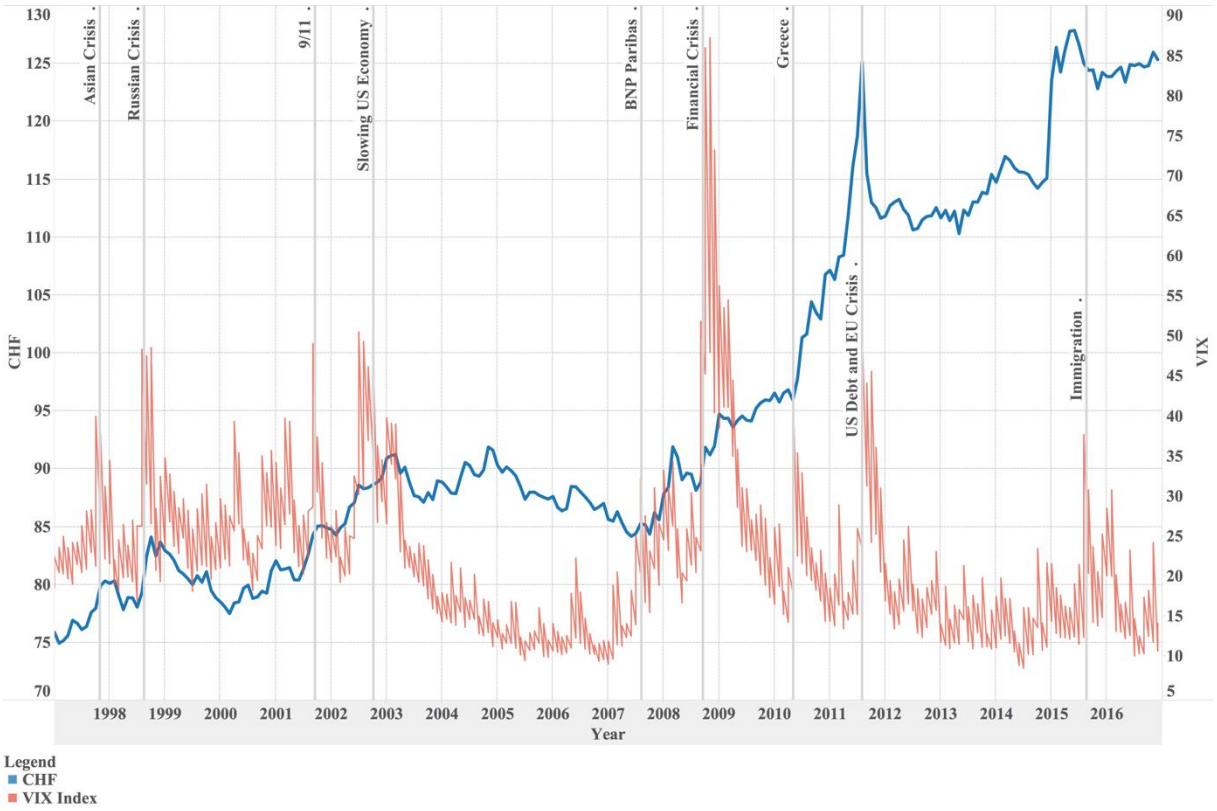


Data Source: Reuters and CBOE

Swiss franc as Safe Haven Currency

Grisse and Nitschka (2015) tested safe haven characteristics of CHF during sample period from 1990 to 2011. They used the bilateral exchange rates to find out the ranking of CHF compared to other currencies. It is a similar approach to the one used by Fatum and Yamamoto. As a result, they found three currencies that on average outperformed the Swiss franc, namely US dollar, Japanese yen and British pound. Despite being outperformed by the GBP, there is still more evidence for CHF having a safe haven status than for GBP.

Graph 6: Swiss Franc Nominal Effective Exchange Rate in Risk-off Periods



Data Source: Reuters and CBOE

3 Mexico

Previously, we explained theoretical background, which is necessary for our empirical part. We also settled risk-off periods that will be deeply analysed. Due to the high level of globalisation and interconnection of financial markets, the VIX is capable to reveal periods of worldwide financial stress. However, it is highly probable that it will fail to detect a local turmoil that might hit one of our examined countries. Therefore, we have to track suspicious changes in either capital flow or exchange rates and try to find reasonable explanations for these changes.

In this section, we will focus on Mexico. For the purpose of our research, it is not necessary to introduce the country itself, its economic history or current condition. Throughout our research, we will keep our focus only on capital flow and exchange rates development during recent 20 years (1997-2016).

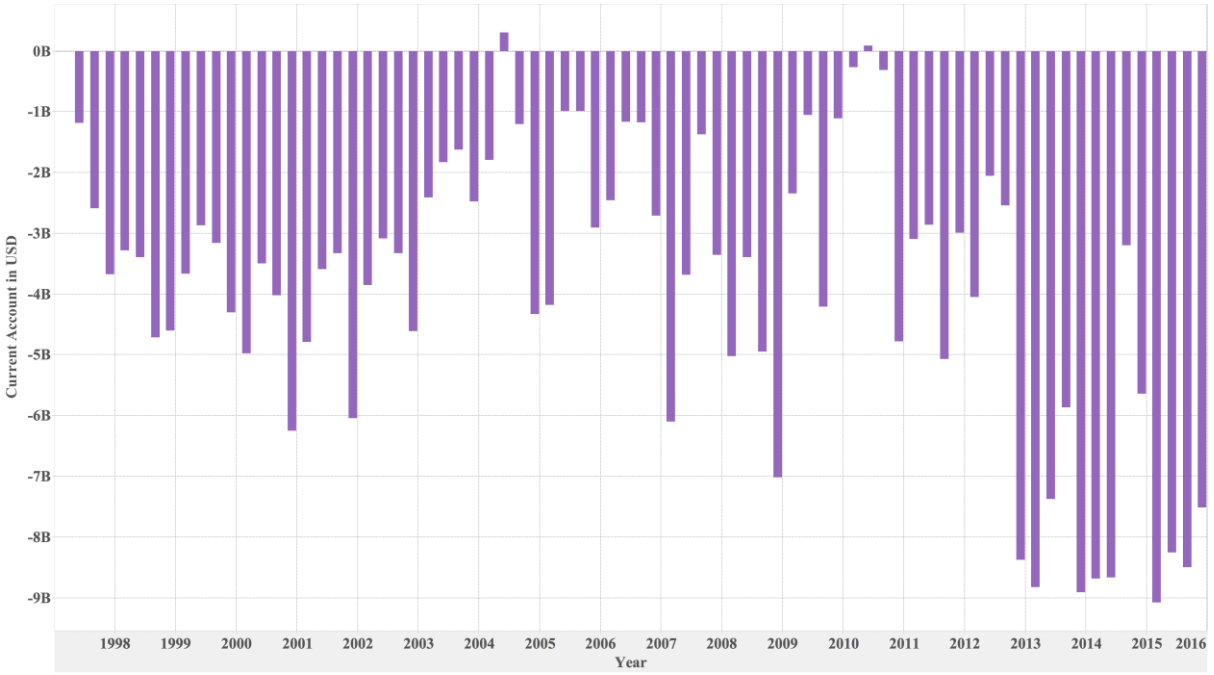
Prior to the examination of capital flow or exchange rates development, we shall discuss some factors that may highly impact and even bias our findings. We came upon the following three factors, (i) exchange rate regime of Mexican Peso (MXN), (ii) Current Account balance, (iii) local economic crisis.

Firstly, we would find out the exchange rate regime of MXN during the whole sample period. Any type of fixed exchange rate would bias our findings. For instance, if the MXN would be pegged to USD, there would be no movement on USD/MXN and changes of MXN against all remaining currencies would be driven by the performance of USD. Hence, the performance of Mexican economy would be irrelevant. During the second half of 20th century, Banco de Mexico (Mexican Central Bank) held the Mexican Peso under various exchange rate regimes (fixed rate, managed floating rate, exchange rate bands and others). According to the International Monetary Fund and Banco de Mexico, Mexican Peso is considered to be under free floating regime (as of end of 2016). In December 1994, Banco de Mexico was forced to abandon the managed floating. Later, we will describe such change of exchange rate regime in more details. A free float regime during the whole sample period is highly convenient for our research.

Next, we would look at the Current Account (CA) balance. This will reveal the dependence of the country on the capital inflow. The graph (7) shows Mexico's Current Account balance on yearly basis. As we see, Mexico suffers from chronical Current Account deficit. Throughout the whole period, the CA was in deficit, indicating large dependence on capital inflow. We

find this result also convenient for our research, as the capital flow could have higher explanatory power on the MXN exchange rate.

Graph 7: Current Account of Mexico



Data Source: Reuters

Our research did not find any local crisis that could impact exchange rate development throughout the sample period. Therefore, we will be focused only on risk-off periods that we introduced in subchapter 2.3. However, it is worth mentioning that the Mexican peso suffered large currency crisis in 1994, also known as Tequila Crisis. At that time, Mexico was subject to many events that put MXN under high depreciation pressure (US interest rates rise, kidnapping of prominent businessmen, sentiment of armed conflict, assassination of presidential candidate). During that time, MXN was kept under "Exchange rate band with managed slippage regime". The floor of this band was fixed, but the cap had to be increased daily. On December 22, 1992, Banco de Mexico decided to abandon this regime due to increasing pressure on further MXN depreciation and diminishing foreign assets reserves, which led to a further large depreciation of the currency.

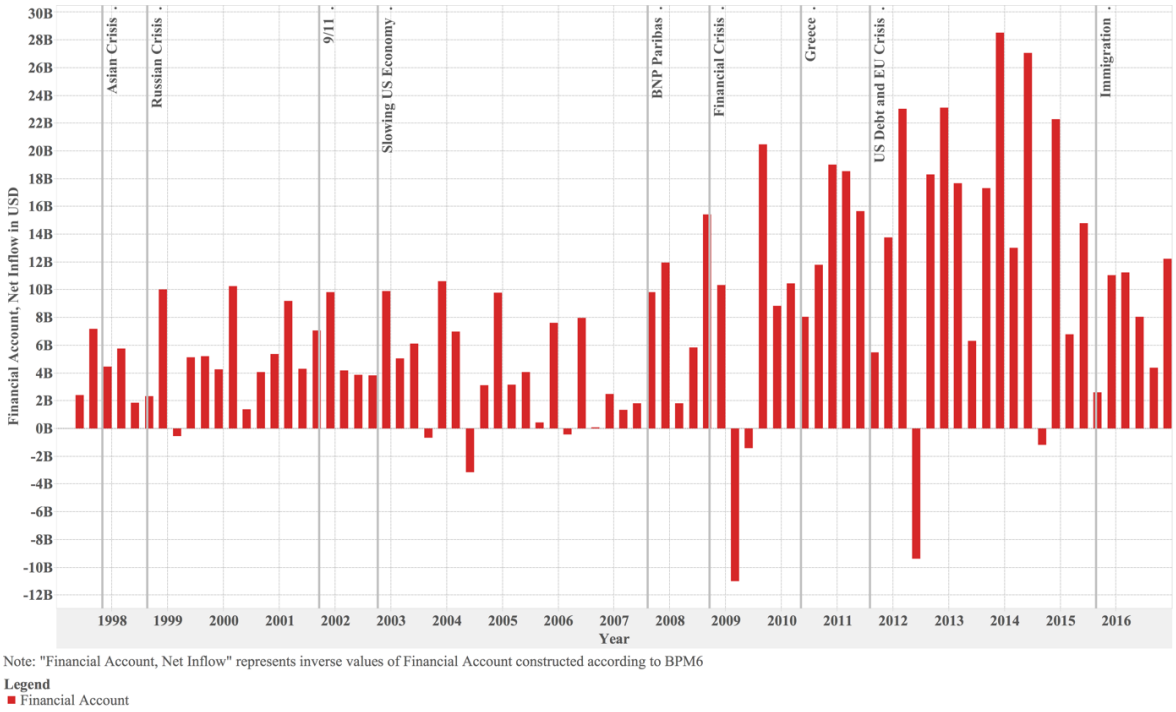
3.1 Capital flow in Mexico

In this chapter, we will examine the Financial Account of Mexico and its potential impact on the exchange rate. Firstly, we will show the overall development of the Financial Account during the whole sample period, with a deeper focus on changes during risk-off and risk-on periods. Afterwards, we will analyse individual components of the Financial Account.

The sixth edition of Balance of Payments Manual (BPM6) brought a methodology change to the Financial Account. According to this methodology, net capital inflow is recorded with minus sign. This methodology was adopted by Eurostat, OECD and World Bank. However, Reuters database has not adopted this methodology yet and uses the old BPM5. Therefore, data used in our research are recorded in compliance with BPM5. To prevent any confusion, we will not use a term "balance of Financial Account" but rather "Financial Account, net inflow" or "net capital inflow". Therefore, a positive sign on our graphs shows larger capital inflow than capital outflow.

In the sample period Mexico has predominantly positive net capital inflow. This is typical for emerging economy as investors see high potential there. From 1997 till 2007, the Financial Account was quite stable. During all that time Mexico recorded negative net capital inflow only in four quarters. Also, the net capital inflow seems to be capped by $10 billion quarter threshold, which was reached several times. We can observe significant decrease after 9/11 and Slowing US Economy Crisis. However, it is difficult to distinguish, whether the capital inflow slumps were cause by financial stress or whether it was caused just by seasonality. On one hand, majority of capital inflow to Mexico is from the United States, which could support the hypothesis that the slump of net capital inflow was caused by financial crises. On the other hand, these slumps are consistent with the seasonality of FA. Seasonality and distribution of capital flow is quite interesting and we will describe it later. During the potential risk-on period between 2003 and 2008, net capital inflow stayed mainly in positive figures. However, the balance was not as large as one would expect in the period of low volatility. Financial Crisis in 2008 had a huge impact on the capital flow. Firstly, it reduced the surplus of net capital inflow in 4Q of 2008 and in 2009Q1 Mexico recorded net capital outflow of $11billion. The recovery after Financial Crisis worked as a catalyst for capital inflow to Mexico. Mexico reached its peak in the last quarter of 2013, when it recorded net capital inflow surplus of $28 billion. Notwithstanding the Current Account deficit, the net capital inflow would become a fundamental driver for MXN appreciation during that period. At this point it is impossible to find out, what caused the net capital outflow in 2012Q2. We will come back to this matter, when examining components of FA (FDI, FPI and other investments). The graph (8) shows all the above-mentioned development of the Financial Account.

Graph 8: Mexico's Net Capital Inflow

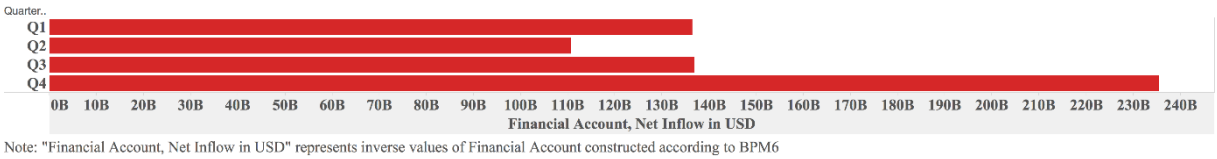


Note: "Financial Account, Net Inflow" represents inverse values of Financial Account constructed according to BPM6

Data Source: Reuters

As we pointed out in the previous paragraph, seasonality makes reading the graph quite challenging. In many cases, especially after 9/11 and Slowing US Economy Crisis, we shall be cautious about our conclusions. We created a chart that shows the overall net capital inflow for every quarter. Overall net capital inflow in Q1-Q3 is almost constant. But, the overall net capital inflow of the fourth quarter is almost twice the size of the second quarter and by 75% higher than first and second quarter.

Graph 9: Mexico's Net Capital Inflow by quarter

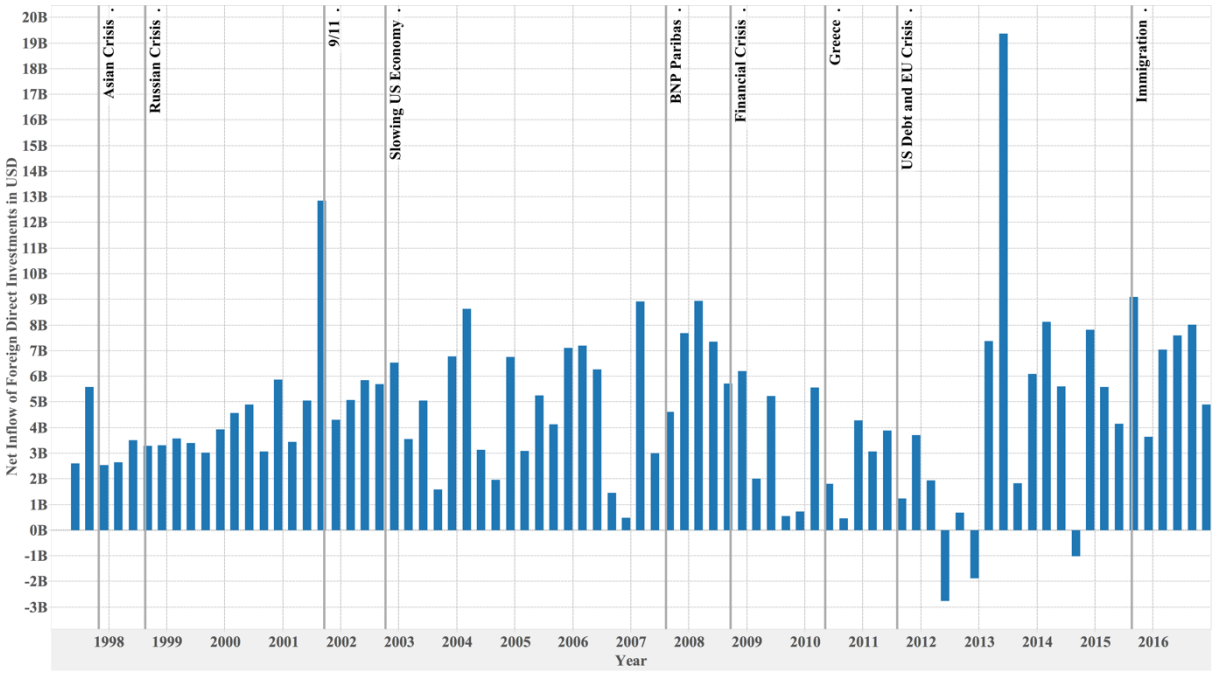


Note: "Financial Account, Net Inflow in USD" represents inverse values of Financial Account constructed according to BPM6

Data Source: Reuters

In the following section, we will focus more on the single three major components of the Financial Account: foreign direct investments, portfolio investments and other investments. In case of Mexico, all of these three accounts are material and follow their own path. Therefore, it would be incorrect to merge them, for instance to merge the portfolio and other investments accounts. Firstly, we will examine each of these accounts separately in order to better understand development and possible changes due to financial stress. Then, we will create a stacked bar chart to unravel, which of these accounts were main drivers for the already described changes in the whole Financial Account.

Graph 10: Mexico's Net Foreign Direct Investments Inflow

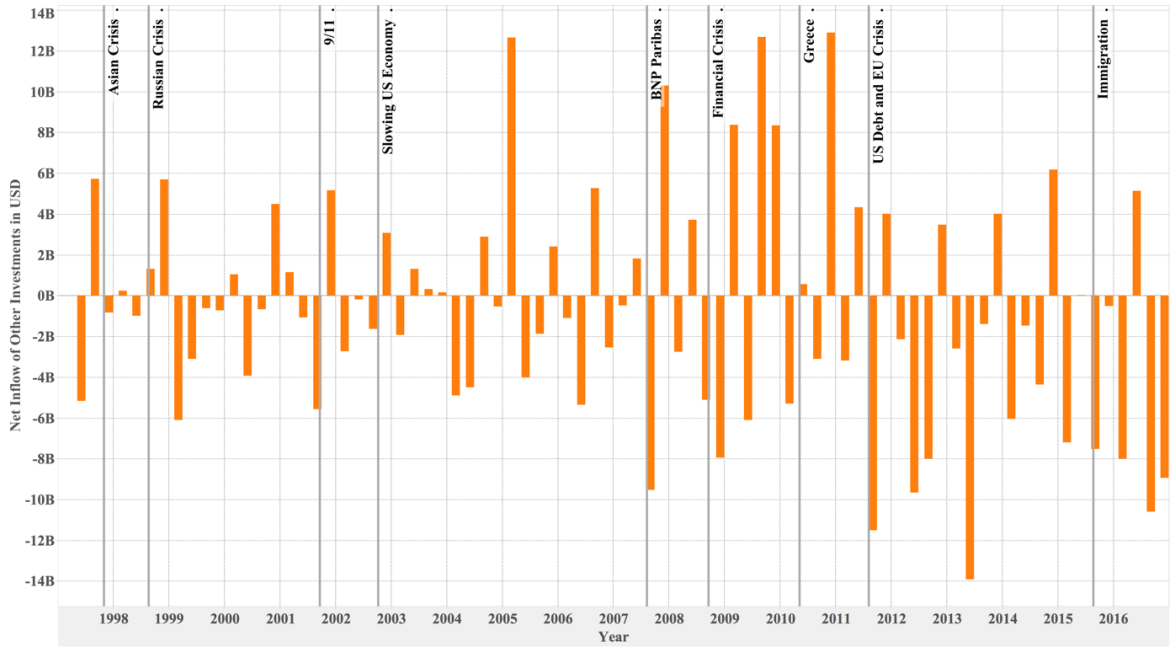


Note: "Net Inflow of Foreign Direct Investments in USD" represents inverse values of Foreign Direct Investments Account constructed according to BPM6

Data Source: Reuters

Despite the presence of seasonality, the graph (10) shows relatively constant net FDI inflow. According to United Nations Conference on Trade and Development report from February 2013, Mexico's FDIs recorded volatile inward reinvested earnings ranging from 12% to 35% share of the total FDI inwards (1997-2011), which indicates that investors were quite confident in Mexico's investment environment and were willing to reinvest their earnings. Any substantial share of reinvested earnings on total FDI ensures stable capital inflow. The equity earnings range from 45% to 65%. Residual FDIs are classified as other investments. Mexico´s stable net FDI inflow is consistent with the "cold money" foreign direct investments theory, thus shows resistance to financial stress. The whole period can be divided into 4 main periods. The first period is from the beginning of our sample to the Slowing US Economy crisis. At that time, FDIs were very stable except for 2001Q3, when they tripled the average of previous quarters. In the second period, between Slowing USD Economy Crisis and Financial Crisis, FDIs still showed net inflow, but we can notice significantly higher volatility. The third period signals material decrease of FDIs and we even observe net outflow in 2012. The year 2013 can be seen as a huge reversal of this trend and as a starting point for the current situation, which is similar to the one before Financial Crisis. The second quarter of 2013 even set a record of almost $20 billion net FDIs inflow. This was mainly due to acquisition of Mexican beer giant Grupo Modelo by Belgian brewer Anheuser-Busch InBev.

Graph 11: Mexico's Net Other Investments Inflow

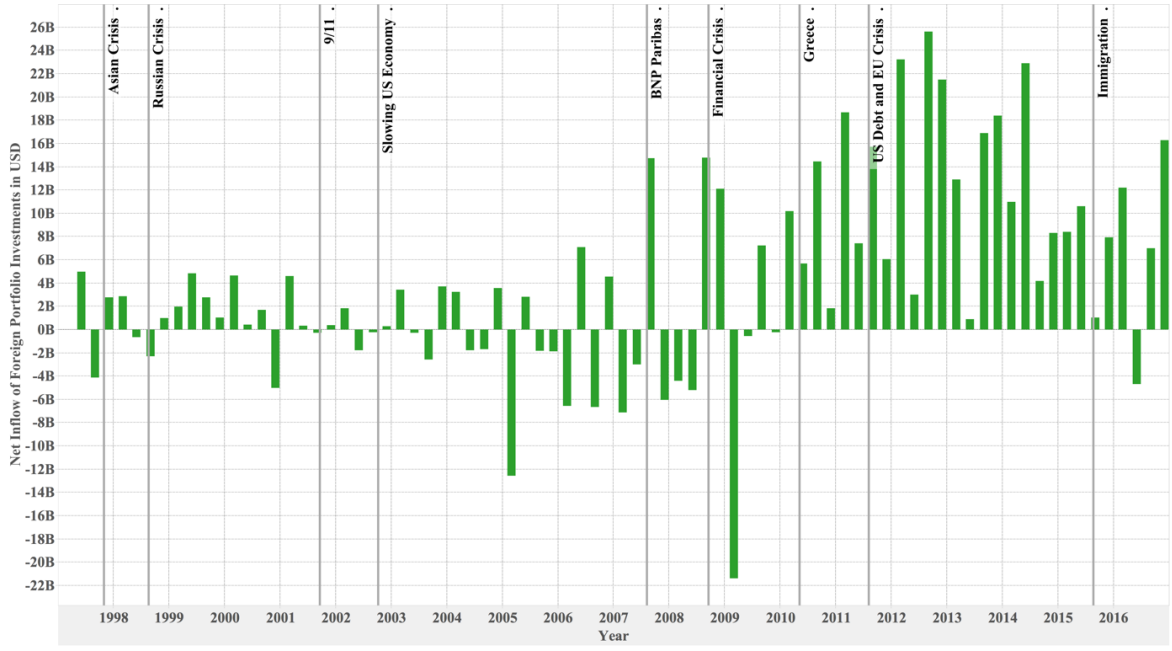


Note: "Net Inflow of Other Investments in USD" represents inverse values of Other Investments Account constructed according to BPM6

Data Source: Reuters

Mexico´s Other Investment (OI) account is extremely volatile to such extent, that it is almost impossible to detect any development patterns. Moreover, it even looks like a random walk. On the other hand, it seems that (i) BNP Paribas crisis, (ii) Financial Crisis and (iii) US Debt and EU Crisis had immediate negative impact on the net OI inflow. However, in each of these cases, the OI recorded a positive net inflow in the quarter following the crisis. Since 2012 Other Investments are mainly in negative net inflow territory.

Graph 12: Mexico's Net Foreign Portfolio Investments Inflow



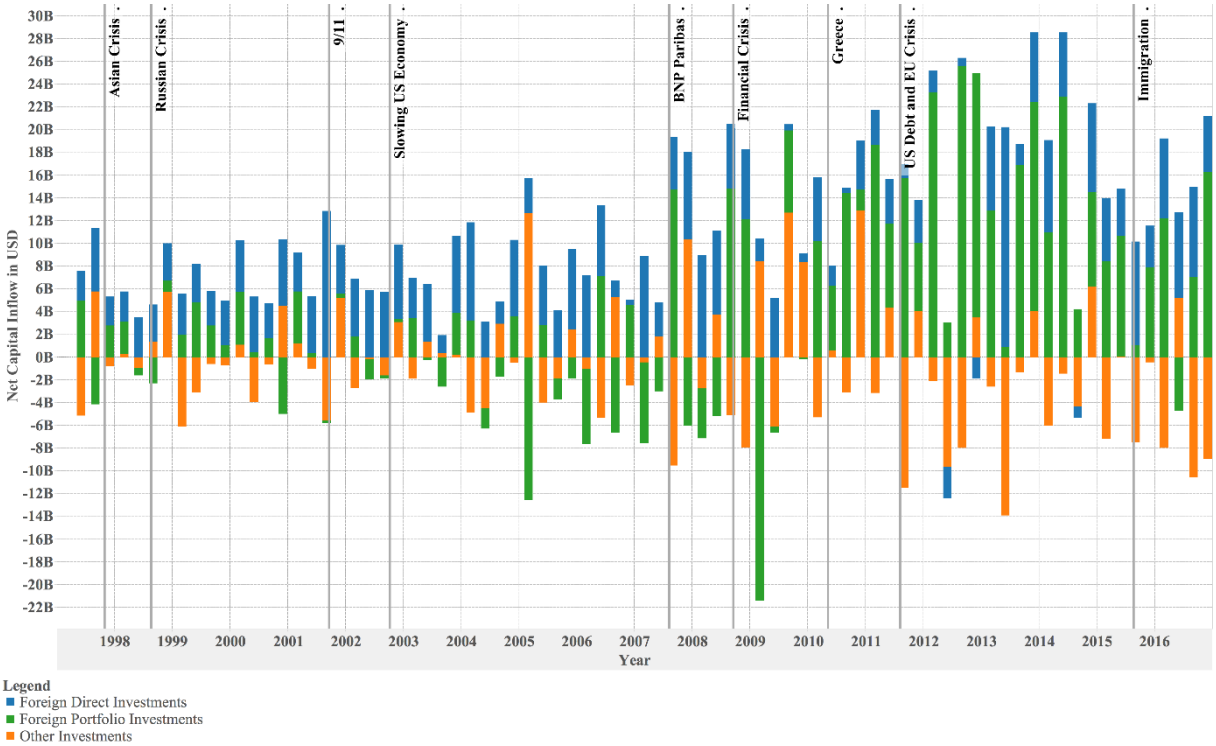
Note: "Net Inflow of Foreign Portfolio Investments in USD" represents inverse values of Foreign Portfolio Investments Account constructed according to BPM6

Data Source: Reuters

Portfolio Investments were marginal before the BNP Paribas crisis, except in 2005Q1, when FPI recorded a negative net inflow of $12 billion. BNP Paribas, Financial Crisis and USD Debt and EU Crisis significantly impacted the FPI, but in a completely opposite way than the OI. We can see either a substantial drop of FPI net inflow in the quarter following the crisis (in case of US Debt and EU Crisis) or a complete reversal, when the FPI ended in a negative net inflow. The most evident case is after the Financial Crisis, when the FPI recorded a $21 billion net outflow in 2009Q1. After the recovery from this crisis, the FPI are more stable and record net FPI inflow, which is again in contrary to OI account.

Now we will identify main drivers of FA changes and constant capital net inflow in the second half of our sample period. At first sight, we can see the evident negative correlation between OI and FPI. Net capital inflow drops after 9/11 and Slowing US Economy resulted mainly from OI net outflow. The net capital outflow in 2004Q2 was a consequence of OI and FPI, both ending in negative net inflow. The net capital outflow in 2009Q1 was driven by a large net FPI outflow, which was approximately twice as big as the net inflow of FDI and OI combined. The net capital inflow after the recovery from Financial Crisis was mainly driven by FPI net inflow in combination with FDI net inflow.

Graph 13: Mexico's Net Capital Inflow (Stacked Bar)



Data Source: Reuters

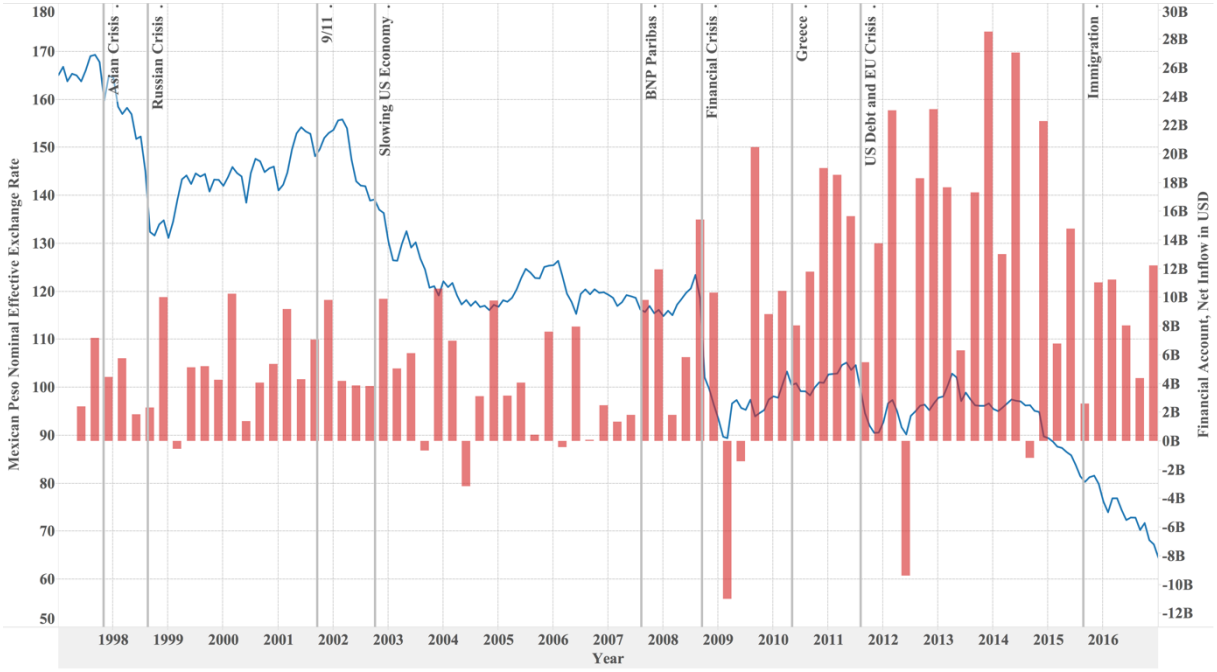
3.2 Mexican Peso's Exchange Rate Development

This section is dedicated to the actual exchange rate development throughout the whole sample period. Firstly, we will examine ER changes during the whole period. We have two benchmark groups that can be used to measure Mexican Peso's performance. The first one is the nominal effective exchange rate of MXN, which measures performance of MXN against a broad currencies' basket. The second are safe haven currencies that we introduced in sub-chapter 2.4, namely USD, CHF, and JPY. At the end, we will provide a short overview of our findings, together with some additional remarks.

Mexican Peso's Nominal Effective Exchange Rate

Nominal effective exchange rate (NEER) has its pros and cons. On one side, it is a very powerful tool to measure selected currency's performance against a basket of currencies. On the other side, the Bank for International Settlements calculates the NEER only on monthly basis. Thus, the graph (14) may look a little bit confusing as reference lines of risk-off periods are intercepting NEER line already during its significant drop, for instance in the case of Financial Crisis. The graph (14) shows a constant depreciation of Mexican Peso. Therefore, it is difficult to identify, whether the depreciation is caused by the trend or by a risk-off event. In case of Asian Crisis, Russian Crisis, Financial Crisis and US Debt and EU Crisis, we can see a large depreciation of MXN occurring right after the beginning of these crises. In the theoretical part, we mentioned that identifying risk-on periods is a very difficult task. However, we anticipate that following periods create space for possible risk-on periods; (i) between Russian Crisis and 9/11, (ii) between Slowing US Economy and BNP Paribas Crisis, (iii) between US Debt and EU Crisis and Immigration Crisis. Despite the long-term depreciation trend, we can observe appreciation of the Mexican Peso during the first of above-mentioned periods. This by far was the longest and strongest appreciation period for MXN. The second period shows an overall depreciation, but such depreciation was fractional and the exchange rate was relatively stable. In the third period, MXN strengthened except in 2012Q2, which seems to be strongly connected to the net capital outflow during that period. At the end of this period, MXN weakened significantly. One of the reasons was net capital inflow drop.

Graph 14: Mexican Nominal Effective Exchange Rate



Note: "Financial Account, Net Inflow" represents inverse values of Financial Account constructed according to BPM6

Data Source: Reuters

It would be insufficient to evaluate Mexican Peso NEER performance only based on a graph. Thus, we created a table in which we compare NEER before and after the risk-off event. If this event occurred in month *T*, then we calculate the change according to following formula;

$$Percentage\ Change = \ln \frac{NEER_{t-1}}{NEER_{t+3}}$$

We use $NEER_{t-1}$, because $NEER_t$ is already influenced by the risk-off event. Moreover, we consider a 3-month period to be long enough to absorb ER changes arising from this event. During the whole sample period, Mexican Peso's NEER on average decreased by 1.52% during a 4-month period. This represents the overall depreciation trend of the currency. The median was -0.88. The difference between the median and average is showing asymmetrical distribution. In this case, we have a negatively skewed distribution. This finding is consistent with our expectations that risk-off events cause a significant slump of the NEER. According to our calculations, top 3 risk-off events are:

1. Financial Crisis (-24.73%)
2. US Debt and EU Crisis (-14.48%)
3. Russian Crisis (-12.81%)

Except 9/11, all other crises resulted in a decrease of Mexican Peso's NEER. However, this decrease was not as significant as in case of the top 3 crises. The table (4) shows results of our calculations.

Table 4: Mexican Peso Nominal Effective Exchange Rate Changes

Event	Month	NEER chang
Asian Crisis	Oct-97	-2.86%
Russian Crisis	Aug-98	-12.81%
9/11	Sep-01	0.12%
Fear of Slowing US Economy	Jul-02	-2.69%
BNP Paribas	Aug-07	-2.74%
Financial Crisis	Sep-08	-24.73%
Greece	May-10	-4.07%
US Debt and EU Crisis	Aug-11	-14.48%
Immigration Crisis	Aug-15	-2.71%
Average		-7.44%
Median		-2.86%

Data Source: Reuters

Mexican Peso's Performance Against Safe Currencies

In this subchapter, we will be measuring Mexican Peso's performance against the safe haven currencies USD, JPY and CHF. We expect even worse performance of MXN against these currencies than it was in the case measured by NEER. The graph (15) shows Mexican Peso's exchange rate development against all three safe haven currencies. The dynamics of MXN against safe haven currencies is very similar to the MXN nominal effective exchange rate. We observe significant depreciation of MXN during Russian Crisis, Financial Crisis and US Debt and EU Crisis. The first risk-on period (2003-2007) shows relatively stable exchange rates. Furthermore, we observe large depreciation trend of the Mexican Peso starting from the beginning of 2015.

Graph 15: Mexican Peso Performance Against Safe Haven Currencies

Data Source: Reuters

For evaluation of Mexican Peso's performance against safe haven currencies, we adopted very similar approach to the case of NEER. We tested the performance based on one-week data. These data shall be more accurate and less biased by market's overreaction (described in behavioral finance paragraphs). The following formula was used:

$$Percentage\ Change = \ln \frac{ER_{w-1}}{ER_{w+12}}$$

- w is the week in which the event occurred
- ER is the safe haven currency's exchange rate

The logic behind choosing this 13-weeks period is the same as in the case of NEER. However, weekly data are more convenient as we use 3-month instead of 4-month period. Therefore, the sample would be less biased by the overall trend. The period is shorter despite the reaction being almost the same (12-weeks vs. 3-months). In the data set, a safe currency is always in a position of base currency, meaning that a positive change would result in depreciation of Mexican Peso. In order to have consistent tables, we decided to invert these numbers. Thus, a negative figure in the following table means depreciation of Mexican Peso. During our sample period, Mexican Peso depreciated against all three safe currencies.

We calculated the average and median ER change on a 13-week period. Swiss Franc recorded the strongest average appreciation against Mexican Peso (1.65%), followed by Japanese Yen (1.28%) and US Dollar (1.18%). All three currency pairs had a negatively skewed distribution curve. The most negatively skewed distribution curve was on the JPY/MXN pair and the most normal distribution had the CHF/MXN pair. The table (5) shows performance of Mexican Peso against safe haven currencies.

Table 5: Mexican Peso Performance Against Safe Haven Currencies

Event	Month	USD	CHF	JPY
Asian Crisis	Oct-97	-4,76%	-6,37%	-1,03%
Russian Crisis	Aug-98	-11,73%	-21,49%	-32,14%
9/11	Sep-01	4,41%	4,81%	9,48%
Fear of Slowing US Economy	Jul-02	-2,84%	-3,83%	0,17%
BNP Paribas	Aug-07	3,05%	-0,19%	-0,91%
Financial Crisis	Sep-08	-24,26%	-20,18%	-39,52%
Greece	May-10	-2,75%	-6,13%	-10,75%
US Debt and EU Crisis	Aug-11	-10,27%	-0,75%	-15,11%
Immigration Crisis	Aug-15	-1,89%	1,17%	-3,92%
Average		-5,67%	-5,88%	-10,41%
Median		-2,84%	-3,83%	-3,92%

Data Source: Reuters

Results in the table (5) show quite similar path of USD/MXN and CHF/MXN. MXN depreciated against USD mainly during Russian Crisis, Financial Crisis, and US Debt and EU Crisis. These results are almost identical to the ones observed on Mexican Peso NEER. Depreciation of MXN against CHF was very significant during Russian Crisis and Financial Crisis. The result of the US Debt and EU Crisis is quite biased as the Swiss National Bank intervened on the foreign exchange market in September 2011 and pegged its exchange rate to Euro. Furthermore, Asian Crisis, Greece Crisis, and to some extent also Fear of Slowing US Economy caused significant depreciation of MXN against CHF. The depreciation of Mexican Peso against Japanese Yen is by far the most visible from all benchmarks that we provided. On the other hand, MXN significantly appreciated during 9/11 crisis. The graph (15) shows a decent performance of MXN against JPY and USD during potential risk-on periods. The CHF/MXN graph indicates a constant depreciation of MXN against CHF even during risk-on periods.

Concluding Remarks

Throughout our examination of Mexico's capital flow and Mexican Peso, we highlighted the following points; (i) Current Account deficit, (ii) positive net capital inflow, (iii) significant depreciation during Russian Crisis, Financial Crisis and US Debt and EU Crisis, (iv) strong depreciation trend, (v) relatively stable ER of MXN during potential risk-on periods. Furthermore, MXN started to depreciate strongly at the end of 2014. There are more potential drivers of this downturn. Mexico, as the sixth largest oil producer, was firstly hit by a slump in oil prices. This event had a negative impact on MXN as it did on the Norwegian Krone, Russian Ruble or Azerbaijani Manat. Mexican economy then delivered lower than expected performance and recently MXN has been under significant depreciation pressure after Donald Trump was elected as the US president.

According to Reporte sobre el Sistema financiero 2010 published by Banco de México, banks operating in Mexico are highly exposed to "western banks" (USA 54%, UK 16%, ES 12%, FR 6%). This exposure leads to a large capital outflow during credit crunch episodes. It is a consequence of bank capital withdrawal from emerging markets. These outflows then put the MXN under high depreciation pressure.

It is hard to identify the exact cause for MXN's depreciation trend. However, the interest rate parity and purchasing power parity could be seen as explanatory variables of this trend as IR and CPI are significantly higher in Mexico than in the safe havens. This would also explain, why the Mexican Peso is not appreciating during risk-on periods as the effect of IRP and PPP are offsetting appreciation pressure caused by net capital inflow.

4 Turkey

This chapter analyses Turkey's capital flow and exchange rate development throughout our sample period. We will be using the same approach as we did in the case of Mexico. Thus, we will start with a very brief introduction of Turkey, followed by factors that could impact our results (exchange rate regime, Current Account balance, local economic crises) and then we switch to the core of the analysis, which is the capital flow in Turkey and exchange rate development of the Turkish Lira (TRY).

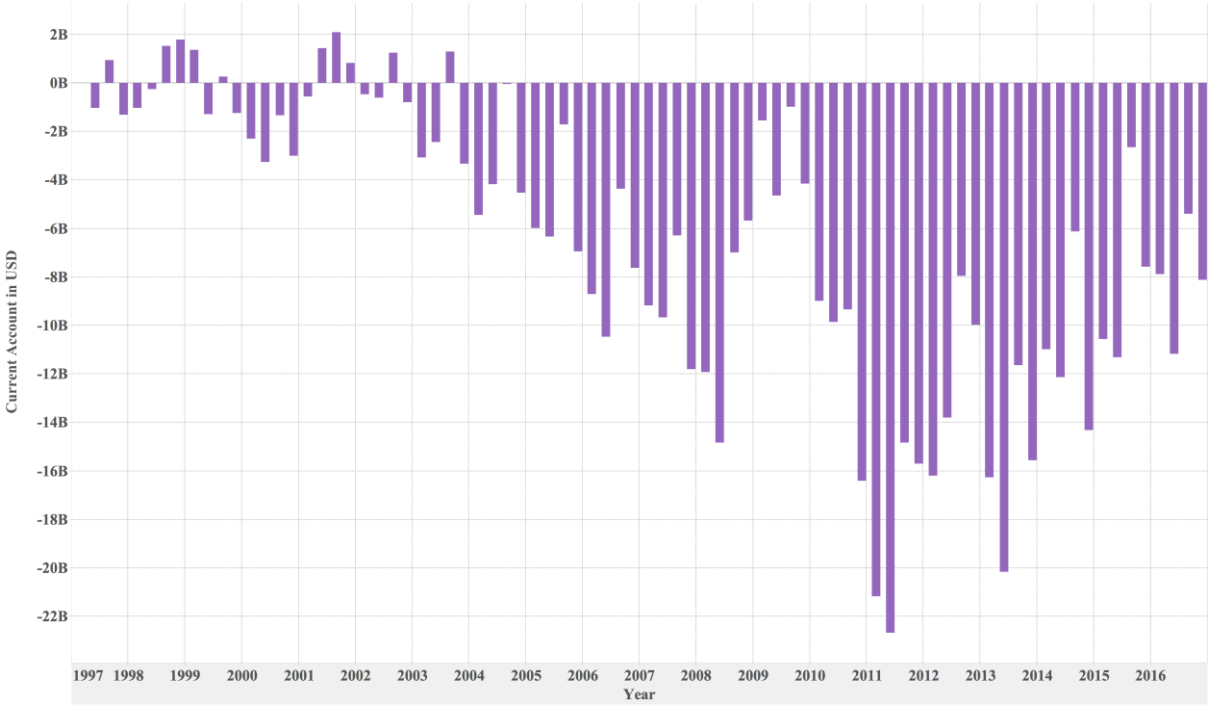
The analysis of Turkey shall be interesting from many aspects. First, Turkey used to be a high inflationary country until it stabilised and current Turkey's inflation is around annual 8% (measured by consumer price index), which is still significantly higher than in Mexico and South Korea. Secondly, we can describe Turkey as a country with high level of instability, both economic and political. Therefore, we shall expect large capital flow changes and volatility of ER. Next, we will provide more insights on ER regimes, CA and local crisis.

We shall start with the exchange rate regime of the Turkish Lira. In the period between November 1995 and December 1999, TRY was under a crawling peg regime. The exchange rate policy was to devaluate the TRY according to inflation changes against a currency basket. Thus, during that time, the ER was consistent with the PPP doctrine. The crawling peg regime was implemented by the Central Bank of the Republic of Turkey (CBRT) to control inflation and avoid negative effects on the foreign trade. One can suggest that the Turkish Central Bank was worried about an appreciation of the Turkish Lira's real exchange rate and consequent decrease of Turkish companies' competitiveness on international market. In 2000, the Central Bank in cooperation with the IMF prepared an Exchange Rate Based Stabilization Program. The aim of this program was to gradually replace the ER regime with a floating regime. This was designed to be accomplished by a gradual widening of ER bands. However, this plan has never been implemented as the Central Bank released the Turkish Lira to a floating regime right after the financial crisis that occurred in February 2001. Since then, the exchange rate policy of the CBRT remains unchanged and the TRY is considered to be a floating currency. However, the Central Bank uses direct (FX interventions) and indirect (FX auctions) methods to influence the ER. These instruments are used to ensure financial stability and avoid excessive ER volatility. (Görmez, 2007)

The Current Account was relatively balanced from the beginning of our sample till 2004. Turkey started to run a chronical CA deficit from 2004. The fall of Lehman Brothers and

consequent financial crisis sharply decreased the CA deficit. This period did not last long as the deficit started to enlarge significantly in 2010. The deficit of CA and its development is very similar to Mexico's CA. Therefore, Turkey is also very dependent on capital inflow to finance the Current Account deficit and keep the BoP in equilibrium.

Graph 16: Current Account of Turkey



Data Source: Reuters

As already mentioned, Turkey faced a heavy economic and currency crisis in 2000/2001. At the beginning of this crisis was a stand-by arrangement between Turkey and the IMF (agreed in December 1999). It was a pre-announced strategy to exit the crawling peg regime along with avoidance of a real appreciation of the currency. Due to heavy problems of Dermibank and resulting consequences on other banks, the Central Bank had to inject liquidity in November 2000. The situation worsened at the beginning of 2001 as the Treasury had to face high interest rates (60-70%), that had negative impact on financing the debt. A public disagreement between the Prime Minister and the President led to a massive attack on TRY on 21st of February 2001. The Central Bank found the situation unsustainable and released the Turkish Lira into a floating regime. The aftermath was devastating as the Lira depreciated immediately against the USD by 40% and the real GDP in 2001 declined by 5.7%. Therefore, we shall include this event to our risk-off periods. (Macovei, 2009)

Generally, political instability causes market's uncertainty and increases volatility. The political situation in Turkey has always been a big issue and became a large topic in mid-

2016. On 15th of July 2016 there was unsuccessful coup attempt. This event shall have a negative impact on the ER and Financial Account. Thus, we can add it to our risk-off periods as well.

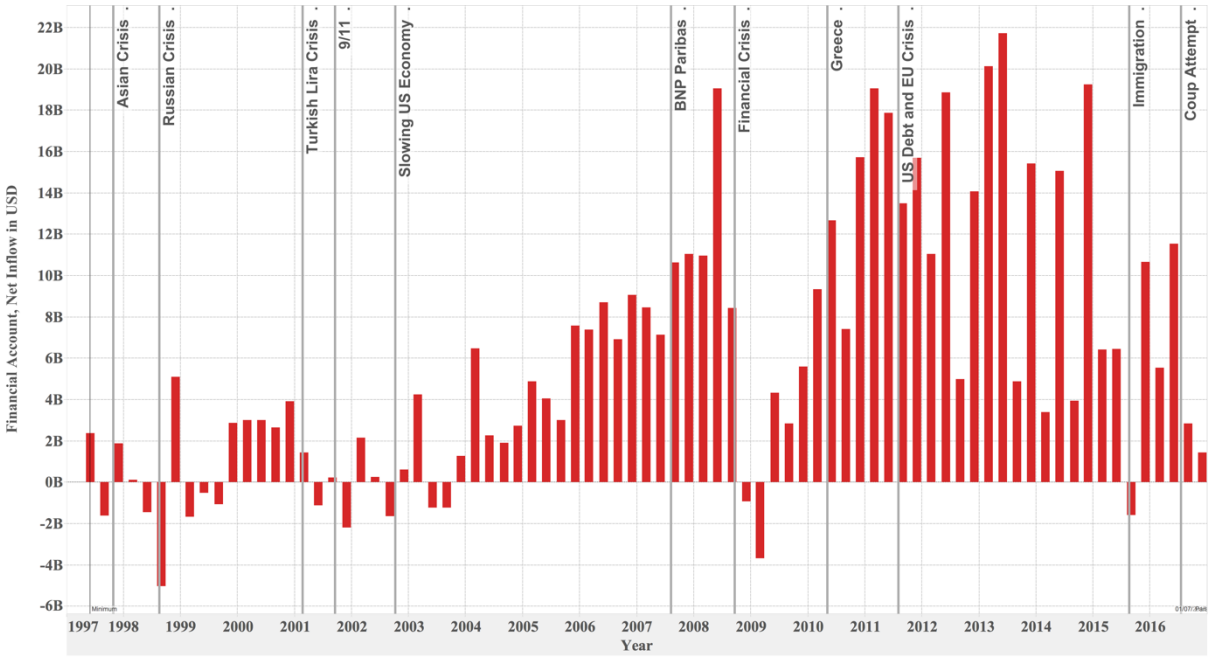
4.1 Capital Flow in Turkey

Next, we shall focus on Turkey's Financial Account. Unlike Banco dé Mexico, the Central Bank of the Republic of Turkey already adopted the latest IMF's methodology (BPM6). For consistency reasons, we keep using terms like "net inflows" or "net outflow" instead of "Financial Account balance". Turkey's Financial Account has two major differences compared to Mexico. First, all data on the Balance of Payments are published monthly, allowing us to see the flexibility of capital flow changes. Second, Turkey's Financial Account has four components. Reserve assets is the extra component that was not included in Mexico's BoP. This inconsistence is also caused by applying different methodology. Mexico's BoP reports reserve assets under a separate account named Change in gross international reserves.

We shall start with the description of the overall capital flow, shown on graph (17). The Balance of Payments shows relatively balanced capital flow from 1997 until 2004. During that time, Financial Account reacted strongly to Russian Crisis and Turkish Lira Crisis. Russian Crisis occurred in the 3rd quarter of 1998, which resulted in a strong net capital outflow. However, this outflow was offset by net inflow in the 4th quarter. From 1999 Q4, the Financial Account started to report a constant quarterly net inflow of approximately 3 billion USD. This favourable trend was reversed in the 1st quarter of 2001, when Turkey suffered a large currency crisis. We observe a stable growth of net capital inflow between 2004 and the Financial Crisis. Financial Account seems to be resistant to BNP Paribas crisis. This is true only for quarterly reported data. Monthly data show significant net inflow drop in the month of this risk-off event, but a quick recovery in the following month. The stable net capital inflow in this period (2004-2008) and low volatility created potential for Turkish Lira's appreciation. We see a large Financial Account net inflow drop in the 3rd quarter of 2008 and net outflow in the following two quarters. These patterns are very similar to Mexico's Financial Account. After the recovery, net capital inflow started to grow rapidly, despite being slowed down by Greek Crisis and US Debt and EU Crisis. Although the Financial Account's volatility increased, we see the net capital inflow at that time (from 2010) as a significant driver for TRY appreciation or at least for performance improvement.

Immigration Crisis and especially the coup attempt in 2016 had large negative effect on the Financial Account net inflow.

Graph 17: Turkey's Net Capital Inflow

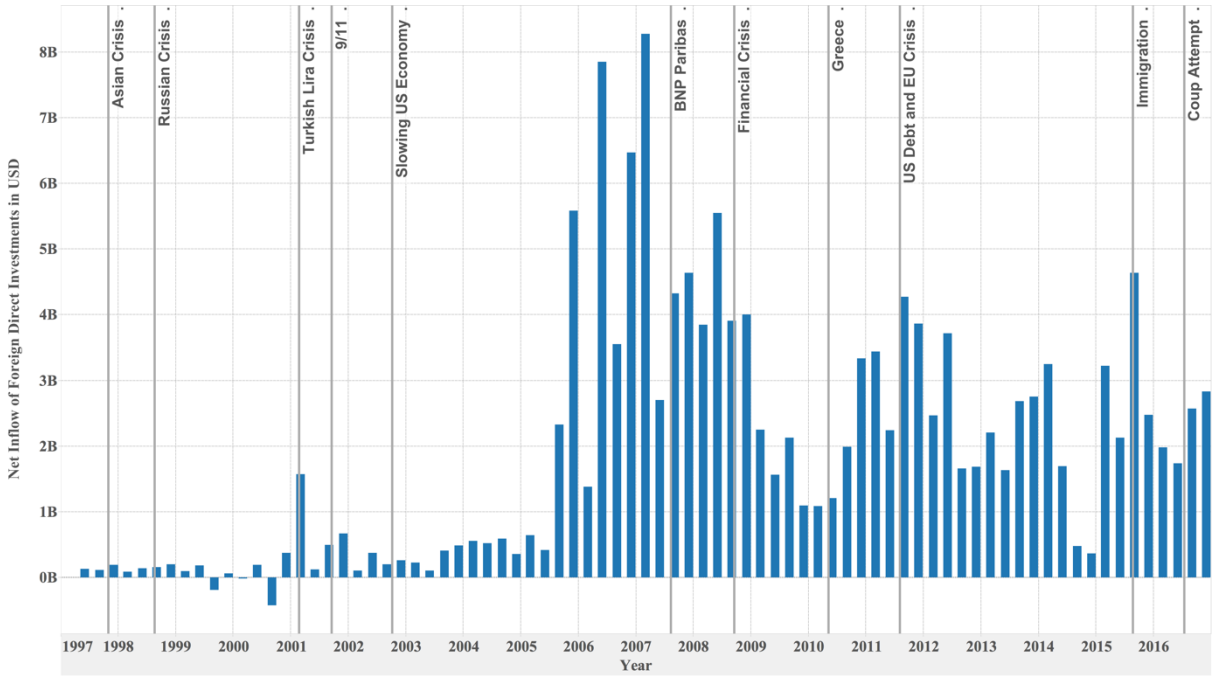


Note: "Financial Account, Net Inflow" represents inverse values of Financial Account constructed according to BPM6

Data Source: Reuters

Further, we shall focus on individual components of the Financial Account, starting with the foreign direct investments, graph (18). The beginning of our sample period shows very low levels of FDIs. The only exception is February 2001, when a new GSM operator entered the telecommunications sector with a FDI of 1.5 billion USD. Despite occurring in the same month, there is no connection between this investment and TRY Crisis. After the Turkish Lira Crisis, the new government decided to implement laws in order to decrease bureaucracy and attract new foreign investors. The real boom of foreign direct investments occurred in the second half of 2005. The source of these investments were mainly EU countries (58% to 90% of all FDI, depending on the year), followed by United Arab Emirates and Russian Federation. Most of the investors targeted the service sector of Turkey's economy. During the last 6 years (2011-2016), foreign investors started to aim at the industrial sector as well, reaching almost 50% of overall FDI inflows. Geographically, sources of capital remained relatively unchanged. The Financial Crisis caused a significant drop (approximately by 50%) of net FDI inflows. This drop was mainly due to decrease of equity inward investment, which recorded a 65% decrease in 2009 compared to 2007. The situation improved and stabilised in 2011. Surprisingly enough, FDI inflows is resistant to the Immigration Crisis and the Coup Attempt. (UNCTAD)

Graph 18: Turkey's Net Foreign Direct Investments Inflow

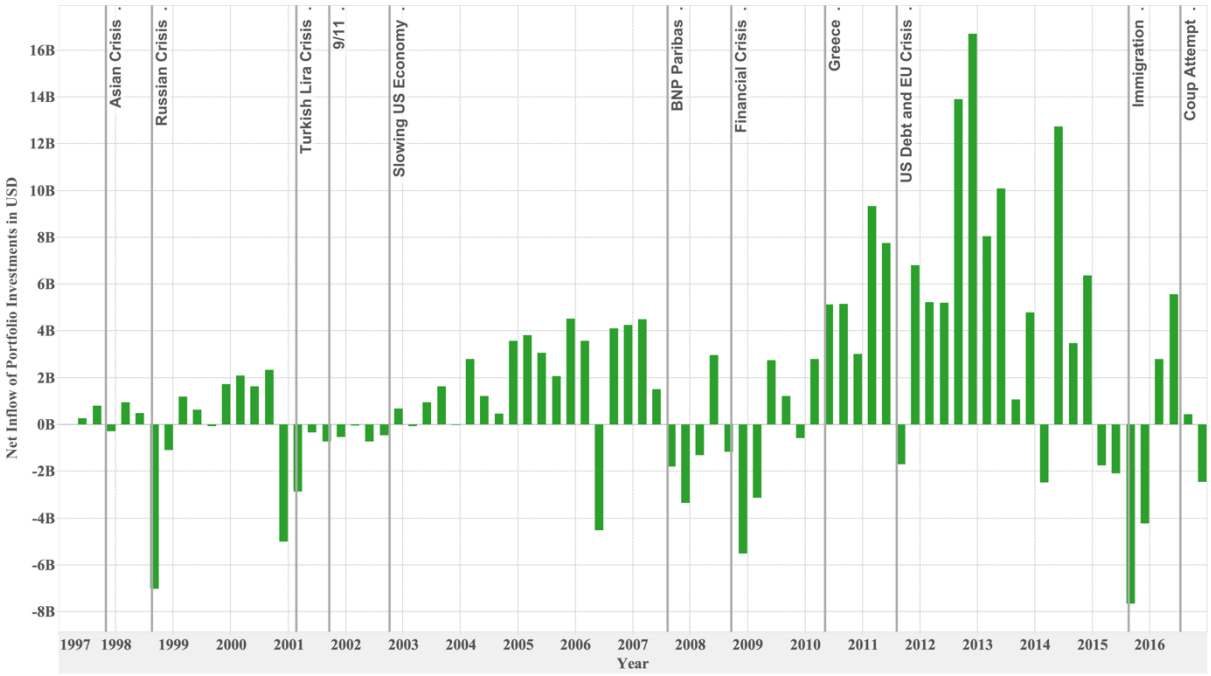


Note: "Net Inflow of Foreign Direct Investments in USD" represents inverse values of Foreign Direct Investments Account constructed according to BPM6

Data Source: Reuters

The graph (19) indicates high risk sensitivity of foreign portfolio investments. Most risk-off events resulted into net portfolio investments outflows. Russian Crisis and Turkish Lira Crisis are very good examples of this outflow. The Turkish Lira Crisis occurred in February 2001. However, the Turkish economy was in problems already in November 2000, which resulted into a net FPI outflow in 4th quarter of 2000. Turkey recorded relatively stable quarterly net FPI inflow from 2003 until 2007. The only exception was the second quarter of 2006, which ended in a net outflow of 4.5 billion USD with 70% of this outflow occurring in May. This outflow looks very suspicious and we shall test, whether it impacted the exchange rate of the Turkish Lira. On the other hand, the stable FPI net inflow in the period 2003-2007 had a positive impact on TRY performance. The Financial Crisis and all following crises, except Greek Crisis, had significantly negative effect on FPIs. New portfolio investments started to flow into Turkey after the recovery from Financial Crisis. This period lasted for 5 years and positively impacted the ER.

Graph 19: Turkey's Net Foreign Portfolio Investments Inflow

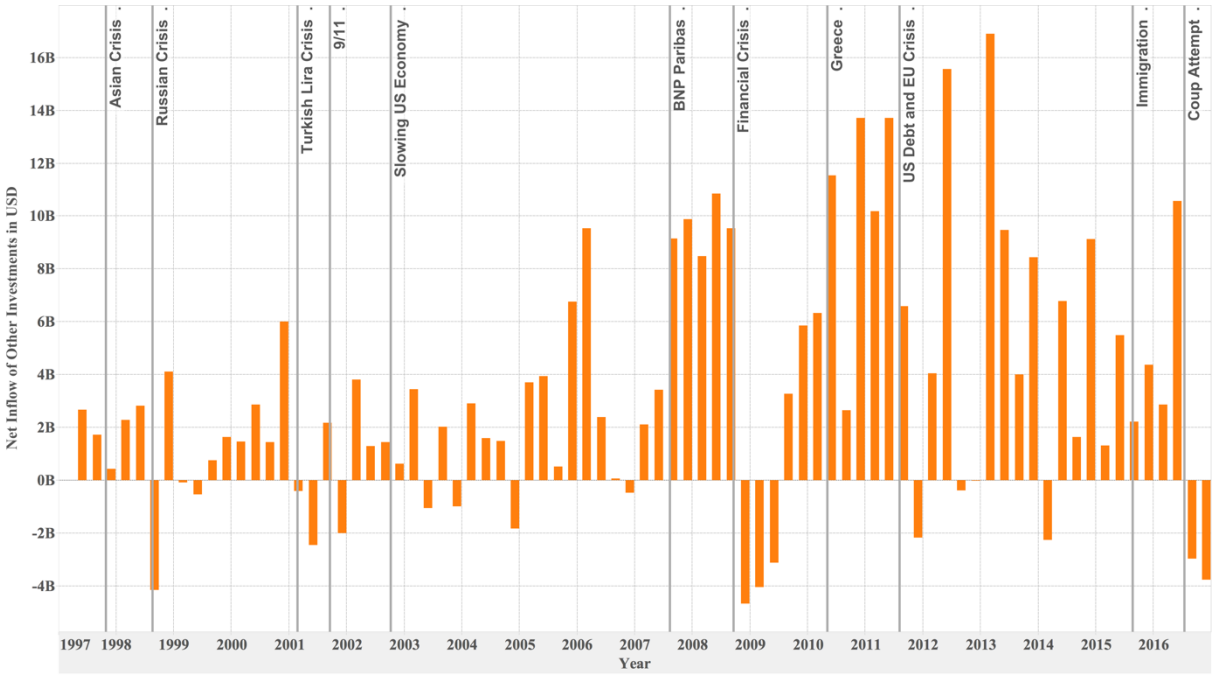


Note: "Net Inflow of Foreign Portfolio Investments in USD" represents inverse values of Foreign Portfolio Investments Account constructed according to BPM6

Data Source: Reuters

Other Investments account looks relatively similar to FPI account. The flow of OI reacts to most of risk-off events. BNP Paribas Crisis and Immigration Crisis had no effect on OI account. In general, Turkey showed net inflow of other investments. Other investments reacted immediately to risk-off event by a sharp decline of net inflow that most of the time resulted in a net outflow. This net outflow of capital lasted only one quarter. The only exception was the Financial Crisis, where Turkey recorded net OI outflow in three consequent quarters.

Graph 20: Turkey's Net Foreign Other Investments Inflow



Note: "Net Inflow of Other Investments in USD" represents inverse values of Other Investments Account constructed according to BPM6

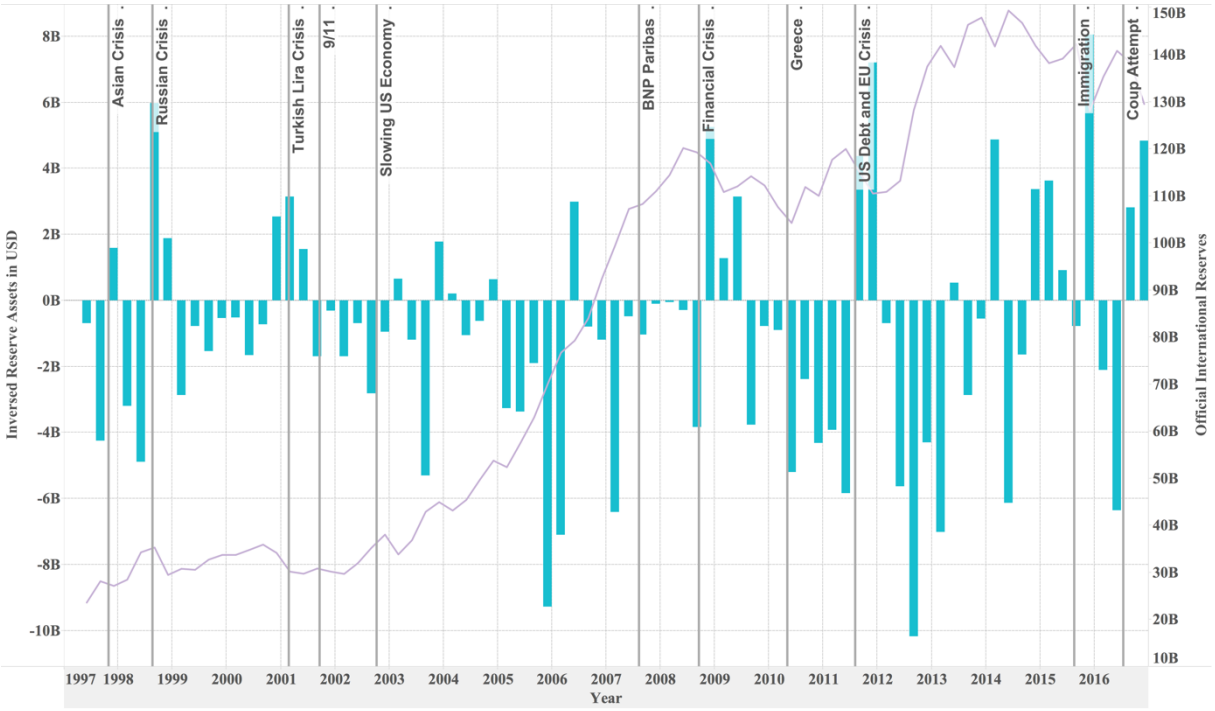
Data Source: Reuters

The last remaining component of the Financial Account are Reserve Assets (RA). This account represents changes of assets that are in a possession of the monetary authority (CBRT). In order to have consistent data, we used inversed values of reserve assets. Our approach to reserve assets reporting ensures the validity of the following equation:

$$FA\ net\ inflow = FDI\ net\ inflow + FPI\ net\ inflow + OI\ net\ inflow + Inversed\ Reserve\ Assets$$

A negative figure of Inversed Reserve Assets are purchases of foreign currencies by the Central Bank and vice versa. Logically, we see a negative correlation between Inversed Reserve Assets and Official International Reserves. Throughout the period, we see significant purchases of RA (negative Inversed Reserve Assets values), creating a depreciation pressure on TRY. These purchases take place mainly during low volatility periods. On the other hand, we see the Central Bank defending its currency during risk-off events. The graph (21) shows changes of reserve values and the development of Official International Reserves.

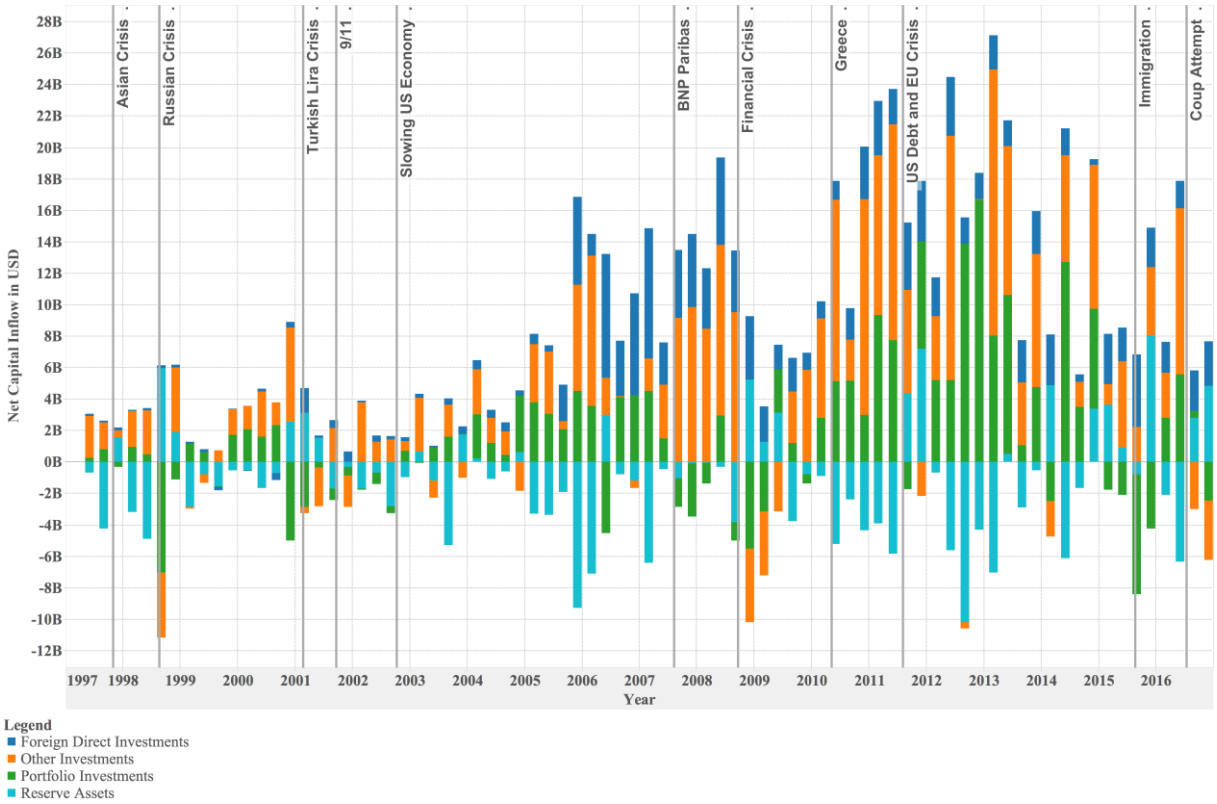
Graph 21: Turkey's Inversed Reserve Assets



Data Source: Reuters

The stacked bar graph (22) reveals several important findings. First is the relative low share of FDI compared to FPI or OI. Net inflow of foreign direct investments played significant role only in 2006 and 2007. At that time, Turkey already reformed its economy and became attractive for foreign investors and simultaneously, the net inflow of OI and FPI were not as significant as they became in the second half of our sample. The second finding is the correlation between FPI+OI and RA. The Central Bank is clearly diminishing the effects of large net capital inflow or net capital outflow on the TRY exchange rate. Therefore, we can observe a strong negative correlation of 0.67 between FPI+OI and RA. In time of high net inflow of FPI and OI, the Central Bank is purchasing foreign currency and building up its international reserves. On the contrary, in time of larger net outflow of FPI and OI (especially during financial crises), the Central Bank is selling its international reserves to reduce depreciation pressure on TRY.

Graph 22: Turkey's Net Capital Inflow (Stacked Bar)



Data Source: Reuters

4.2 Turkish Lira Exchange Rate Development

Next, we start with the examination of Turkish Lira ER. We use the same structure and methodology as we did in the case of Mexican Peso. Firstly, an analysis of TRY against the NEER will be performed, followed by an analysis of TRY exchange rate against safe haven currencies. Firstly, we must address the constraints of the analysis given by the crawling peg, which was in force until December 1999. At that time, the exchange rate followed the inflation differential between Turkey and a basket of countries, making the TRY exchange rate completely resistant to capital flow. Accordingly, we shall exclude that period from our analysis.

Turkish Lira Nominal Effective Exchange Rate

The Central Bank of the Republic of Turkey publishes monthly data on the Balance of Payments that help us to perform a more detailed examination of the relationship between Financial Account and NEER. We tested the correlation between the FA and changes of NEER and presented the results in table (6). We can observe that the correlation increases with the time, meaning that the latest years show significantly higher correlation than those at the beginning of our sample. The results also show significantly higher correlation between OI+ FPI, net inflow and NEER changes than between FA, net inflow and NEER changes.

The OI + FPI net inflow is a simple sum of Other Investments net inflow and Foreign Portfolio Investments net inflow. When we added the Foreign Direct Investments net inflow to OI + FPI net inflow, we received almost the same correlation value.

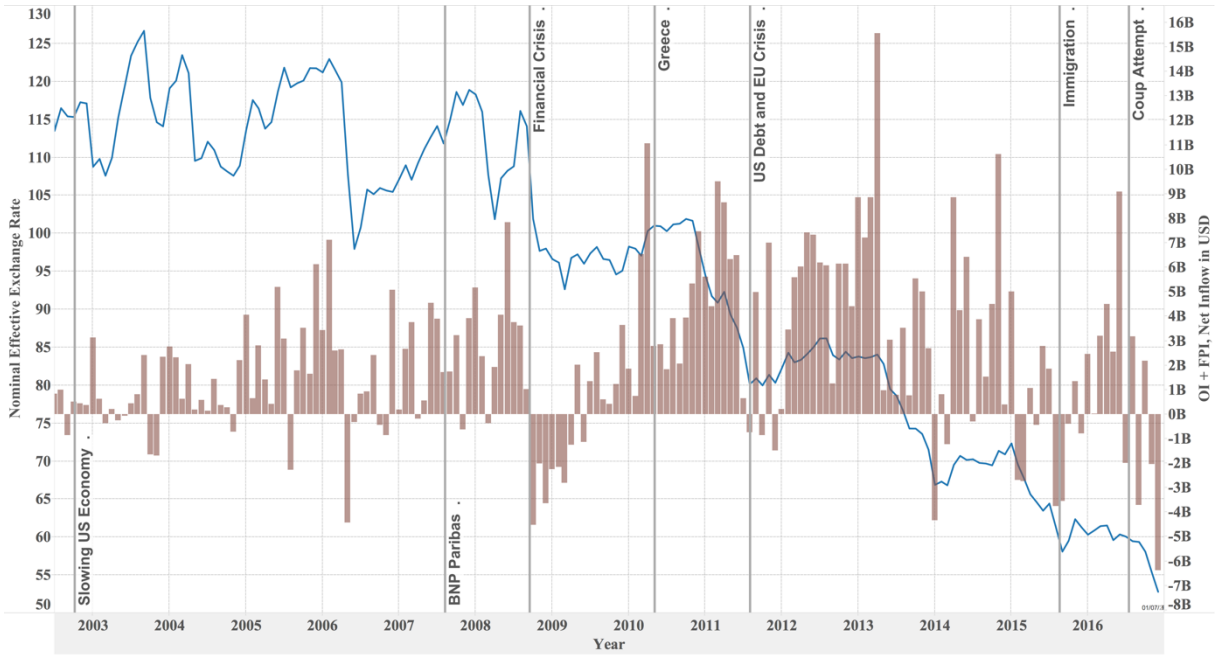
Table 6: TRY NEER and Net Capital Inflow Correlation

Year	FA, net inflow	inversed RA, net inflow	OI + FPI, net inflow	OI + FPI + FDI, net inflow
From 1997	0.231	-0.261	0.348	0.348
From 1999	0.202	-0.278	0.348	0.338
From 2001	0.174	-0.292	0.342	0.326
From 2003	0.151	-0.304	0.355	0.321
From 2005	0.198	-0.333	0.407	0.378
From 2007	0.274	-0.305	0.410	0.410
From 2009	0.196	-0.357	0.420	0.398
From 2011	0.278	-0.380	0.496	0.485
From 2013	0.323	-0.420	0.550	0.546
From 2015	0.389	-0.303	0.551	0.548

Data Source: Reuters

Based on the above given data, we decided to use rather OI + FPI net inflow than the whole FA net inflow data for the visual presentation of TRY NEER. The graph (23) shows the relationship between OI + FPI and NEER, together with the NEER development throughout the whole sample period and responses to risk-off periods. We had to exclude the period from1997 to mid-2002 given that the extreme depreciation of the Turkish Lira (about 40% per year) would make the NEER changes after 2002 almost unnoticeable. Before examining the individual risk-off period, we describe the overall NEER development. We see a noticeable depreciation trend of TRY. The whole sample can be divided to pre- and post-Lehman periods. The pre-Lehman period exhibits a high volatility level and no overall trend. At that time, the NEER also largely overreacted to OI + FPI net outflows or to drop of inflows, for instance in October 2003, May 2004, or May 2006. The post-Lehman period shows completely opposite signs (low volatility and significant depreciation trend). The NEER shape is very similar to a shape of stairs (periodical change between stable ER and sharp depreciation of TRY). At the time of significant net OI + FPI inflow, the TRY exchange rate stabilised, but failed to appreciate against the broad basket of currencies. The NEER was not as sensitive to risk-off events as one would think. A clear impact of risk-off event on NEER can be observed only during (i) Financial Crisis, (ii) Immigration Crisis, (iii) Coup Attempt.

Graph 23: Turkish Lira Nominal Effective Exchange Rate



Note: "OI + FPI, Net Inflow" represents inverse values of sum of Other Investments Account and Foreign Portfolio Account constructed according to BPM6

Data Source: Reuters

Next, we quantify changes of NEER during the risk-off episodes. We use the same approach as we did in the case of Mexican Peso, presented in chapter 3.2. We had to exclude Asian Crisis and Russian Crisis due to TRY's fixed exchange rate regime in force, but added the Turkish Lira Crisis and Coup Attempt. Results are shown in table (7). There is no doubt which of the crises had the strongest impact on TRY. Turkish Lira lost almost half of its value during Turkish Lira Crisis. The second place is occupied by the Financial Crisis, when NEER of TRY decreased by almost 17%. According to table (7), the Fear of Slowing US Economy crisis should occupy the third place. However, we must be careful with such judgement as the graph (23) shows that the TRY appreciated in the first two months of this crisis and then sharply depreciated in January 2003. This depreciation could be caused by lagged consequences of Fear of Slowing US Economy event or it could be caused by completely different driver. The same applies to US Debt an EU Crisis, when the sharp depreciation trend existed before the risk-off event.

Table 7: Turkish Lira Nominal Effective Exchange Rate Changes

Event	Month	NEER change
Turkish Lira Crisis	Feb-01	-47.81%
9/11	Sep-01	-2.56%
Fear of Slowing US Economy	Jul-02	-9.16%
BNP Paribas	Aug-07	2.41%

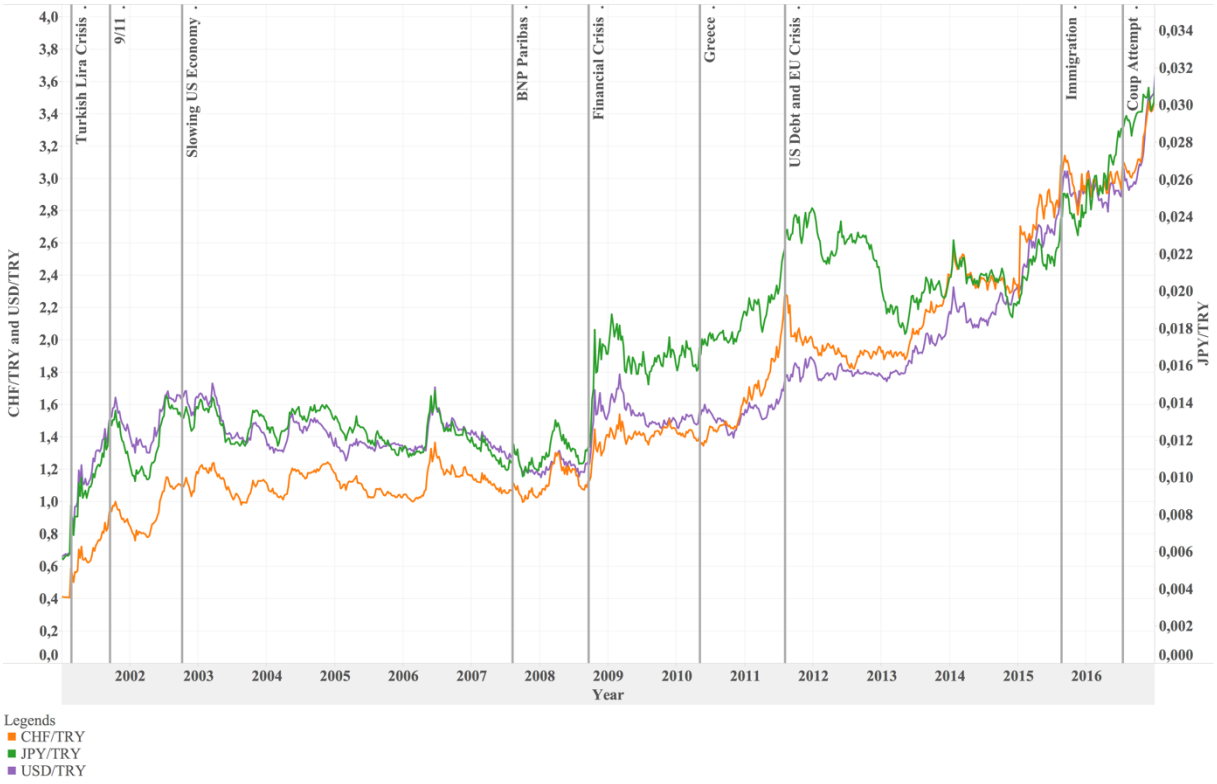
Event	Month	NEER change
Financial Crisis	Sep-08	-16.97%
Greece	May-10	0.85%
US Debt and EU Crisis	Aug-11	-4.27%
Immigration Crisis	Aug-15	-3.25%
Coup Attempt	Jul-16	-3.83%
Average		-9.40%
Median		-3.83%

Data Source: Reuters

Turkish Lira Performance against Safe Currencies

Now, we shall measure performance of the TRY against determined safe haven currencies. The exchange rate development of USD/TRY, CHF/TRY and JPY/TRY is shown on graph (24). During the first risk-on period (2003-2007) we can observe relatively constant exchange rates, showing some volatility, but no trend. We observe a very significant depreciation of TRY during Turkish Lira Crisis and Financial Crisis. These findings are consistent with the NEER. The correlation coefficients between USD/TRY, CHF/TRY and JPY/TRY are extremely high, being evident at first sight. The correlations between these currency pairs are about 0.96, indicating very strong positive correlation.

Graph 24: Turkish Lira Performance Against Safe Haven Currencies



Data Source: Reuters

The Swiss Franc on average appreciated most significantly against the Turkish Lira (by 3.01%) in a 13-week period. The Japanese Yen appreciated by 2.34% and American Dollar by 2.25%. The CHF/TRY pair had the most negatively skewed distribution curve. The remaining currency pairs also had negatively skewed distribution curves. Data in table (8) show development of exchange rates during risk-off episodes. We excluded Asian Crisis and Russian Crisis, as we did in the case of NEER calculations. Some of the figures are very similar to the ones shown in table (7), for instance during Turkish Lira Crisis and Coup Attempt. These risk-off episodes are driven by local crises and therefore they do not influence global financial markets. The Turkish Lira performed decently against safe haven currencies during the 9/11 and the BNP Paribas Crisis, when the TRY noticeably outperformed all safe haven currencies. The Turkish Lira mainly depreciated against safe haven currencies in all remaining risk-off events. The most significant depreciation of TRY occurred during the Turkish Lira Crisis, followed by Financial Crisis and Coup Attempt.

Table 8: Turkish Lira Performance Against Safe Haven Currencies

Event	Month	USD	CHF	JPY
Turkish Lira Crisis	Jul-16	-47.70%	-43.84%	-41.11%
9/11	Sep-01	3.41%	3.94%	11.68%
Fear of Slowing US Economy	Jul-02	-2.10%	-3.11%	0.00%
BNP Paribas	Aug-07	7.81%	4.69%	5.07%
Financial Crisis	Sep-08	-23.16%	-19.03%	-40.10%
Greece	May-10	-1.18%	-4.58%	-9.35%
US Debt and EU Crisis	Aug-11	-3.28%	6.13%	-4.50%
Immigration Crisis	Aug-15	-1.08%	2.05%	-2.45%
Coup Attempt	Jul-16	-8.41%	-6.72%	-3.11%
Average		-8.41%	-6.72%	-9.32%
Median		-2.10%	-3.11%	-3.11%

Data Source: Reuters

Concluding Remarks

To conclude this chapter, we will address some core findings that arose in this chapter. Firstly, we had to exclude the period from beginning of 1997 to the end of 2000, as the Turkish Lira was under a crawling peg exchange rate regime and the ER followed the PPP theorem. The Balance of Payments brought the following findings: (i) chronical Current Account deficit, (ii) net capital inflow in almost every quarter of the sample period, (iii) other investments and portfolio investments being very sensitive to risk-off events, (iv) the CBRT offsetting a sudden appreciation or depreciation pressure to ensure stability on financial

markets. The research on the Turkish Lira and its development also brought several findings: (v) increasing correlation between OI + FPI net inflow and nominal effective exchange rate, (vi) high level of TRY depreciation during Turkish Lira Crisis and Financial Crisis, (vii) decent performance of TRY before the Financial Crisis, (viii) depreciation trend after the Financial Crisis, being accelerated after 2013 and catalysed by the recent political crisis.

5 South Korea

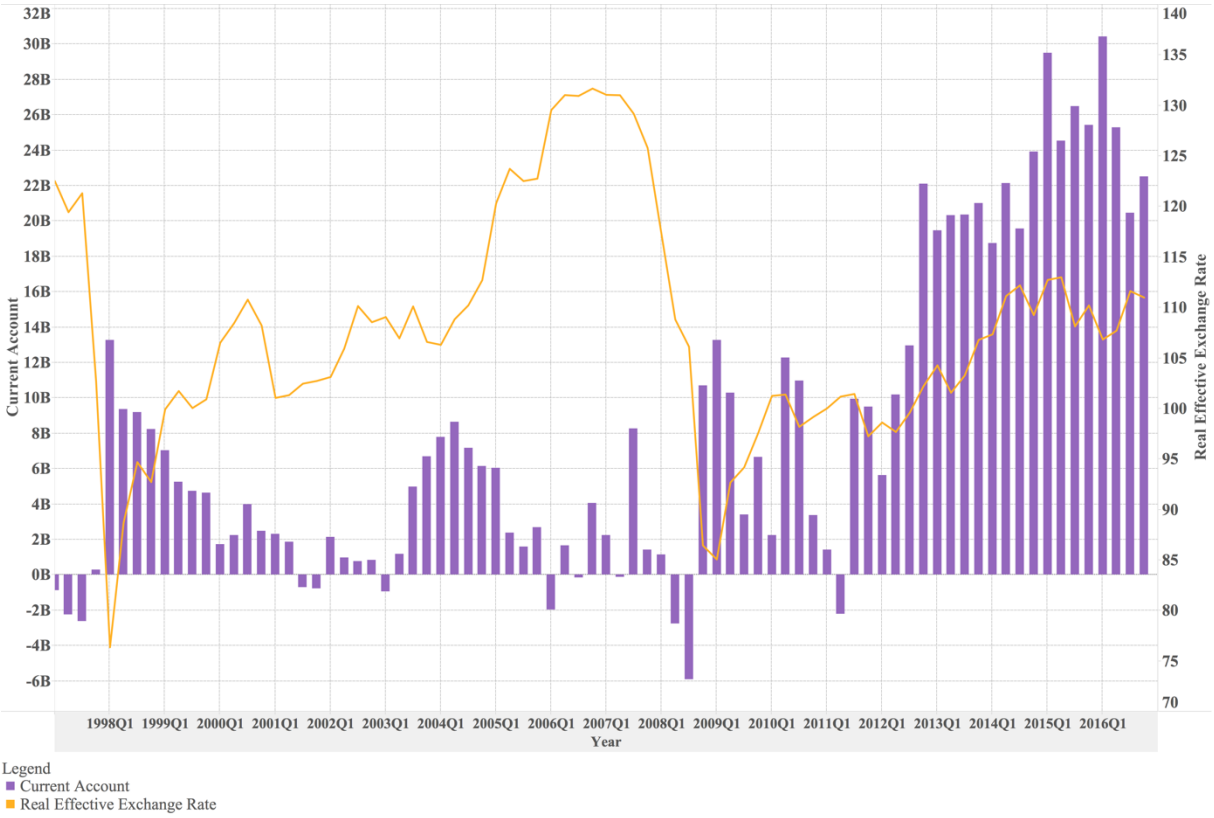
The last country on our "list" is South Korea or officially the Republic of Korea. In the following text, we will simply use the term Korea. Korea does not fit into the puzzle of our previously presented countries. This difference shall be seen as an opportunity to compare different types of emerging markets. The main differences are in economic development and in the Current Account balance. According to Human Development Report (2016), the Human Development Index (HDI) is significantly higher in Korea (0.901) compared Turkey (0.767) or Mexico (0.762). The core components of the HDI are (i) life expectancy, (ii) education, and (iii) income per capita. The GDP of Korea is higher than that of Mexico, despite Mexico's population being 2.5 times bigger than population of Korea. Next, we follow the method applied in previous chapters and focus on (i) Korean Won (KRW) exchange rate regime, (ii) Current Account, and (iii) local crises.

The Korean Won was under fixed exchange rate regime until February 1980. Then, the ER regime was changed to a multiple-basket pegged regime. This basket consisted of SDR and currencies of countries with most intensive trade relations. In the first quarter of 1990, the regime was replaced by the Market Average Rate System. Under this system, the exchange rate was determined by the interaction between supply and demand on the domestic FX market. The ER's volatility was still very low as the central bank set an upper and lower limit band. The lower and upper exchange rate limits were derived from the basic exchange rate, fixed on daily basis. A main turnover occurred in December 1997, when the Bank of Korea was forced to abandon the pegged exchange rate regime and shifted to a floating exchange rate regime due to high fluctuation and depreciation pressure. We can see some similar patterns to the Turkish Lira Crisis. However, the main catalyst for abandoning the fixed exchange rate regime was different. In the case of Turkey, the crisis was caused by the domestic economy, whereas the crisis that hit Korea had origins outside the country, specifically in Thailand. Korea became a victim of a domino effect like many other South-East Asian countries. The floating system has been effective since then.

The surplus of Korean Current Account is another major difference compared to Mexico or Turkey, both of the latter run a chronical CA deficit. Graph (25) shows the quarterly values of the Current Account, along with the real effective exchange rate (REER). We can observe the effect of the REER depreciation on the international competitiveness in 1997/1998. At that time, the Korean Won depreciated sharply, surpassing the inflation rate differential. The REER drop helped Korean companies to gain competitive advantage over other countries,

resulting into CA surplus. The sharp KRW depreciation influenced Korean importers as well (imported goods became relatively more expensive than those produced within Korean borders). As the Korean Won started to recover and appreciate both in nominal and more importantly real terms, the Current Account surplus began to diminish. We observe similar patterns at the beginning of the Financial Crisis. From 2012, the Korean Current Account has been in a constant surplus, despite REER appreciation. One can suggest that sudden change (especially depreciation) of REER has a significant effect on the CA, whereas a slow-paced change does not have to affect the Current Account at all.

Graph 25: Korea's Current Account



Data Source: Reuters

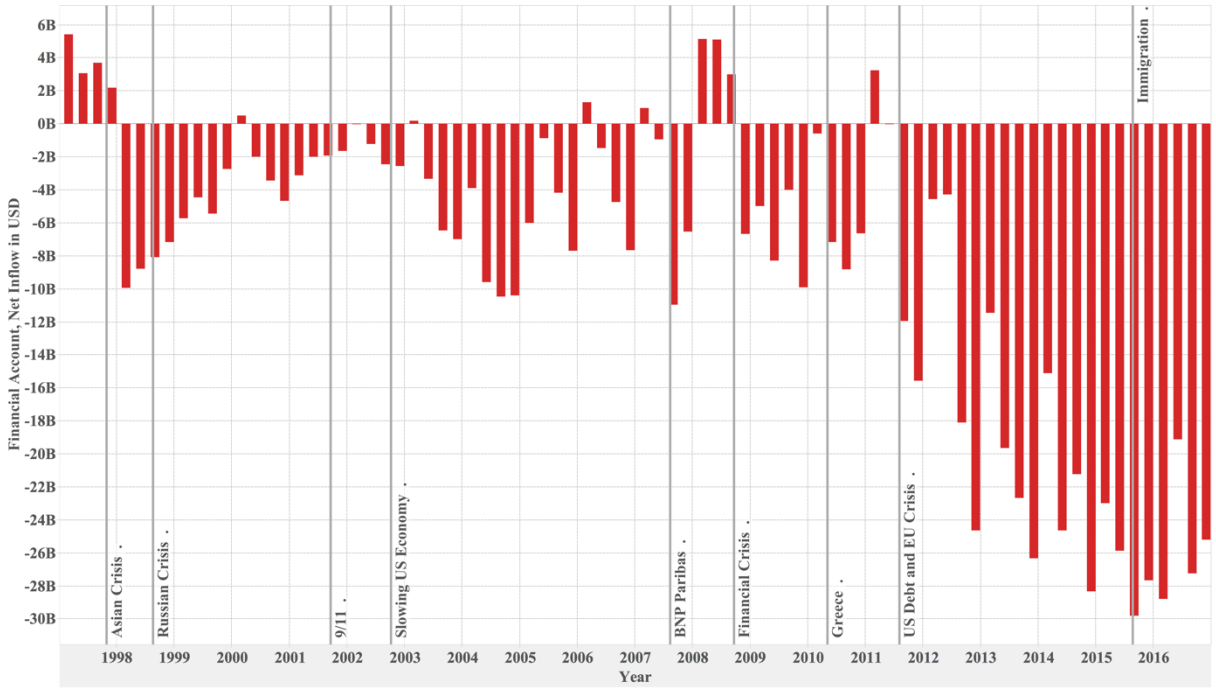
We cannot find any economic crisis, which origins would be solely within the Korean borders. Nonetheless, the Asian Crisis had a large impact on the Korean economy and Won. Next, we shall extend description of the Asian Crisis (chapter 2.4.) and look at this risk-off episode from the Korean perspective. According to Kihwan (2006), we could observe three triggers of the Korean Crisis in 1997/1998; (i) strong appreciation of USD against KRW, which resulted in profitability drop denominated in USD and therefore in capital outflow, (ii) financial problems of big companies like Hanbo or Kia and lack of resoluteness of the government whether to bailout these companies or not and (iii) the Southeast Asian Crisis preventing American and Japanese banks to provide loans to Korean financial institutions due

to regional financial instability. After failing to approve a financial reform bill package, the Korean government was forced to request help from the IMF (21st of November 1997). At that time Korea had serious liquidity problems, but was offered a long-term bailout programme instead of immediate large capital infusion. Korea could withdraw from IMF only $9.1 billion at the beginning of December 1997, being not enough to cover Korean banks' short-term obligations. The final rescue came from the U.S. government and financial institutions from G7 countries, which helped Korea to restructure 95% of its short-term debt. Several reforms were implemented after the crisis to prevent such situation in the future. One of these reforms was Financial Account liberalization (Korean Stock Exchange, foreign investments in Korean bonds, money market instruments, floating ER adoption, or abolishment of restrictions on foreign M&As).

5.1 Capital Flow in Korea

The net flow of capital indicates another major difference between Korea on one side and Mexico with Turkey on the other. Turkey and Mexico are dependent on capital inflow as they are running a Current Account deficit. On the contrary, Korea has a Current Account surplus and is a net capital exporter, as shown on graph (26). The graph shows the capital flow during individual quarters throughout the sample period. One of the following scenarios can take place during the risk-off episodes; (i) Korea as a net exporter of capital will withdraw its investment from foreign countries during risk-off episodes, leading to either a net capital outflows drop or even to a net capital inflow and thus acting like a safe haven (ii) Korea will act like a standard emerging market country and record even higher net outflow of capital, or (iii) Korean Financial Account will be resistant to risk-off periods. We will discuss these possible scenarios both on the overall Financial Account level and on individual sub-account level, mainly FPI and OI. At the very beginning of our sample (1997), Korea was recording a net capital inflow. The situation changed with the Asian Crisis, which caused a significant net outflow of capital. After the recovery from the Asian Crisis, the net capital outflow diminished, but remained still higher than capital inflow. We can observe a significant increase of net capital outflow at the times of BNP Paribas Crisis, Financial Crisis and US Debt and EU Crisis, confirming our second scenario. On the other hand, capital flow seems resistant to other risk-off events. The potential risk-on periods, especially the one after US Debt and EU Crisis recovery, show increasing net capital outflows, which is in contrast with the second scenario.

Graph 26: Korea's Net Capital Inflow

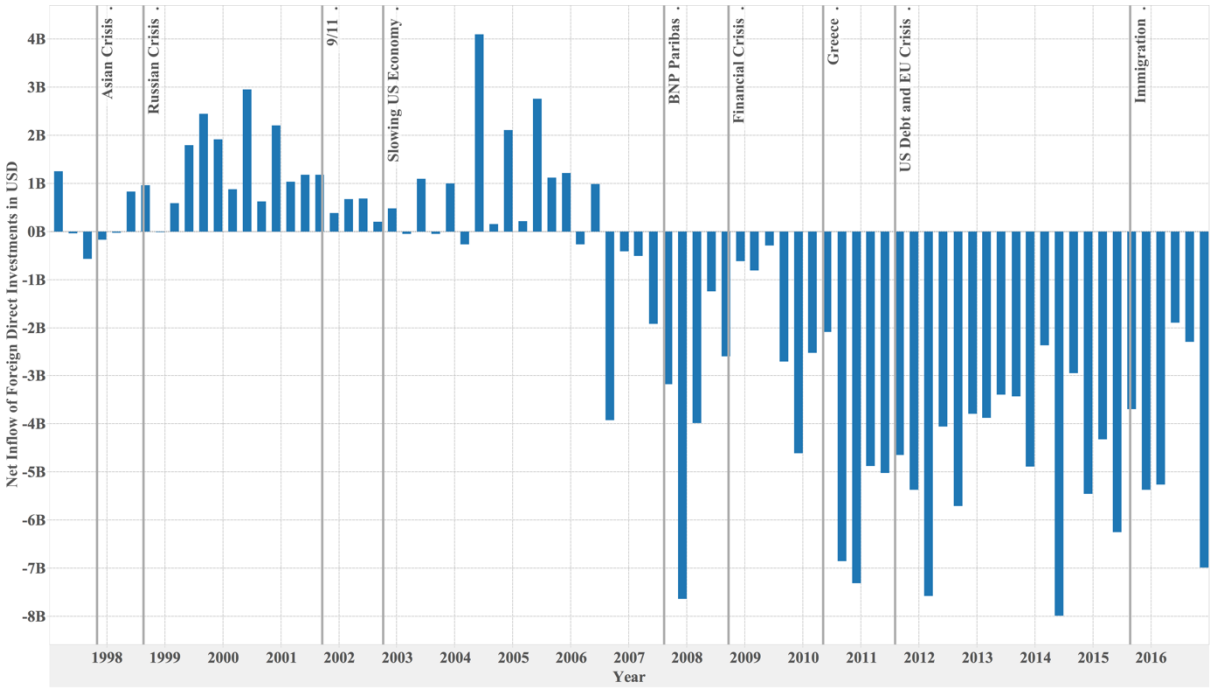


Note: "Financial Account, Net Inflow" represents inverse values of Financial Account constructed according to BPM6

Data Source: Reuters

We shall investigate individual accounts of the Financial Account. The Bank of Korea already implemented the BPM6, therefore the Financial Account was divided into the following sub-accounts; (i) Direct Investment, (ii) Portfolio Investment, (iii) Other Investment, (iv) Financial Derivatives, (v) Reserve Assets. Unfortunately, Reuters does not provide data about Financial Derivatives and Reserve Assets, so we have collective data for both accounts. We shall start with the Foreign Direct Investments as shown on graph (27). Korea recorded mostly net FDI inflows from 1998 until mid-2006. Reforms and liberalization of Korean market after the Asian Crisis worked as a catalyst for large FDI inflows. In 2002, Korea started to record an exponential increase of FDI outwards and with the FDI inwards staying at the same level, the outwards of FDI became higher than inwards, resulting into a net outflow of Foreign Direct Investments. The gap between FDI inwards and outwards increased and currently is about $18 billion on yearly basis. We do not observe any significant changes of FDI that could be caused by risk-off events, except the Financial Crisis. At that time, FDI outflows decreased and inflows stayed at the same level, causing almost balanced net FDI flows in a 3-quarters period.

Graph 27: Korea's Net Foreign Direc Investments Inflow

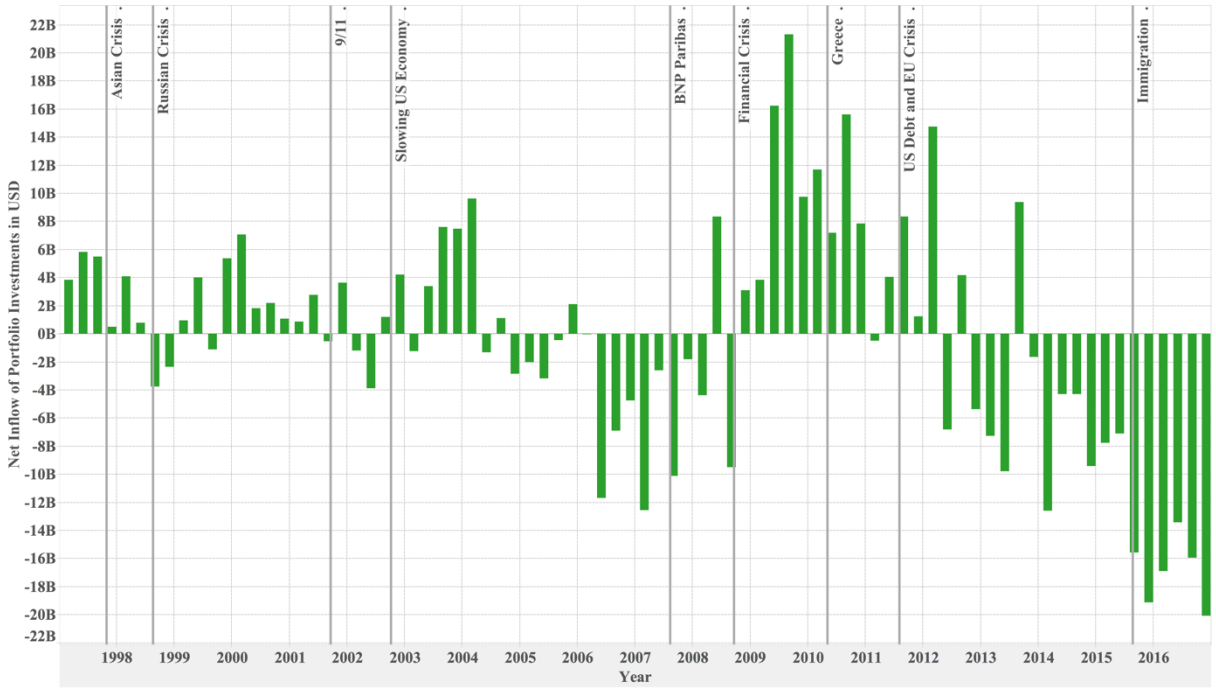


Note: "Net Inflow of Foreign Direct Investments in USD" represents inverse values of Foreign Direct Investments Account constructed according to BPM6

Data Source: Reuters

Korean Portfolio Investment Account shows numerous trend reversals. From 1997 until 2004, Korea recorded mostly net FPI inflows. On the other hand, we can see a sharp drop of these net inflows in the 4th quarter of 1997 as a reaction to the Asian Crisis and even a net FPI outflow following the Russian Crisis. Investors were extremely worried about the impact of the Russian Crisis on Asian countries as countries like Korea, Thailand, or Indonesia were at that time in a recovery stage of the economic cycle. This uncertainty caused the capital withdrawal in the second half of 1998. Portfolio Investment Account started to record a significant net outflow in 2006. The Financial Crisis completely reversed the trend, resulting into a net FPI inflow. After the US Debt and EU Crisis recovery, and the beginning of the second risk-on period, we observe another major reversal as Korean FPI recorded net outflows. This trend continued until the end of our observation period. According to our findings, Korea acted like a classic emerging market at the time of Asian and Russian Crisis, but started to act as a safe haven during the Financial Crisis and the second risk-on period.

Graph 28: Korea's Net Foreign Portfolio Investments Inflow

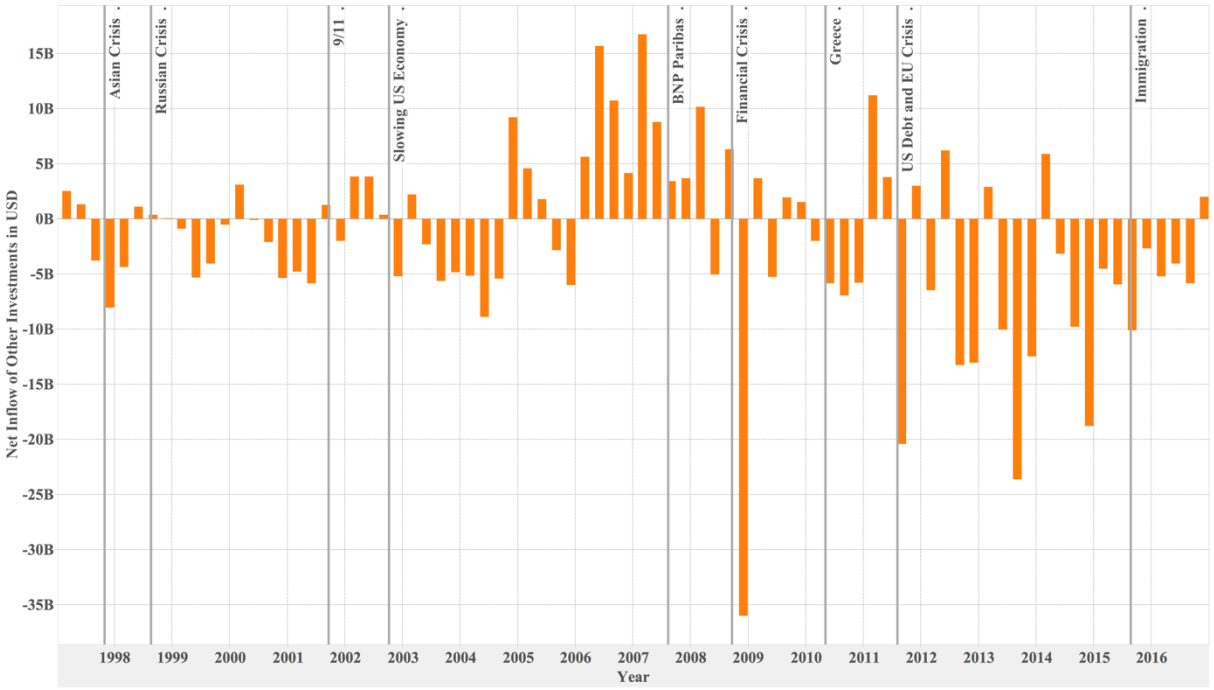


Note: "Net Inflow of Foreign Portfolio Investments in USD" represents inverse values of Foreign Portfolio Investments Account constructed according to BPM6

Data Source: Reuters

The Other Investment Account is more volatile than FDI or FPI, lacks a constant trend and contains a few reversals as observed in the Portfolio Investment Account. Graph (29) also indicates high sensitivity of other investments to the risk-off events. Korea recorded significant net outflow of Other Investments at the time of (i) Asian Crisis, (ii) Slowing US Economy Crisis, (iii) Financial Crisis, (iv) US Debt and EU Crisis, and partially also during (v) the Greece Crisis and (vi) Immigration Crisis. Due to lack of data from Bank of Korea, we are unable to track precisely the sources of sudden outflows during the first two crises. The highest quarter net outflow of Other Investments was recorded during the Financial Crisis, in the 4th quarter of 2008. After reviewing the monthly data, we found $23 billion net OI outflow in October 2008. According to BoK reports, the main drivers for such outflows were large-scale repayments of foreign borrowings by financial institutions. These repayments and an increase of Korean banks' managed overseas funds were behind the net OI outflow during US Debt and EU Crisis in September 2011. The overseas lending by Korean financial institutions caused a sharp net OI outflow in August 2015 and together with a net outflow of currency and deposits from Korean banks caused the overall net outflow of Other Investments.

Graph 29: Korea's Net Other Investments Inflow

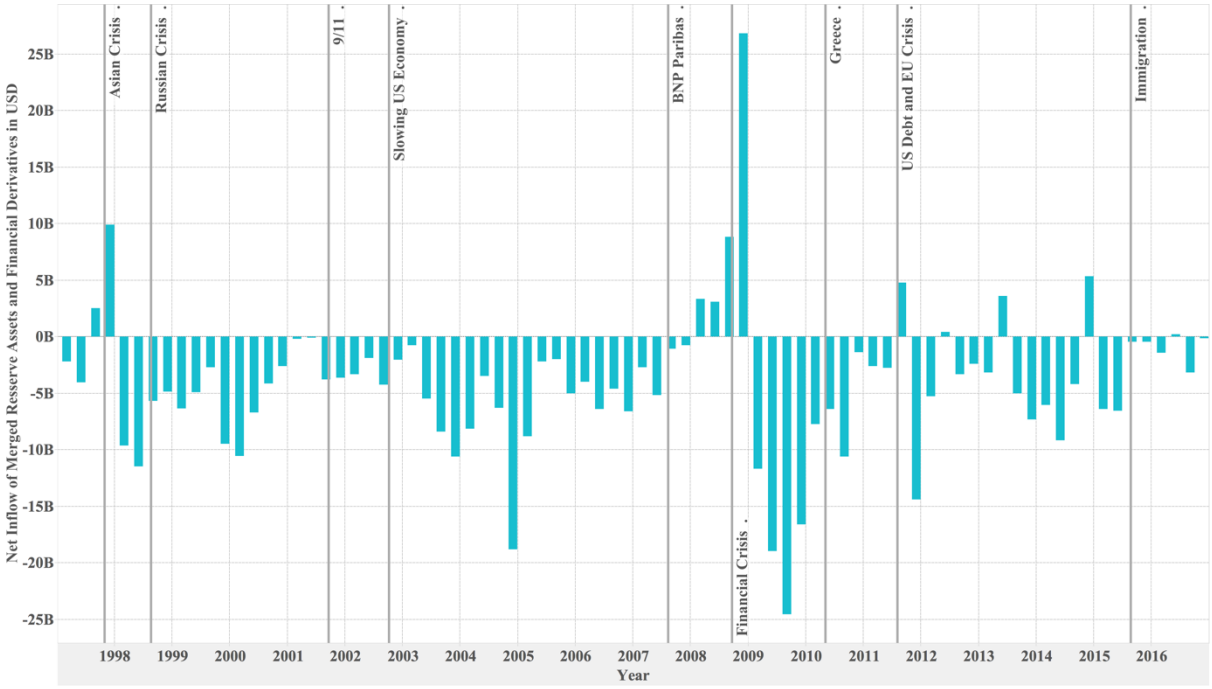


Note: "Net Inflow of Other Investments in USD" represents inverse values of Other Investments Account constructed according to BPM6

Data Source: Reuters

The last component of the Financial Account is the collective account of Reserve Assets and Financial Derivatives shown on graph (30). This account shows chronical net capital outflow of. The only rare exemptions can be observed during the Asian Crisis and Financial Crisis. The Bank of Korea does not provide detail information about the Balance of Payments at the time of the first mentioned crisis. However, one could assume that the net inflow of capital was mainly caused by interventions of the BoK as they were defending the Korean Won against the depreciation pressure. The net inflow in the 4th quarter of 2008 was mainly due to $20 billion drop in reserve assets. The reversal and net outflow in 2009 was caused mainly by the increase of reserve assets.

Graph 30: Korea's Net Inflow of Merged Reserve Assets and Financial Derivatives Inflow

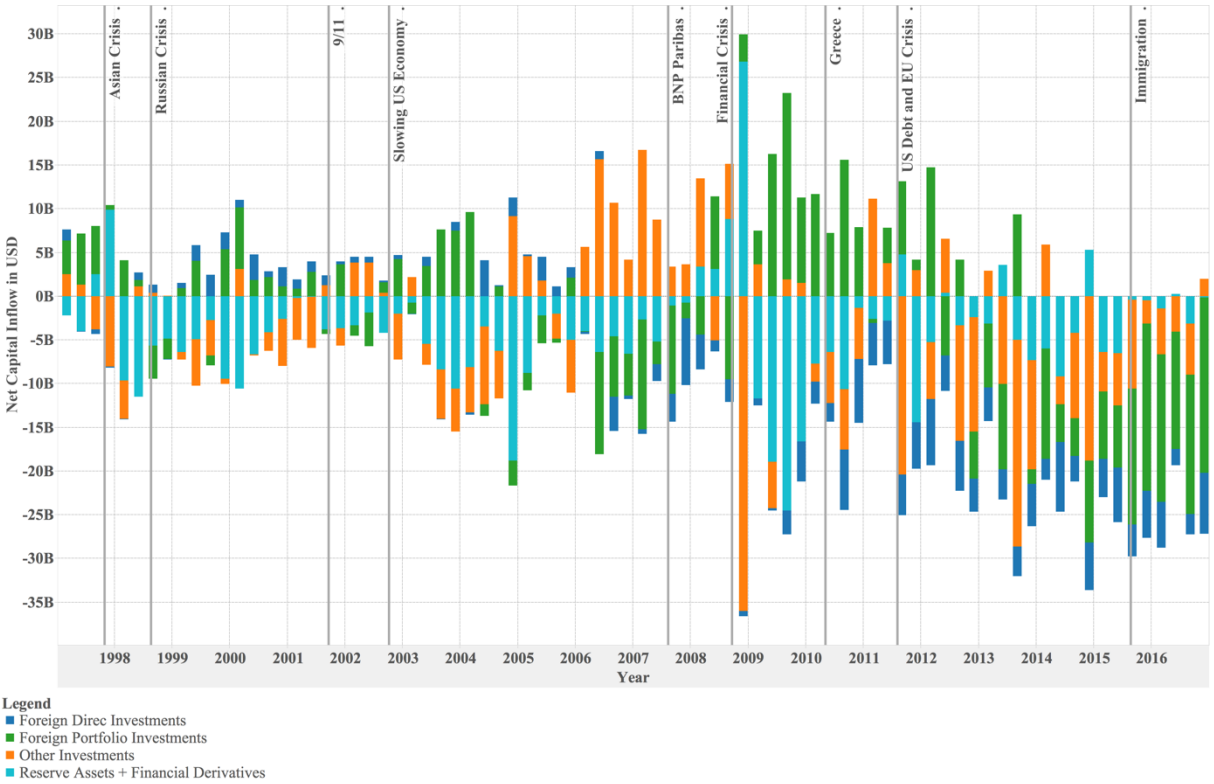


Note: "Net Inflow of Merged Resserve Assets and Financial Derivatives in USD" represents inverse values of Reserve Assets and Financial Derivatives accounts constructed according to BPM6

Data Source: Reuters

The last section of this sub-chapter is again dedicated to a stacked graph of individual components of the Financial Account. The graph (31) describes weight and influence of each component on the overall FA balance. We can observe changing weight of each FA's component throughout the sample period. Except FDI, components of the Financial Account have a very similar average weight/share of the overall capital flow. The Foreign Direct Investments show significantly lower share of the capital flow. We also observe a moderate negative correlation (0.5) between Other Investments and Portfolio Investments in the period between 1997 and 2011. The correlation dropped significantly after 2012, as all components of FA started to record net outflows.

Graph 31: Net Capital Inflow (Stacked Bar)



Data Source: Reuters

5.2 Korean Won Exchange Rate Development

Now, with the finished research on Korean Won exchange rate regime and capital flow, we can proceed to the analysis of KRW exchange rate changes throughout the sample period. The Bank of Korea released the KRW into a floating regime during the Asian Crisis and has kept it under this regime since then. The floating regime allows us to analyse all risk-off episodes that were set in the theoretical part of this paper. Our research did not reveal any additional local risk-off events; thus we will study the same risk-off events as we did for the Mexican Peso. Although Korea belongs to emerging market countries, it is in a very different position than Turkey or Mexico. The main differences are as follows; (i) higher HDI, (ii) higher GDP per capita, (iii) Current Account surplus, (iv) net capital outflow, (v) lower inflation and (vi) lower interest rates. Therefore, we are expecting the Korean Won to deliver quite different performance than we observed in case of the Mexican Peso and the Turkish Lira.

Korean Won Nominal Effective Exchange Rate

The Bank of Korea publishes monthly data about the Balance of Payments, which allows us to measure the correlation between BoP and NEER. In case of Turkey, we used the correlation between NEER changes and BoP as it provided the highest results. In case of Korea, we found out that NEER itself shows better results than the NEER changes. We tested

all components of the Financial Account, but the Financial Account as a whole, or more precisely the net capital inflow, showed the best results. The table (9) shows the correlation coefficients between the NEER and net capital inflow. We measured the correlation from a specific year till 2016 and also from 1997 until a specific year. Our results indicate a strong positive correlation at the beginning of the sample period (until 2003) and a moderate negative correlation from 2009. The positive correlation is consistent with the theory. proving that increase of net capital inflow causes appreciation of the currency and vice versa. The negative correlation, which can be observed from 2009 is however inconsistent with this theory.

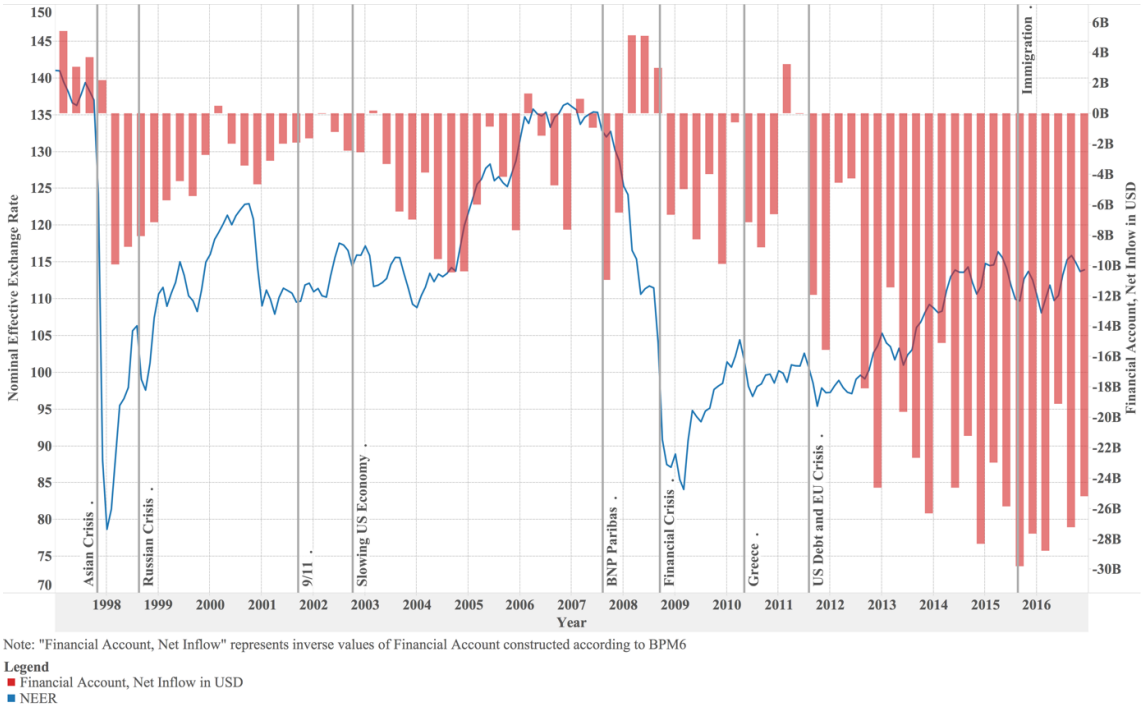
Table 9: Correlation between NEER and Financial Account

Year	Financial Account	Year	Financial Account
From 1997	0.235	**Until 1997**	0.567
From 1999	0.157	**Until 1999**	0.859
From 2001	0.140	**Until 2001**	0.762
From 2003	0.142	**Until 2003**	0.686
From 2005	0.140	**Until 2005**	0.492
From 2007	-0.053	**Until 2007**	0.338
From 2009	-0.648	**Until 2009**	0.325
From 2011	-0.605	**Until 2011**	0.319
From 2013	-0.289	**Until 2013**	0.340
From 2015	0.191	**Until 2015**	0.256

Data Source: Reuters

Next, we focus on the nominal effective exchange rate in risk-off and risk-on episodes, graph (32). We observe significant depreciation of the Korean Won during Asian Crisis, BNP Paribas Crisis and Financial Crisis. The Korean Won depreciated significantly during the Russian Crisis, but recovered quickly. Such a prompt recovery may indicate that markets overreacted to this risk-off event. The same applies to the recovery after the Asian Crisis. Graph (32) shows KRW recovery after the Financial Crisis as well. However, in this case we observe a significantly slower pace of recovery, which seems rather as an appreciation trend of the KRW than a correction of market's overreaction behaviour. The BNP Paribas Crisis worked as a trend reversal event, causing a continuous depreciation of the KRW. When this trend reached its bottom, the Financial Crisis occurred. The KRW also depreciated during the Greek Crisis and US Debt and EU Crisis and ignored 9/11, Slowing US Economy and Immigration crisis. The Korean Won significantly appreciated during both potential risk-on periods.

Graph 32: Korean Won Nominal Effective Exchange Rate



Data Source: Reuters

In order to quantify nominal effective exchange rate changes of the Korean Won, we used the same approach as in case of MXN and TRY. The Korean Won NEER has a negatively skewed distribution as it depreciated on average by 0.32%, but the median showed an appreciation of 0.71% (both during a 4-month intervals). The performance of the Korean Won NEER is shown in table (10). The average depreciation during risk-off episodes of almost 11% is highly influenced by the Asian Crisis (56.33% depreciation) and the Financial Crisis (24.66% depreciation), followed by the Greek Crisis (6.26% depreciation). The KRW depreciated in all risk-off episodes, except the 9/11 and Immigration Crisis.

Table 10: Korean Won Nominal Effective Exchange Rate Changes

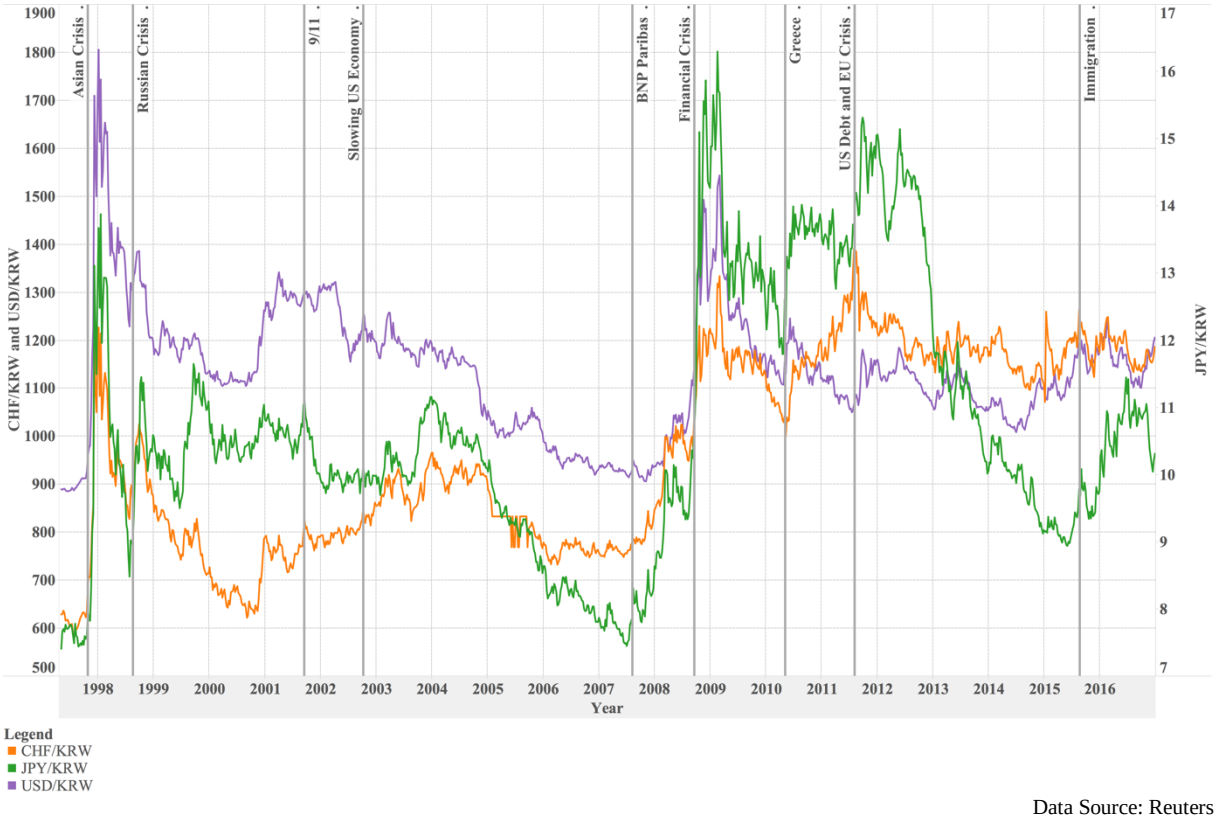
Event	Month	NEER change
Asian Crisis	Oct-97	-56.33%
Russian Crisis	Aug-98	-4.28%
9/11	Sep-01	1.22%
Fear of Slowing US Economy	Jul-02	-1.09%
BNP Paribas	Aug-07	-3.85%
Financial Crisis	Sep-08	-24.66%
Greece	May-10	-6.26%
US Debt and EURO Crisis	Aug-11	-4.71%
Immigration Crisis	Aug-15	1.68%
Average		-10.92%
Median		-4.28%

Data Source: Reuters

Korean Won Performance Against Safe Currencies

The graph (33) shows the development of the Korean Won exchange rate against all three safe haven currencies. This paragraph will be mostly focused on risk-on periods, the detailed description of KRW behaviour during risk-off periods will be done later, based on the outcome from the quantitative analysis. The Korean Won appreciated noticeably against the U.S. dollar and Japanese Yen during the first risk-on period (2003-2007). The exchange rate between CHF and KRW was relatively stable. In the second risk-on period (2012-2015), the Korean Won appreciated significantly only against the Yen. The CHF/KRW and USD/KRW remained unchanged. Interesting is also a sharp appreciation of the Japanese Yen against the Korean Won, evident from October 2007 until February 2009. During these 16 months, the KRW depreciated against the JPY by more than 100%.

Graph 33: Korean Won Performance Against Safe Haven Currencies



Data Source: Reuters

According to our calculations, the Korean Won performed extremely poorly during risk-off periods, as shown in table (11). The average double-digit depreciation against each safe haven currency was mainly driven by the Asian Crisis and the Financial Crisis. Generally, the results of KRW performance against safe haven currencies is very similar to the performance against the broad basket of currencies (NEER). Geographically the closest KRW counterparty is the Japanese Yen. We can observe extremely polarised results on the JPY/KRW currency pair.

The KRW depreciated during risk-off episodes (Asian Crisis, Russian Crisis, Financial Crisis and Greece Crisis). In both risk-on periods, the Won appreciated against the Yen. The median indicates an appreciation of the Won against the Yen of 1.06% on a 14-weeks period throughout the whole sample.

Table 11: Korean Won Performance Against Safe Haven Currencies

Event	Month	USD	CHF	JPY
Asian Crisis	Oct-97	-63.20%	-64.65%	-60.40%
Russian Crisis	Aug-98	-6.99%	-16.62%	-29.29%
9/11	Sep-01	1.56%	1.43%	9.74%
Fear of Slowing US Economy	Jul-02	-2.69%	-3.65%	-0.33%
BNP Paribas	Aug-07	1.76%	-1.42%	-0.99%
Financial Crisis	Sep-08	-21.29%	-17.51%	-38.22%
Greece	May-10	-6.47%	-9.90%	-14.64%
US Debt and EU Crisis	Aug-11	-4.50%	4.93%	-5.72%
Immigration Crisis	Aug-15	0.73%	3.87%	-0.61%
Average		-11.23%	-11.50%	-15.61%
Median		-4.50%	-3.65%	-5.72%

Data Source: Reuters

Concluding Remarks

Korea's Balance of Payment is very different from that of Mexico or Turkey. Our research revealed Current Account deficit and net capital outflow during our sample period. The research on capital flow in Korea resulted into following findings; (i) continuous net FDI outflow from mid-2006 due to an increase of FDI outwards and relatively constant FDI inwards, (ii) the Portfolio Investment account showed a sinusoidal trend with increasing extremum, (iii) high sensitivity of the Other Investment account to risk-off episodes, indicating net outflow during these periods, (iv) moderate negative correlation between FPI and OI, (v) chronical net outflow of the "residual account" (collective reserve assets and financial derivatives account), with the exception of 2008Q4, caused by a significant reserve assets drop. Then, we studied the relationship between the Financial Account and ER changes and the behaviour of the Won during risk-on/risk-off episodes. Our research delivered the following extra findings; (vi) positive correlation between net capital inflow and the nominal effective exchange rate in the beginning of the sample, which reversed to a negative correlation after the Financial Crisis, (vii) material depreciation of the KRW during almost all risk-off events and a very significant depreciation during Asian Crisis, Russian Crisis, and Greek Crisis, (viii) strong appreciation trend during both risk-on periods.

6 Comparison of Emerging Markets' Currencies

In this chapter, we shall summarize our results and compare them within selected emerging markets. We shall split this chapter into three main parts. The first part is dedicated to summary of all three emerging market currencies' performance during risk-on and risk-off periods to find shared patterns and differences among them. The second part is focused on the fundamentals factors that determine currency performance. In particular, we will be comparing there the Current Account, Financial Account, interest rates and inflation rates. According to the presented theory, these four factors have the strongest explanatory power for exchange rates changes. In the last part, we will test, how the currencies performed against each other and which of the theories is more likely to be applicable.

Having compared countries listed as emerging markets, we found some major fundamental differences among them. In this part, we will target these differences and create hypotheses on a long-term and short-term exchange rates development. In the theoretical part, we addressed three main fundamentals for estimating expected exchange rate in the future; (i) purchasing power parity, (ii) interest rate parity, (iii) balance of payments theory. The PPP (IRP) theory argues that the currency with a higher inflation rate (interest rate) shall depreciate against the one with a lower inflation rate (interest rate) approximately by the inflation rate (interest rate) differential. The table (12) shows development of interest rates and inflation rates in Korea, Mexico and Turkey during our sample period. According to this dataset and IRP, we shall expect significant depreciation of the Turkish Lira against the Mexican Peso and the Korean Won as the deposit rate in Turkey is markedly higher. Interest rates in Mexico and Korea are quite similar, but Korea still records slightly higher numbers, suggesting a slight depreciation of the Korean Won against the Mexican Peso in a long-run. Despite continuous disinflation, especially at the beginning of this millennium, Turkey still has the highest inflation rate among targeted emerging markets, making the Turkish Lira likely to depreciate against the Peso and the Won. Mexico's inflation rates were on average higher during the observed period than the ones in Korea, mainly due to significant inflation rates differential at the sample's beginning and end. Thus, according to PPP, the Peso shall depreciate against the Won.

Table 12: Interest Rates and Inflation Rates in Selected Emerging Markets

	Interest Rates			Inflation Rates		
Year	**Korea**	**Mexico**	**Turkey**	**Korea**	**Mexico**	**Turkey**
1997	10.81%	16.36%	79.49%	4.45%	20.63%	85.73%
1998	13.29%	15.45%	80.11%	7.51%	15.93%	84.64%
1999	7.95%	11.60%	78.43%	0.81%	16.59%	64.87%
2000	7.94%	8.26%	47.16%	2.27%	9.50%	54.92%
2001	5.79%	6.23%	74.70%	4.07%	6.36%	54.40%
2002	4.95%	3.76%	50.49%	2.76%	5.03%	44.96%
2003	4.25%	3.09%	37.68%	3.51%	4.55%	25.30%
2004	3.87%	2.70%	24.26%	3.59%	4.69%	10.58%
2005	3.72%	3.46%	20.40%	2.75%	3.99%	10.14%
2006	4.50%	3.30%	21.65%	2.24%	3.63%	9.60%
2007	5.17%	3.21%	22.56%	2.53%	3.97%	8.76%
2008	5.87%	3.04%	22.91%	4.67%	5.12%	10.44%
2009	3.48%	2.01%	17.65%	2.76%	5.30%	6.25%
2010	3.86%	1.21%	15.27%	2.94%	4.16%	8.57%
2011	4.15%	0.96%	14.22%	4.03%	3.41%	6.47%
2012	3.70%	1.08%	16.35%	2.19%	4.11%	8.89%
2013	2.89%	1.33%	15.76%	1.30%	3.81%	7.49%
2014	2.54%	0.84%	16.77%	1.27%	4.02%	8.85%
2015	1.81%	0.59%	14.92%	0.71%	2.72%	7.67%
2016	X	X	14.61%	0.97%	2.82%	7.78%
Average	5.29%	4.66%	34.27%	2.87%	6.52%	26.32%

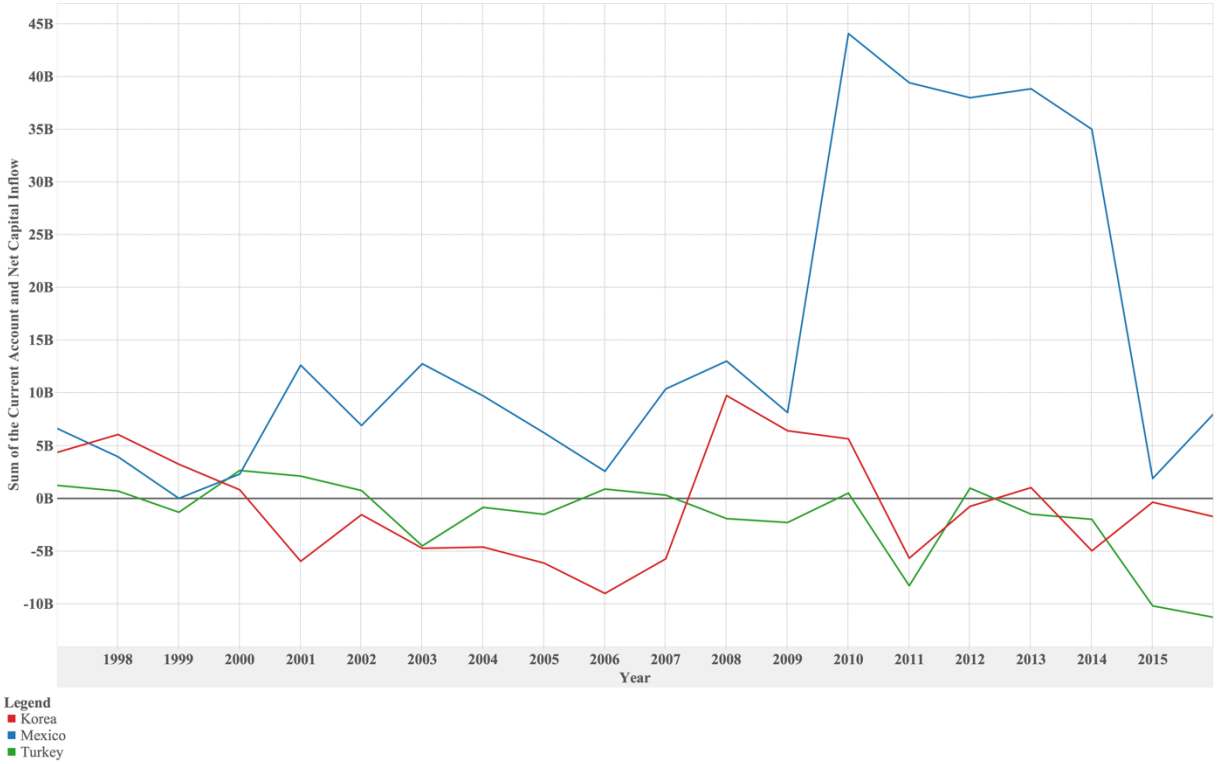
Data Source: Reuters

A substantial part of each empirical chapter was dedicated to the Financial Account and capital flow. We stressed many times that Turkey and Mexico are capital importers as they need capital to finance their Current Account deficit and Korea is a capital exporter. Our analysis on capital flows revealed some major differences between these countries. Mexico's Financial Account reacted to risk-off events in the way we would expect from an emerging market country, recording drop of net capital inflow or even net capital outflow during risk-off episodes and recording net capital inflow increase during risk-on episodes. Turkey's FA showed very similar patterns, but the effects were diminished by CBRT policy ensuring financial stability and acting against sudden capital inflows or outflows. The capital flow in Korea is in a great contrast to the capital flow in Turkey and Mexico. Korea's net capital outflows increase in risk-on periods. At the time of low volatility (risk-on) Korea can be seen as the provider of capital to EM countries like Turkey or Mexico. On the other hand, the net capital outflow increases even during risk-off episodes, which is a sign of EM country. Hence, Korea's FA shows some characteristics of EM country and some characteristics of safe

haven/developed country. We were able to investigate Turkey's and Korea's FAs and their components in more details, as central banks of these countries provide data about FA on monthly basis. Both countries showed high sensitivity of OI to risk-off events. In case of Turkey we observed the same impact on FPI as well. We found a positive correlation between net OI+FPI inflow and NEER, a similar situation was visible in Korea until 2009. In the 1997-2009 period, Korea's net capital inflows were also positively correlated to NEER. But from 2009, Korea's net capital inflows and NEER began to be negatively correlated.

Furthermore, determination of exchange rate given by the Balance of Payments theory suggests that a currency of a country with higher Current Account surplus and net capital inflow (inversed value of Financial Account balance constructed according to BPM6) shall appreciate against its counterparty's currency. As compared with other theories, the Balance of Payments disregards any other variables that could impact the ER. We used the yearly BoP data and constructed the graph (34), showing the difference between balances of the Current Account and the Financial Account (BPM6). We shall point out that the difference between balances of CA and FA is equal to the sum of the CA balance and net capital inflow. Our results show that Mexico significantly outperforms Korea and Turkey and its currency (MXN) shall thus appreciate against KRW and TRY, especially after the Financial Crisis and during the second risk-on period. The balances (CA+FA) of Turkey and Korea are relatively similar, whereas Turkey was performing better before 2008 and Korea outperformed Turkey from 2008. If we assume that the exchange rate is a function of interest rates, inflation rates and balance of payments, we would expect the Lira to depreciate against the Won and the Peso in a long-term horizon. The results of Mexico and Korea are mixed. The BoP theory and the interest rate parity would suggest appreciation of the Peso, whereas the purchasing power parity suggests appreciation of the Won. However, we must be aware of numerous limitations while explaining ER changes based on these three factors. Firstly, we have at least these three fundamental factors, for instance GDP growth, public debt, country's credit rating. Secondly, we can get mixed results as in the case of Mexico and Korea. In that case, we have to figure out, which of the variables have stronger explanatory power and are more likely to determine the ER changes. Thirdly, most likely the fundamental factors are not the only factors influencing and determining exchange rates.

Graph 34: Sum of the Current Account and Net Capital Inflow



Data Source: Reuters

Our quantitative research of exchange rates changes revealed significant depreciation of EM's currencies during risk-off periods. Table (13) summarizes our results from previous chapters, where we used the nominal effective exchange rate as a benchmark indicator. We did not calculate the performance of TRY during Asian Crisis and Russian Crisis as the Turkish Lira was under a pegged ER regime. The performance of MXN and KRW during the Turkish Lira Crisis and the Coup Attempt was also skipped as these risk-off events influenced Turkey only. The results clearly show that local crises (currency, economic, political) have the most negative impact on the currency performance, for instance 56.33% depreciation of the Korean Won of during the Asian Crisis or 47.81% depreciation of the Turkish Lira of during the Turkish Lira Crisis. Apart from these two crises, all three currencies depreciated the most during the Financial Crisis. This result highlights the magnitude of the Financial Crisis and the impact of such risk-off event on the FX market. The average and median indicate the Korean Won as the worst performing currency during risk-off episodes, followed by the Turkish Lira, while the Mexican Peso was the best performing one. We observe similar behaviour of the Mexican Peso and the Korean Won during risk-off periods. According to our calculations, these currencies are relatively more sensitive to the turmoil in the European financial sector (Russian Crisis, Financial Crisis, Greece Crisis or Eurozone Crisis) than the Turkish Lira. We see two major reasons behind this finding; (i) large exposure to European

banks, especially in the case of Mexico and (ii) an active approach of the CBRT during financial turmoil, ensuring financial stability. Graphs have shown appreciation trend of the Korean Won during both risk-on episodes. The Turkish Lira and the Mexican Peso show very similar patterns during risk-on episodes. Both currencies did not record an overall depreciation or appreciation trend during the first risk-on periods, but depreciated significantly in the second one.

Table 13: Emerging Markets Nominal Effective Exchange Rate Changes

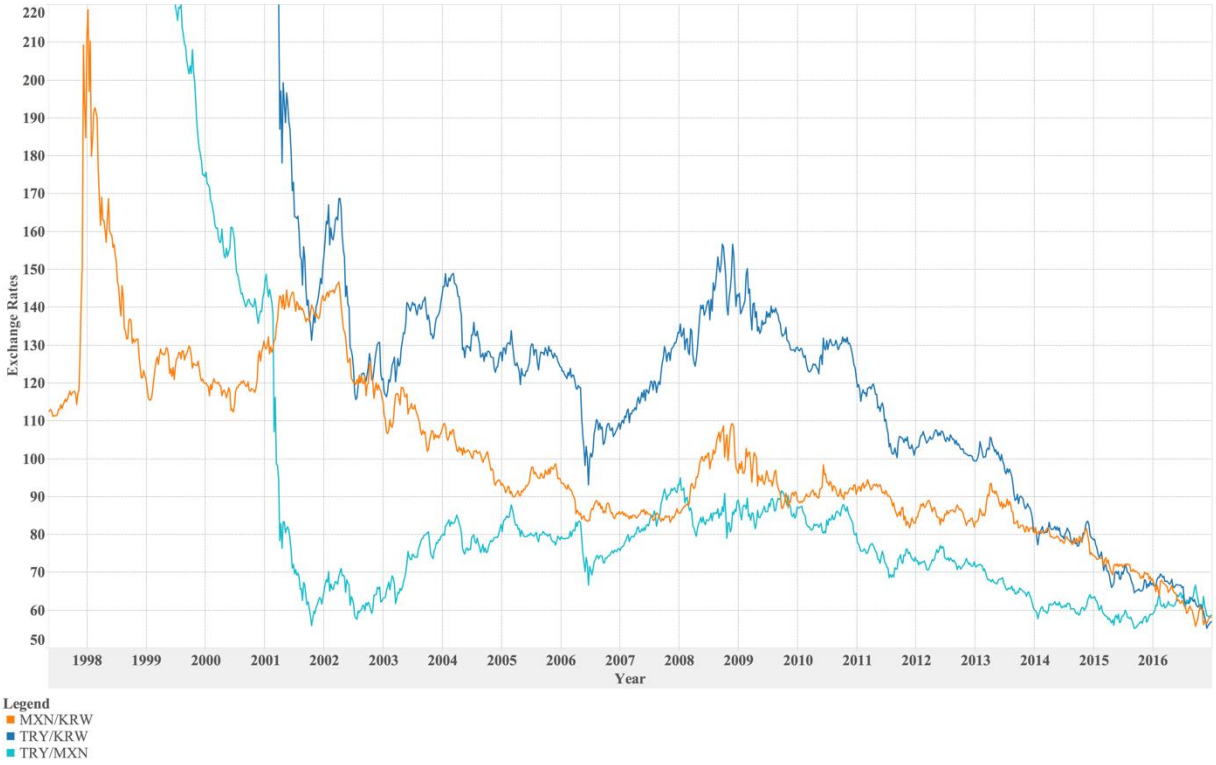
Event	Month	MXN	TRY	KRW
Asian Crisis	Oct-97	-2.86%	X	-56.33%
Russian Crisis	Aug-98	-12.81%	X	-4.28%
Turkish Lira Crisis	Feb-01	X	-47.81%	X
9/11	Sep-01	0.12%	-2.56%	1.22%
Fear of Slowing US Economy	Jul-02	-2.69%	-9.16%	-1.09%
BNP Paribas	Aug-07	-2.74%	2.41%	-3.85%
Financial Crisis	Sep-08	-24.73%	-16.97%	-24.66%
Greece	May-10	-4.07%	0.85%	-6.26%
US Debt and EU Crisis	Aug-11	-14.48%	-4.27%	-4.71%
Immigration Crisis	Aug-15	-2.71%	-3.25%	1.68%
Coup Attempt	Jul-16	X	-3.83%	X
Average		-7.44%	-9.40%	-10.92%
Median		-2.86%	-3.83%	-4.28%

Data Source: Reuters

The graph (35) shows the exchange rates changes of the MXN/KRW, TRY/KRW and TRY/MXN. We had to adjust the rates in order to fit in the graph. Therefore, the TRY/KRW exchange rates were divided by seven and the TRY/MXN rates were multiplied by ten. Furthermore, the exchange rates, where the Turkish Lira is one of the counterparties exceed the maximum value of our horizontal axis. The reason is in extreme depreciation of the TRY at the beginning of our sample period. If we would decide to adjust the horizontal axis to fit all data, then the changes after 2001 would be marginal. The TRY/MXN exchange rate clearly violates and rejects our expectation for the Lira being clearly the most likely currency to depreciate against the other ones. The graph (35) even shows an appreciation of the Lira against the Peso between 2002 and 2008. This development is against all fundamental factors that we previously presented. After almost three years of the TRY/MXN exchange rate being caped in 80-90 range, the ER finally breached the support level of the Lira, resulting into trend reversal. If we examine the whole period (from recovery after the Turkish Lira Crisis until the end of the sample period), the exchange rate of the Lira against the Peso remained

unchanged. The Korean Won is the clearly the best performing currency, especially during the second risk-on period.

Graph 35: Emerging Markets Currency Pairs Development



Data Source: Reuters

In the introduction, we set two hypotheses that were afterwards tested throughout the practical part. We accepted the first hypothesis on depreciation of the EM currencies during risk-off periods. The table (13) shows that all three currencies depreciated during these periods (based on both average and median). We found risk-off episodes, where the EM currencies appreciated, but these occasions were very rare and the appreciation was marginal. On the other hand, we must reject the second hypothesis as the Korean Won was the only currency appreciating during risk-on periods. Both Mexican Peso and Turkish Lira either depreciated during these periods or maintained constant exchange rate level. The IRP and PPP might provide explanation of this phenomena as interest rates and inflation rates were relatively high in these countries, especially in Turkey.

Conclusion

Throughout the paper, we focused on two major macro indicators, Balance of Payments and exchange rate. We used the literature review to research the fundamental determinants of the ER. At the beginning, we mentioned the classical theories, such as the purchasing power parity and the interest rate parity. These doctrines are more likely to have stronger explanatory power in a long-term period. We used them in the final chapter as we were looking for factors that could explain the long-term trends between EM currency pairs. The chapter about capital flow played a crucial role in our paper as there were determined the risk-off events based on the VIX and its 60-day moving average. Throughout that chapter, we also focused on the capital flow and its potential impact on the exchange rate. We expected the capital flow (especially hot money) to have significant influence on EM countries with Current Account deficit.

The findings of this research has shown some similarities with past literature however also exhibited some deviations from traditional theories. We have accepted the first hypothesis that EM currencies depreciate in risk-off periods. Afterwards we have rejected the second hypothesis that these currencies appreciate in risk-on periods, despite of very good performance of the Korean Won. In addition, the research delivered following findings; (i) net capital outflows in risk-off episodes and net capital inflows in risk-on episodes in Turkey and Mexico, (ii) Turkey revealed increasing positive correlation between OI+FPI and NEER (consistent with BoP theory), RA negatively correlated with NEER due to CBRT policy, (iii) Korea responded to the risk-off events that took place before 2009 as a standard EM country, but began to act like a developed country after 2009 (increasing net capital outflows during risk-on periods), (iv) Korea delivered positive correlation between NEER and FA before 2009 that afterwards reversed to negative territory and negative correlation between OI and FPI, (v) high exposure of Korean and Mexican banking sectors to European and U.S. markets, making them more vulnerable in time of financial turmoil, (vi) strong overall depreciation trend of MXN and TRY, probably caused by IRP and PPP, (vii) currencies being very sensitive to risk-off events that kicked off on domestic market.

Further findings have shown that depreciation in risk-off periods may have several ramifications on the economy, (i) inflation surge as a result of more expensive import, (ii) competitive advantage in international trade, (iii) financial uncertainty, (iv) currency crash hazard.

References

APPLEYARD, Dennis R. and Alfred J. FIELD. *International economics*. 2nd ed. Chicago: Irwin, c1995. ISBN 02-561-6192-5.

AZADINAMIN, Amirsaleh. *The Bankruptcy of Lehman Brothers: Causes of Failure & Recommendations Going Forward* [online]. 2012, 19 [cit. 2017-04-17]. Available from: http://ssrn.com/abstract=2016892

BACHELIER, Louis. *The Theory of Speculation.* Gauthier-Villars, 1900

BANCO DE MÉXICO. Available from: http://www.banxico.org.mx/indexEn.html

BANCO DE MÉXICO. *Reporte sobre el Sistema Financiero* [online]. 2010 [cit. 2017-05-01]. Available from: http://www.banxico.org.mx/publicaciones-y-discursos/publicaciones/informes-periodicos/reporte-sf/%7BDC37ABCB-26F0-020D-145B-5CF397D62E68%7D.pdf

BANK FOR INTERNATIONAL SETTLEMENTS. Available from: https://www.bis.org

BEKAERT, Geert, Min WEI and Yuhang XING. *Uncovered interest rate parity and the term structure*. Journal of International Money and Finance [online]. 2007, 26(6), 1038-1069 [cit. 2017-05-24]. DOI: 10.1016/j.jimonfin.2007.05.004. ISSN 02615606. Available from: http://linkinghub.elsevier.com/retrieve/pii/S0261560607000630

BOTMAN, Dennis, Irineu de Carvalho FILHO and W. Raphael LAM. *The Curious Case of the Yen as a Safe Haven Currency: A Forensic Analysis*. International Monetary Fund: IMF Working Paper [online]. 2013, (13/228), 21 [cit. 2017-05-24]. Available from: https://www.imf.org/external/pubs/ft/wp/2013/wp13228.pdf

BRUNNERMEIER, Markus K., Stefan NAGEL and Lasse H. PEDERSEN. *Carry Trades and Currency Crashes*. The Universoty of Chicago Press Journals [online]. The University of Chicago Press, 2008, (23), 313-348 [cit. 2017-05-24]. Available from: http://www.jstor.org/stable/10.1086/593088

BRUNNERMEIER, Markus K., Stefan NAGEL and Lasse H. PEDERSEN. *Carry Trades and Currency Crashes*. NBER Macroeconomics Annual [online]. 2008, **23**(1), 313-348 [cit. 2017-05-02]. DOI: 10.1086/593088. ISSN 0889-3365. Available from: http://www.journals.uchicago.edu/doi/10.1086/593088

CALDERÓN, César Calderón, Norman LOAYZA and Luis SERVÉN. *Greenfield Foreign Direct Investment And Mergers And Acquisitions: Feedback And Macroeconomic Effects* [online]. World Bank Policy Research Working Paper 3192, 2004 [cit. 2017-05-28]. Available from: http://documents.worldbank.org/curated/en/628261468781753575/110510322_20041117173021/additional/325780wps3192.pdf

CAMPBELL, John Y. et al. *Global Currency Hedging* [online]. 2009 [cit. 2017-04-17]. Available from: https://scholar.harvard.edu/files/campbell/files/globalcurrencyhedging_20090128_manuscript.pdf

CHOWN, John. *A history of money: from AD 800*. [First publ. in paperback]. London: Routledge, 1996. ISBN 978-041-5137-294.

CNN Money [online]. [cit. 2017-05-03]. Available from: http://money.cnn.com/2002/07/31/news/economy/economy/

CNN Money. U.S. economic growth slows. [online]. Cable News Network, 2002 [cit. 2017-05-02]. Available from: http://money.cnn.com/2002/07/31/news/economy/economy/

COPELAND, Laurence S. *Exchange Rates and International Finance*. 3rd edition. Great Britain: Pearson Education Limited, 2000. ISBN 0201-39850-8.

CENTRAL BANK OF THE REPUBLIC OF TURKEY. Available from: http://www.tcmb.gov.tr/wps/wcm/connect/tcmb+en/tcmb+en

DE BOCK, Reinout and Irineu DE CARVALHO FILHO. *The Behavior of Currencies during Risk-off Episodes*. IMF Working Paper. 2013, **2013**(8), 33.

DELLA CORTE, Pasquale and Ilias TSIAKAS. *Statistical and Economic Methods for Evaluating Exchange Rate Predictability*. Handbook of Exchange Rates [online]. Hoboken, NJ, USA: John Wiley, 2012, s. 221 [cit. 2017-05-28]. DOI: 10.1002/9781118445785.ch8. ISBN 9781118445785. Available from: http://doi.wiley.com/10.1002/9781118445785.ch8

DURČÁKOVÁ, Jaroslava and MANDEL, Martin. *Mezinárodní finance*. Praha: Management Press, 2010, 494 s. ISBN 978-80-7261-221-5

DWYER, Gerald P. and LOTHIAN, James R. *International Money and Common Currencies in Historical Perspective*. Federal Reserve Bank of Atlanta Working Paper 2002-7; CEIS Tor Vergata - Research Paper Series No. 9. 2003. Available from: https://ssrn.com/abstract=315081

EUN, Cheol S. and Bruce G. RESNICK. *International financial management*. 6th ed. New York, NY: McGraw-Hill, 2012. ISBN 9780078034657.

FAMA, Eugene. *Efficient Capital Markets: A Review of Theory and Empirical Work*. The Journal of Finance. 1970, **25**(2), 35.

FAMA, Eugene. *The behavior of stock-market prices*. *The journal of Business*, 1965, 38.1: 34-105. Available from: http://www.jstor.org/stable/2350752

FATUM, Rasmus and Yohei YAMAMOTO. *Intra-Safe Haven Currency Behavior During the Global Financial Crisis* [online]. 2014 [cit. 2017-05-24]. Available from: http://www.dallasfed.org/assets/documents/institute/wpapers/2014/0199.pdf. Working Paper. University of Alberta, Hitotsubashi University.

GIBSON, Heather D. *International Finance: Exchange Rates and Financial Flows in the International System*. New York: Longman Group Limited, 1996. ISBN 0-582-21813-6.

GÖRMEZ, Yüksel; YILMAZ, Gökhan. The evolution of exchange rate regime choices in Turkey. na, 2007.

GRISSE, Christian and Thomas NITSCHKA. *On financial risk and the safe haven characteristics of Swiss franc exchange rates*. Journal of Empirical Finance [online]. 2015, **32**, 153-164 [cit. 2017-05-24]. DOI: 10.1016/j.jempfin.2015.03.006. ISSN 09275398. Available from: http://linkinghub.elsevier.com/retrieve/pii/S0927539815000249

HABIB, Maurizio Michael and Livio STRACCA. *Getting Beyond Carry Trade: What Makes A Safe Haven Currency?* Working Paper Series [online]. European Central Bank, 2011, (1288), 41 [cit. 2017-05-24]. ISSN 1725-2806. Available from: http://ssrn.com/abstract_id=1737628.

HOSSFELD, Oliver and Ronald MACDONALD. *Discussion Paper: Carry funding and safe haven currencies: a threshold regression approach* [online]. 34. Frankfurt am Main: Press and Public

Relations Division, 2014, s. 29 [cit. 2017-05-24]. ISBN 978–3–95729–086–1. Available from: http://www.bundesbank.de

HSBC. Risk On - Risk Off: The Full Story. *Currency Quant Special* [online]. 2010, **2010**(10), 38 [cit. 2017-05-01].

INTERNATIONAL MONETARY FUND. *Annual Report on Exchange Arrangements and Exchange Restrictions 2014*. Washington, D.C., 2014. ISBN 978-1-49830-409-2.

INTERNATIONAL MONETARY FUND. *Balance of payments and international investment position manual*. 6th ed. Washington D.C: International Monetary Fund, 2009. ISBN 9781589068124.

INVESTOPEDIA. Available from: http://www.investopedia.com

JOHN C. HULL. *Options, futures, and other derivatives*. 8th ed., Global ed. Essex, England: Pearson Eduation Limited and Associated Companies throughout the world, 2012. ISBN 9780273759072.

JONES, Ronald Winthrop and Peter B. KENEN, ed. *Handbook of international economics*. 2nd edition. Amsterdam: Elsevier, 1996. ISBN 04-448-6792-9.

KAHNEMAN, Daniel and Amos TVERSKY. *Prospect Theory: An Analysis of Decision under Risk*. Econometrica [online]. 2010, **47**(2) [2016-04-04]. Available from: http://www.princeton.edu/%7Ekahneman/docs/Publications/prospect_theory.pdf

KIHWAN, Kim. *The 1997-98 Korean financial crisis: Causes, policy response, and lessons*. In: IMF Seminar on Crisis Prevention in Emerging Markets. 2006.

LEVICH, Richard M. *Evidence on financial globalization and crises: Interest rate parity*. 2011.

LIU, Berlinda. *Identifying the Differences Between VIX® Spot and Futures* [online]. The S&P Dow Jones Indices, 2014 [cit. 2017-05-02]. Available from: http://us.spindices.com/documents/education/practice-essentials-difference-between-vix-spot-futures.pdf

LOKSHIN, Michael and Martin RAVALLION. *Welfare Impacts of Russia´s 1998 Financial Crisis and the Response of the Public Safety Net*. Washington, DC, 2000.

LOTHIAN, James R. and Liuren WU. *Uncovered Interest-Rate Parity over the Past Two Centuries* [online]. 2005 [cit. 2017-05-24]. Available from: http://faculty.baruch.cuny.edu/lwu/. Fordham University, Baruch College.

MACOVEI, Mihai. *Growth and economic crises in Turkey leaving behind a turbulent past?* [online]. Brussels: European Commission, Directorate-General for Economic and Financial Affairs, 2009 [cit. 2017-05-28]. ISBN 9789279133619.

MAKIN, Anthony. J. *The Balance of Payments and the Exchange Rate*. International Economics, Finance and Trade 2002.

MCCAULEY, Robert N. and MCGUIRE, Patrick. *Dollar Appreciation in 2008: Safe Haven, Carry Trades, Dollar Shortage and Overhedging*. BIS Quarterly Review December 2009. Available from: https://ssrn.com/abstract=1519814

MCCAULEY, Robert N. *Managing Recent Hot Money Inflows in Asia*. ADBI Discussion Paper 99. Tokyo: Asian Development Bank Institute. 2008. Available from: http://www.adbi.org/discussion-paper//2008/03/13/2508.managing.hot.money.inflows.asia/

MCCAULEY, Robert. *Risk-on/risk-off, capital flows, leverage and safe assets*. BIS Working Papers. 2012, (382), 20.

MENKHOFF, L., SARNO, L., SCHMELING, M. & SCHRIMPF, A. (2011). *Carry trades and global foreign exchange volatility*. The Journal Of Finance, 67(2), pp. 681-718. doi: 10.1111/j.1540-6261.2012.01728.x

MIZEN, Paul. *The Credit Crunch of 2007-2008: A Discussion of the Background, Market Reactions, and Policy Responses* [online]. Federal Reserve Bank of St. Louis Review, 2008, (90(5), 531-67 [cit. 2017-05-24]. Available from: https://files.stlouisfed.org/files/htdocs/publications/review/08/09/Mizen.pdf

NEELY, Christopher J. and Paul A. WELLER. *Technical Analysis in the Foreign Exchange Market*. Handbook of Exchange Rates [online]. Hoboken, NJ, USA: John Wiley, 2012, s. 343 [cit. 2017-05-28]. DOI: 10.1002/9781118445785.ch12. ISBN 9781118445785. Available from: http://doi.wiley.com/10.1002/9781118445785.ch12

NELSON, Rebecca M., Paul BELKIN and Derek E. MIX. *Greece's Debt Crisis: Overview, Policy Responses, and Implications*. Congressional Research Service, 2010.

PARK, Cheol-Ho and Scott H. IRWIN. *What Do We Know About The Profitability Of Technical Analysis?* Journal of Economic Surveys [online]. 2007, **21**(4), 786-826 [cit. 2017-05-28]. DOI: 10.1111/j.1467-6419.2007.00519.x. ISSN 09500804. Available from: http://doi.wiley.com/10.1111/j.1467-6419.2007.00519.x

PUBLICATIONS, U. N. *Human Development Report 2016: human development for everyone*. S.l.: United Nations pubns. ISBN: 978-92-1-126413-5. [2017-04-04] Available from: http://hdr.undp.org/sites/default/files/2016_human_development_report.pdf

RANALDO, Angelo and Paul SÖDERLIND. *Safe Haven Currencies*. *Review of Finance*. 2009, 28.

SARNO, Lucio and Mark P. TAYLOR. *Hot money, accounting labels and the permanence of capital flows to developing countries: an empirical investigation*. Journal of Development Economics [online]. United Kingdom, 1999, (59), 337-364 [cit. 2017-05-24]. Available from: https://www.cass.city.ac.uk/__data/assets/pdf_file/0004/40684/JDE.pdf

SARNO, Lucio and Mark P. TAYLOR. *The economics of exchange rates*. Cambridge: Cambridge University Press, 2003. ISBN 05-214-8133-3.

SCHADLER, Susan. 2008. *Managing Large Capital Inflows: Taking Stock of International Experiences*. ADBI Discussion Paper 97. Tokyo: Asian Development Bank Institute. Available from: http://www.adbi.org/discussion- paper/2008/03/11/2504.managing.large.capital.inflows/

SEWELL, Martin. *Behavioural finance*. University of Cambridge. Available from: http://www.behaviouralfinance.net/behavioural-finance.pdf, 2007.

SMALES, Lee A. *News sentiment and the investor fear gauge*. Finance Research Letters [online]. 2014, **11**(2), 122-130 [cit. 2017-04-19]. DOI: 10.1016/j.frl.2013.07.003. ISSN 15446123. Available from: http://linkinghub.elsevier.com/retrieve/pii/S1544612313000354

STATMAN, Meir. *Behavioral Finance versus Standard Finance*. AIMR Conference Proceedings [online]. 1995, **1995**(7), 14-22 [cit. 2017-05-28]. DOI: 10.2469/cp.v1995.n7.4. ISSN 15350207. Available from: http://www.cfapubs.org/doi/abs/10.2469/cp.v1995.n7.4

SULA, Ozan and Thomas D. WILLETT. *Reversibility of Different Types of Capital Flows to Emerging Markets* [online]. Munich Personal RePEc Archive Paper, 2006, (384), 35 [cit. 2017-05-24]. Available from: http://mpra.ub.uni-muenchen.de/384/

THALER, Richard and Werner DE BONDT. *Does the Stock Market Overreact?* The Journal of Finance [online]. 1984, **40**(3) [2016-04-04]. Available from: http://links.jstor.org/sici?sici=0022-1082%28198507%2940%3A3%3C793%3ADTSMO%3E2.0.CO%3B2-Q

THE BANK OF KOREA. Available from: http://www.bok.or.kr/eng/engMain.action

THE CHICAGO BOARD OF EXCHANGE. *The CBOE Volatility Index - VIX: The powerful and flexible trading and risk management*[online]. CBOE. [cit. 2017-05-02]. Available from: http://www.cboe.com/micro/vix/vixwhite.pdf

THE ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT (OECD). Available from: http://www.oecd.org

THE WORLD BANK. Available from: http://www.worldbank.org

UNITED NATIONS CONFERENCE ON TRADE AND DEVELOPMENT. Available from: http://unctad.org/en/Pages/Home.aspx

WHALEY, Robert E. *The Investor Fear Gauge*. The Journal of Portfolio Management [online]. 2000, **26**(3), 12-17 [cit. 2017-04-19]. DOI: 10.3905/jpm.2000.319728. ISSN 00954918. Available from: http://www.iijournals.com/doi/abs/10.3905/jpm.2000.319728

WILLIAMS, Stacy, Daniel FENN and Mark MCDONALD. *Risk On – Risk Off: Fixing a broken investment process* [online]. HSBC Global Research, **2012** [cit. 2017-05-02].

WITZANY, Jiří. *International financial markets*. 2nd, rev. ed. Praha: Oeconomica, c2012. ISBN 9788024519029.

WORLD TRADE ORGANIZATION. *World Trade Statistical Review*. 2016, 165 p. [cit. 2017-05-24]. Available from: www.wto.org/statistics

List of Graphs and Tables

List of Graphs

List of Tables