Predicting Crises in Turkey Using an Exchange Market Pressure Model and Four-Way Decomposition Analysis of Gross Capital Flows

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Abstract

This study examines quarterly macroeconomic data in an attempt to reveal crises experienced in Turkey from 1998 to 2013 using an exchange market pressure model and analyze gross capital flows using a four-way decomposition analysis during. The results indicate that the exchange market pressure model successfully predicts the economic crisis following the 1998 Marmara earthquake, the February 2001 crisis and the effects of the 2008 global financial crisis in Turkey. The four-way decomposition is found to be more effective than the standard two-part differential analysis in explaining the relationship between crises and the inflow and outflow of domestic and foreign capital.

Keywords: financial crises, capital flows, balance of payments, capital and financial accounts, four-way decomposition, exchange market pressure

1. Introduction

Financial and economic crises are commonplace; thus, studies proliferate and evolve examining international capital flows, one of their suspected causes. The first studies examining international capital flows focused on the influence of foreign investment on growth and development. Researchers have also begun asking whether or not the inflows and outflows of foreign investment in developing countries was the cause of economic crises.

The relationship between crises and capital flows is currently under re-examination. When analyzing crises in particular, it has become accepted that analyzing international capital flows using empirical models focusing on gross capital inflows and outflows in the balance of payments is a more appropriate approach than looking at net capital flow within an economy (Boratav, 2009; Janus & Riera, 2010).

In order to effectively analyze capital flows during crises, the gross capital flows within the balance of payments should be decomposed, and each type of capital flow during the crises should be analyzed in a comparative fashion (Boratav, 2009; Janus & Riera, 2010). This type of study yields more realistic results for understanding international capital flows during crises because the flows are decomposed and analyzed according to their categories within the balance of payments prior to, during and following a given crisis (Boratav, 2002, 2009; Kraay, 2005; Lane, Gian, & Ferretti, 2007; Cowan et al., 2008; Janus & Riera, 2010; Rothenberg & Warnock 2008; Forbes & Warnock, 2012; Broner et al., 2011).

This study contributes to the literature by using quarterly data and the Exchange Market Pressure (EMP) model originally developed by Eichengreen, Rose, and Wyplosz (1995, 1996) to predict financial crises in Turkey from 1998 to 2013.

The EMP model used in this study is found to successfully predict the economic crisis following the 1998 Marmara earthquake, the February 2001crisis and the effects of the 2008 global economic crisis in Turkey. Furthermore, the four-way decomposition analysis of capital flows during crises is found to yield more meaningful results than the standard two-way decomposition.

The results show capital flows during crises differ from those during normal periods; the behavior of foreign investors, in particular, differs from that of domestic investors. It is found that prior to the 1999 crisis, foreign capital flowed freely into the country. Furthermore, foreign investment that is heavy prior to the global crisis of

2008 begins to flee the country at a similarly rapid pace at the height of the crisis. Additionally, domestic capital is found to fill the void left behind by foreign capital.

Section 2 of this study summarizes the literature concerning crises and their connection to capital flows, while section 3 explains the data set and methodology used. Section 4 describes the results obtained, and section 5 provides the conclusion.

2. Literature Summary

From their onset, crises impact all markets negatively in both direct and indirect ways. They are one of the critical economic problems throughout the world and are particularly troublesome for developing countries like Turkey.

Although it is not possible to speak of a single accepted definition of crisis with the literature, they are generally defined as sudden, unforeseen phenomena that present both threats and new opportunities. They are also accepted as periodic and having the potential to spread (Uygur, 2001; Krugman, 1979; Tüz, 2010; Yıldırım, 2006; Bastı, 2006; Şimşek, 2007).

Generally accepted causes of crises include rapid contractions in production, sudden drops in prices, sudden rises in unemployment, bankruptcies, falling wages, stock market collapses and speculations (Kindleberger, 2007).

The factors leading to crises identified with the literature vary depending on crisis type. Economic factors are generally given the following order of importance: Inappropriately implemented macroeconomic policies, weak financial structure, errors in fixing the value of currency, errors in the exchange rate system, external macroeconomic conditions, policies concerning structuring and oversight, and speculative trends resulting from an optimistic outlook prior to a crisis (Mishkin, 2001; Kindleberger, 2007).

Krugman (1979) contended that crises are caused by the depletion or near depletion of official reserves in countries where the government tries to stabilize the currency using a fixed exchange rate system in order to finance the fiscal deficit. Furthermore, research following Krugman's work also reached the conclusion that fixed exchange rate leads to speculative attacks (Obstfeld, 1996; Calvo & Mejia, 1995). According to a new approach later developed by Krugman (1979), crises do not emerge with the collapse of central banks' currency liabilities, but with the start of speculative attacks on domestic credits. Investors sell their assets to the central bank, a crisis sets in and as a result of this sudden rise in national assets.

Macroeconomic factors seen as contributing to crises include rapid contractions in production, sudden drops in general price levels, sudden spikes in unemployment, bank collapses, stock market collapses, inappropriately implemented macroeconomic policies, weakness in financial structure, inappropriate application of fixed exchange rates, sudden upsets in the balance of payments, short-term capital flows, and speculative capital attacks (Krugman, 1979; Calvo & Mejia, 1995; Obstfeld, 1996; Kaminsky, Lizondo, & Reinhart, 1998; Kumhof, 2000; Mishkin, 2001; Kindleberger, 2007; Prasad, Wei, & Köse, 2003; Corbo & Hernandez, 1996; Rodrik & Velasco, 1999).

External factors thought to contribute to crises include overvalued real effective exchange rate (REER), deviation of REER from the trend, reserve sufficiency, reserve expansion, domestic credit expansion, the ratio of banknotes in circulation to total international reserves, export growth, domestic production, the value of assets and imports, disparities between domestic and foreign real interest rates, debt ratios, and negative changes in bank deposits (Kaminsky, Lizondo, & Reinhart, 1998; Mendoza, 1991; Frankel & Rose, 1996; Goldberg, 1994; Guillermo, Reinhart, & Vegh, 1995).

Global capital flows have increased along with the expansion of international commercial transactions and financial liberalization processes throughout the world. Crises have also begun to erupt with frequency; therefore, economists have begun investigating the link between crises and these increased capital flows (Frankel & Rose, 1996; Hoggarth & Sterne, 1997; Kaminsky, Lizondo, & Reinhart, 1998; Berg & Pattillo, 1999; Kaminsky & Reinhart, 1999; Abiad, Oomes, & Ueda, 2008; Bussiere & Fratzscher, 2006). Many studies dealing with crises in Asia, Latin America, Russia and Turkey have focused on the connection between the crises and international capital flows (Motto & Norman, 1996; Rodrik & Velasco, 1999; Blomstrom & Kokko, 1997; Velde & Bezemer, 2004).

It has been determined that international capital flows negatively impact domestic capital and national economies by intensifying economic fluctuations and metastasizing crises (Stiglitz, 2006; Klein, 2007; Klein & Olivei, 2008). It has been found that international financial consolidation supports domestic financial development in developing countries just as it does in developed countries (Vanessche, 2004; Arestis & Caner, 2005; Quinn & Toyoda, 2008).

Heavy short-term inflows and outflows of foreign capital in particular have been seen as a cause of crises (Barro et al., 1992; Calvo, 1998; Dooley, 2000; Aghion, Bachetta, & Banerjee, 2004; Burnside, Eichenbaum, & Rebelo, 2004). Using the macroeconomic and policy data of 20 industrialized countries from 1959 to 1993, Eichengreen, Rose, and Wyplosz (1996) found that a nation-wide financial crisis caused by a speculative attack occurs anywhere in the world increases the probability of an attack on the national currency of another country by 8%. On the other hand, it has not been observed that the interaction of variables contributing to crises and those causing capital flows yield any definitive information about their connection or causation (Obstfeld, 1996; Motto & Norman, 1996; Blomstrom & Kokko, 1997; Besanger, Guest, & McDonald, 2000; Velde & Bezemer, 2004).

Studies looking into the connection between capital flows and crises focus on decompositions of items comprising capital flows such as the budget, fiscal deficit, and active and passive assets in the balance of payments. Therefore, using items with in the balance of payments as a basis is likely to yield a more effective prediction of the course of various capital flows during a crisis.

Studies on the decomposition of capital also perform decompositions to analyze direct investment and portfolio investment flows during crisis periods. Despite its positive effects in quite a few economic areas, many negative impacts of direct investment have also been observed. Due to the high rates of unskilled manpower in developing countries, for instance, multinational firms base their skilled production in their home countries. Intermediate goods must then be exported from the home country to the developing country in which the firms are investing (Kokko, 2002). In their study of direct investment, Razin, Sadka, and Yuen (1999) emphasized that while direct investment can have positive effects, there are also drawbacks.

Another downside of direct investment is that during periods of crisis owners of foreign capital gain the ability to make purchases for practically nothing vis-a-vis their experience and connections within a country. For example, they take advantage of the hardships experienced by domestic firms during crises and maintaining their power as financiers, are able to take ownership of shares in domestic firms for very low prices (Loungani & Razin, 2001). Furthermore, owners of foreign capital in the financial industry are able to perform manipulations via local agencies (Goldberg, 2003). These sorts of manipulations and speculative attacks cause anxiety among many domestic investors and can render economies fragile.

Feltenstein, Rochon, and Shamloo (2010) investigate the changes that occur in direct foreign capital flows during crises in which irregularity emerged in a variety of macroeconomic variables across several countries. The results showed that during monetary crises, which were often caused by speculative attacks in currency markets, negative changes in macroeconomic variables such as inflation, monetary supply, budget and trade balance led to a reduction in direct capital flow and even to capital flight. Conversely, studies on Russia, Latin America, India, The Czech Republic and South Africa indicated little short-term effect on direct investment during times of crisis (Edwards, 2001; Ramirez, 2006; Djankov & Hoekman, 2000; Cuadros, et al., 2004; Fedderke & Romm, 2006). According to Prasad et al. (2003), foreign capital flowing heavily into an institutionally weak economy can lead quickly to financial deficit and crises within that country.

In an analysis of 85 developing countries, Papanek (1973) argues that increases in direct investment lead to decreases in domestic saving. Furthermore, external aid entering an economy alienates private foreign investment and the inflow of other capital. The work of Rand and Tarp (2002), which avoided the traditionally assumed relationship between direct investment and growth, found no relationship between foreign investment and the domestic investments of locals.

Looking at studies analyzing the connection between the crisis dynamics of the Turkish economy and foreign capital flows, a large majority of them are purely theoretical. Furthermore, only a limited number of them use any sort of econometric method to test this connection.

The study of Özatay and Sak (2002) is one that applies such a method. Using quarterly data from 1977 to 1999, the study evaluates direct investment flows entering the Turkish economy over a 20-year period. The results did not reveal any connection between direct investment and economic growth.

Onur (2005) found that in 2003, when a large amount of direct capital flowed into the country, these flows contributed to gross national product and financial development. Uçak (2006), on the other hand, found a long-term connection between changes in gross domestic product and the increasing portfolio type inflow. The study concluded that the portfolio type inflow led to economic growth. Using cointegration, Granger causality and vector error correction model, Yapraklı (2007) revealed a positive correlation between a rise in foreign capital and economic growth rates. Looking at other indicators, however, capital flow increases correlated negatively with economic growth. Apak and Uçak (2007) found that external factors had positive effects on Turkey's macroeconomic parameters following direct capital inflows. Demir (2007) and Özatay and Sak (2002)

also reached similar conclusions.

Altıntaş and Ayrıçay (2009) concluded that direct increases in foreign investment had no long-term connection with variables such as real growth rates, financial development, external deficit, and real interest rates. Ağır (2010) found the connection between increased direct capital inflow and economic growth variables to be both positive and statistically significant in the long term. The study also points out that this interaction may be just the opposite in the short term.

Because direct capital flows do not display sudden outflows during periods of crisis and so they are not seen as causes of crises. If weaknesses in an economy persist following a crisis, it has been seen that this capital may flow out of the economy.

Portfolio investments are believed to have negative economic impacts in addition to their positive contributions. Rodrik and Velasco (1999) determined that short-term inflows of portfolio investments both negatively affect the economy and lead to shrinkage in domestic capital. Jordan and Fiona (1998) revealed that increases in foreign portfolios slow the flow of domestic capital and that decreases in foreign portfolios, in turn, increase domestic investment.

In a comparative analysis of nine countries, Yang (2002) found that direct foreign investment in all countries observed positively affected the formation of domestic capital. However, portfolio-type financial capital flow had no net impact on the stock of domestic capital or economic growth.

In countries such as South Korea, Indonesia and Singapore, which have experienced heavy inflows of portfolio-type capital, account deficits were found to drag the economies into currency crises during periods then this kind of capital suddenly spikes (López & Large, 1999).

In Turkey, significant increases in portfolio investment have been observed just prior to and during crises. This situation demonstrates the fluctuating course of inflow and outflows of portfolio investment in Turkey during periods of crises. Therefore, the economic and financial effects of foreign capital flows in Turkey have been a subject of debate for researchers. For instance, Barışık and Şarkgüneşi (2009) concluded that from 1990 to 2007 foreign capital strengthened the capital of domestic banks through direct and portfolio investment.

At the same time, it has been determined that capital inflows block domestic savings and lead to macroeconomic instability by upsetting the equilibrium exchange rate. İnsel and Sungur (2003) examined the effect of capital flows on macroeconomic indicators in Turkey from 1989 to 1999. Their results revealed that capital flows increase indicator volatility, bring short-term perspective to economic activity, and play a role in increasing instability.

In a similar study of Turkey from 1996 to 2006, Örnek (2006) found that direct investment had a positive effect on domestic savings and economic growth. The study found, however, that short-term capital flows had a positive effect on economic growth, but a negative effect on domestic savings.

Portfolio-type investments display sudden outflows during crises periods, and the financial vacuum they create can increase the risk of financial crisis (İnsel & Sungur, 2003; Kaya & Yılmaz, 2003).

Decomposing capital flows into direct and portfolio categories has been found to be an unsatisfactory means of explaining the third-generation crises that have emerged in recent years. Analyses of undecomposed gross capital flows suggest that they have a negative effect (Barro et al., 1992; Calvo, 1998; Dooley, 2000; Aghion, Bachetta, & Banerjee, 2004; Burnside, Eichenbaum, & Rebelo, 2004, Janus & Riera, 2010).

Thus, studies decomposing capital flows during crisis periods based on direction, quality and a net-gross basis have begun to proliferate (Kraay, 2005; Lane, Gian, & Ferretti, 2007; Cowan et al., 2008; Rothenberg & Warnock, 2011; Forbes & Warnock, 2012; Broner et al., 2011, Janus & Riera, 2010).

The theoretical studies of Barro et al. (1992) and Aghion, Bachetta, and Banerjee (2004) and the empirical studies of Burnside, Eichenbaum and Rebelo (2004) and Bordo, Cavallo, and Meissner (2010) in particular focus exclusively on gross capital inflows during periods of crisis.

A study of developed and developing countries by Broner et al. (2011) analyzes capital inflows and outflows by both domestic and foreign investors since the 1970s. According to the study, when looking at gross capital flows during crises, foreign capital outflows appear to increase while domestic capital fills the void left behind. Furthermore, they emphasized that this situation cannot be clearly recognized by looking at net capital flows alone (Lane, Gian, & Ferretti, 2007; Rothenberg & Warnock, 2011). Furthermore, domestic and foreign capital display different flow patterns during times of crisis; one makes new investments to fill the gap as the other leaves. This is because owners of domestic capital in many countries know very well the faults in the domestic

financial markets and can manage their capital much more effectively than foreign investors in these situations (Bernanke, 1983; Caballero & Krishnamurthy, 2001).

Studies decomposing and analyzing capital flows have determined that domestic investors take their assets abroad during times of economic expansion and bring them back during crises in which foreign investment decreases (Kraay et al., 2005; Lane, Gian, & Ferretti, 2007; Broner et al., 2011). During a crisis in South Korea, a large outflow of domestic capital was observed along with the return of domestic capital. Similarly, a return of capital was seen in the US and Great Britain during the 2008-2009 crisis (Janus & Riera, 2010).

It has been suggested that not only capital outflows but also inflows of domestic and foreign capital need to be factored in during times of crisis. For this reason, international capital flows should be decomposed into their foreign and domestic components and evaluated according to their different inflow and outflow patterns and the type of crises experienced. This is because domestic capital can be seen to flow in and out of the country earlier, more heavily and more rapidly than foreign capital (Hendricks & Singhal, 2005).

Four-way decomposition of capital flows appears to be more revealing than two-way decomposition for the latest six economic crises experienced in various parts of the world. It has also been shown to more accurately predict the end of the crises in a variety of studies (Kraay et al., 2005; Lane, Gian, & Ferretti, 2007; Cowan et al., 2008; Rothenberg & Warnock, 2011; Forbes & Warnock, 2012; Broner et al., 2011).

3. Data and Methodology

3.1 Data

Statistics on Turkey's balance of payments are based on international standards and principles recommended for all members of the International Monetary Fund. Starting with data from 1992, balance of payments statistics are published on a monthly basis by the Central Bank of the Republic of Turkey (TCMB) Statistics Department Balance of Payments Division and are used in compiling Financial Accounts.

The data are accessed via the "Statistics" menu on the official website of TCMB under the "Electronic Data Delivery System" heading on the "Statistical Data" submenu.

Figure 1 displays changes in interest (int), reserves (res) and nominal exchange rate (e) in three-month intervals according to the exchange market pressure model.
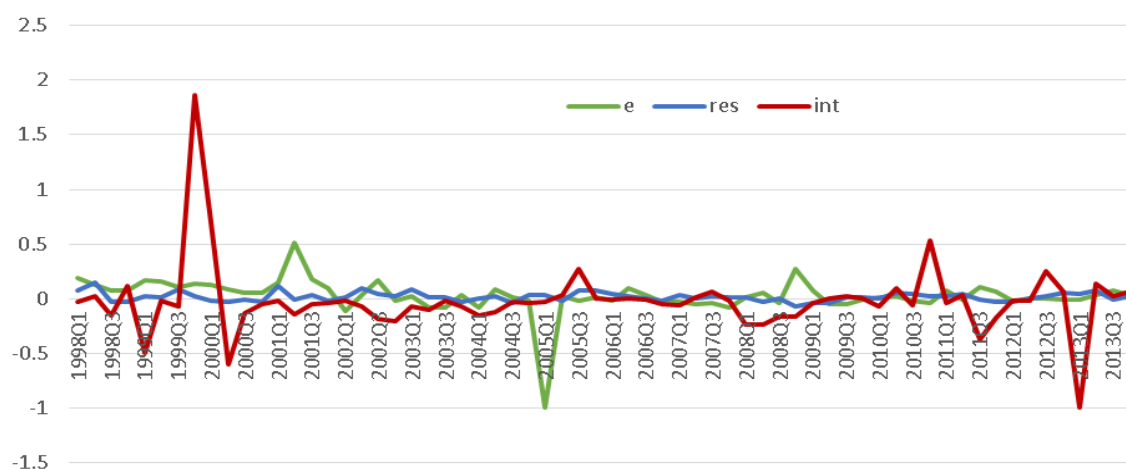

Figure 1. Changes in interest, reserves and nominal currency value

Note. Change in nominal exchange rate (e) is nominal effective exchange rate adjusted by the national price index.

3.2 Methodology

The Exchange Market Pressure (EMP) index has been used frequently in recent studies attempting to reveal crises.

The EMP index has been used to both predict crises and explain the connection between crises and capital flows in studies by Eichengreen, Rose, and Wyplosz (1995, 1996), Özkan and Sutherland (1995), Frankel and Rose (1996), Kaminsky, Lizondo, and Reinhart (1998), Calvo (1998), Berg and Pattillo (1999), Kaminsky and

Reinhart (1999), Edison (2000), Jacobs and Gerard (2003), Mariano et al. (2004), Bussiere and Fratzscher (2006), Çepni and Köse (2006), Hutchison and Noy (2006), Kraay et al. (2005), Lane, Gian, and Ferretti (2007), Abiad (2008), and Janus and Riera (2010).

The EMP model is defined as a situation that may lead to two or three of the following negative outlooks: Sudden currency devaluations resulting from attacks, a significant drop in international reserves and significant increases in domestic interest rates (Eichengreen, Rose, & Wyplosz, 1995 & 1996; Kaminsky, Lizondo, & Reinhart, 1998; Edison, 2000).

Using the studies of Eichengreen, Rose, and Wyplosz (1995 and 1996) and Kaminsky, Lizondo, and Reinhart (1998) as a basis, a crisis index is calculated according to percentage changes in existing currency reserves, weighted averages of percentage changes in the nominal exchange rates, and, finally, changes in domestic exchange rates during the relevant period.

Thus, the EMP index serves as a dummy variable calculated based on exchange rates, reserves and interest rates. (Eichengreen, Rose, & Wyplosz, 1995, 1996). Therefore:

$$dEMP > 1.5\sigma_{EMP} + \mu_{EMP} : crisis\ exists$$

$$dEMP \leq 1.5\sigma_{EMP} + \mu_{EMP} : no\ crisis$$

The σ_{EMP} and μ_{EMP} above stand for the sample standard deviation and sample average of EMP, respectively. The variable $dEMP$ signifies the threshold value. Changes in exchange rates have a positive value, while changes in reserves have a negative value. Therefore, both depreciations in currency and decreases in reserves increase the EMP index value (Eichengreen, Rose, & Wyplosz, 1995, 1996). As such, a crisis is considered to exist when the EMP rises over a certain threshold (Edison, 2001; Kaminsky, Lizondo, & Reinhart, 1998).

This study considers a crisis to be when the EMP index exceeds the threshold value 1.5 standard deviations above the average.

Although the threshold value is taken to be the average plus 1.5 standard deviations, researchers have often multiplied the standard deviation by 2.5 or 3 and added the average to achieve stronger results (Kaminsky, Lizondo, & Reinhart, 1998; Berg & Pattilo, 1999; Edison, 2001).

In this situation this suggested EMP model formulation is shown in Equation (1).

$$EMP_t = \%\Delta e_t - \alpha_1 \%\Delta r_t + \alpha_2 \Delta i_t \qquad (1)$$

In Equation (1), e expresses the nominal exchange rate at time t, while r expresses reserves, and i expresses domestic nominal interest rate change at time t. Variable α_1 expresses the ratio of the standard deviation of the nominal exchange rate change and the standard deviation of the relative change in reserves. Variable α_2 expresses the ratio of the standard deviation of the change in nominal exchange rate to the standard deviation of the domestic nominal interest rate change.

This study differs from the literature in that it decomposes and analyzes capital flows into four parts rather than two. This is because a four-way composition is more effective for both determining exactly the net capital inflow during crisis periods and for explaining the Dynamics behind capital flows during crisis periods (Janus & Riera, 2010).

Equation (2) uses standard methodology for balance of payments calculations to calculate net capital.

$$NI_2 = \Delta L - \Delta A \qquad (2)$$

In Equation (2), variable ΔA expresses n change in both domestic and foreign total assets included in the capital flow calculations for the relevant period. Variable ΔL expresses the increase in total liabilities both domestic and foreign.

The two-way decomposition method calculates net capital flows by separating all capital flows into two groups: Those flowing in and those flowing out. This standard methodology focuses on inflows and outflows, categorizing all entering capital as foreign and all exiting capital as domestic.

For this reason, some gaps exist in the net capital flow calculations made with Equation (2). For example, foreign investments, which can comprise a significant share of a country's balance of payments, may drop off during certain periods. Some foreign capital enters a country but does not get invested. Also, domestic capital may fill the gap left behind when foreign capital exits (Janus & Riera, 2010). Therefore, any reduction in foreign assets can be misinterpreted as the complete withdrawal of foreign capital based on Equation (2) (Janus & Riera, 2010).

In other words, calculating inflows and outflows is not a satisfactory means of determining reductions in foreign

capital in the balance of payments. It is known that the changes in question may take place without any reduction in foreign investment and without such investors withdrawing their capital. Furthermore, there exists the possibility that domestic capital may return.

Janus and Riera examined capital flows during crises using Equation (2) and concluded that using a two-way decomposition resulted in incomplete and erroneous conclusions. Therefore, they recommended using a four-way decomposition method (Janus & Riera, 2010).

This study takes into account the potential asymmetry between foreign investment or lack thereof in the balance of payments. Furthermore, the absolute value/measurement of lack of investment is calculated. Equation (3) is used in this calculation.

$$NI_4 = (L^+ - L^-) - (A^+ - A^-) \tag{3}$$

In Equations (2) and (3), variable NI_2 expresses net capital flows according standard methodology. It is defined by subtracting the increase in international reserves from the budget deficit. Data on balance of payments is obtained from the TCMB balance of payments statistics. The variable NI_4 expresses gross capital flows. It is calculated by adding the total increases and decreases in assets in a country's financial balance to the increases and decreases in the absolute values of all liabilities. The variable L^- expresses negative changes in liabilities (exiting foreign investment) and is defined as the absolute value of all decreases in foreign liabilities of domestic persons in private-sector financial and capital accounts. For example, commercial and cash loans obtained by domestic persons from creditors abroad are traced by the TCMB and banks as foreign currency accounts opened by persons settled abroad. The variable L^+ signifies positive changes (entering foreign capital) in liabilities and is defined as the absolute value of all increases in foreign liabilities of domestic persons in private-sector financial and capital accounts. The variable A^+ expresses positive changes in assets (entering domestic investment), and is defined as the absolute value of all increases in foreign assets of domestic persons in private-sector financial and capital accounts. For example, commercial and cash loans issued by a domestic creditor to a foreign person are tracked by banks as foreign currency and Turkish lira. The variable A^- expresses negative changes (exiting domestic capital) and is defined as the absolute value of all decreases in foreign assets of domestic persons in private-sector financial and capital accounts.

The values for all variables in Equation (3) and their calculation are as follows (Janus & Riera, 2010):

$L^+ \geq 0$: Positive changes in liabilities (entering foreign investment)

$L^- \geq 0$: Negative changes in liabilities (exiting foreign investment)

$A^+ \geq 0$: Positive changes in assets (entering domestic/foreign investment)

$A^+ \geq 0$: Negative changes in assets (exiting domestic/foreign investment)

Equation (3) identifies the four main sources of gross capital variations within a given country. Conversely, the two-way decomposition used in previous studies only takes into account net entrance calculated with equation $\Delta L = (L^+ - L^-)$ or net exit calculated with $\Delta A = (A^+ + A^-)$. For this reason, the standard two-way decomposition method erroneously decomposes investment from lack thereof and accepts both of these as flawless variables (Janus & Riera, 2010; Forbes & Warnock, 2012; Broner et al., 2011).

The standard methodology draws attention to the fact that crises in Indonesia, Mexico and South Korea were caused in large part by capital inflows. Predictions made with four-way decomposition identify lack of foreign investment at the root of the crises in question (Janus & Riera, 2010). Furthermore, along with the return of domestic capital during the crisis in South Korea, it was seen that foreign capital largely exited. Similarly, this method determined that during the global crisis from 2008 to 2009, domestic capital largely returned to the US and Great Britain (Janus & Riera, 2010).

Just as the four-way decomposition method is more effective than the two-way method for explaining crises, it has also been observed to be better able to predict sudden halts in capital flows during said crises (Janus & Riera, 2010).

Thus, this study relies on experiment and observation to examine the gross capital inflows and outflows in Turkey from 1998 to 2013 and uses the four-way decomposition method recommended by Janus and Riera (2010).

4. Empirical Results and Analysis

Figure 2 illustrates the crises taking place in Turkey from 1998 to 2013 identified using the EMP index model used by Eichengreen, Rose, and Wyplosz (1995 and 1996) and Kaminsky, Lizondo, and Reinhart (1998). Our

study defines a crisis as instances when the EMP index exceeds the average (0.36471208) by 1.5 standard deviations.
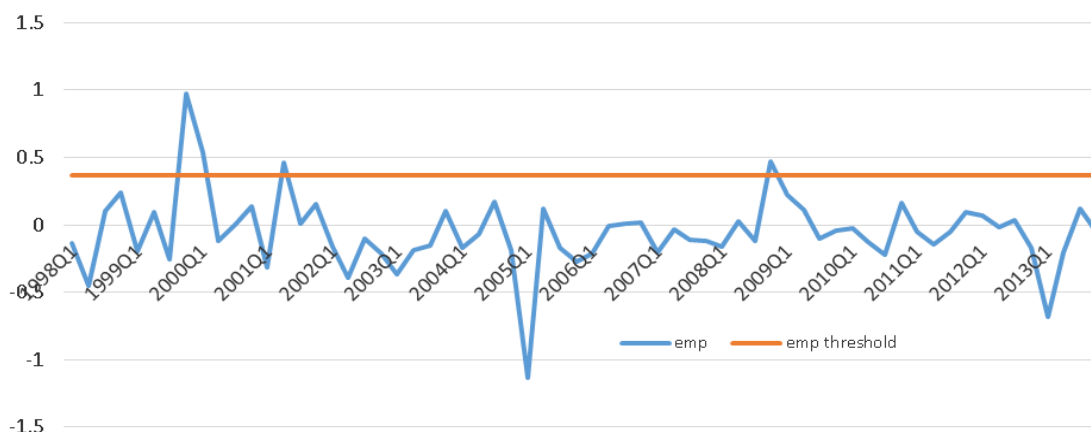

Figure 2. EMP index and the threshold value

As can be seen in Figure 1, three crises are experienced from 1998 to 2013. The first crisis begins in the fourth quarter of 1999, reaching a peak in the middle of the first quarter of 2000, and ending at the end of the second quarter of 2000. This crisis is known as the economic collapse following the 1999 Marmara earthquake. The second crisis period begins in the first quarter of 2001 and reaches a peak in the middle of the second quarter of 2001. This crisis is known as the February 2001 crisis. The third crisis begins in the final quarter of 2008 and reaches a peak toward the end of the same quarter. This crisis is known as the effect of the global mortgage crisis in Turkey.

This study successfully predicts these three well-known crises using the EMP index model and threshold value.

Figure 3 displays the capital flows obtained from the results of the four-way decomposition analysis. For ease of explanation they are presented in two Windows-one from 1998 to 2005 and the other from 2006 to 2013.
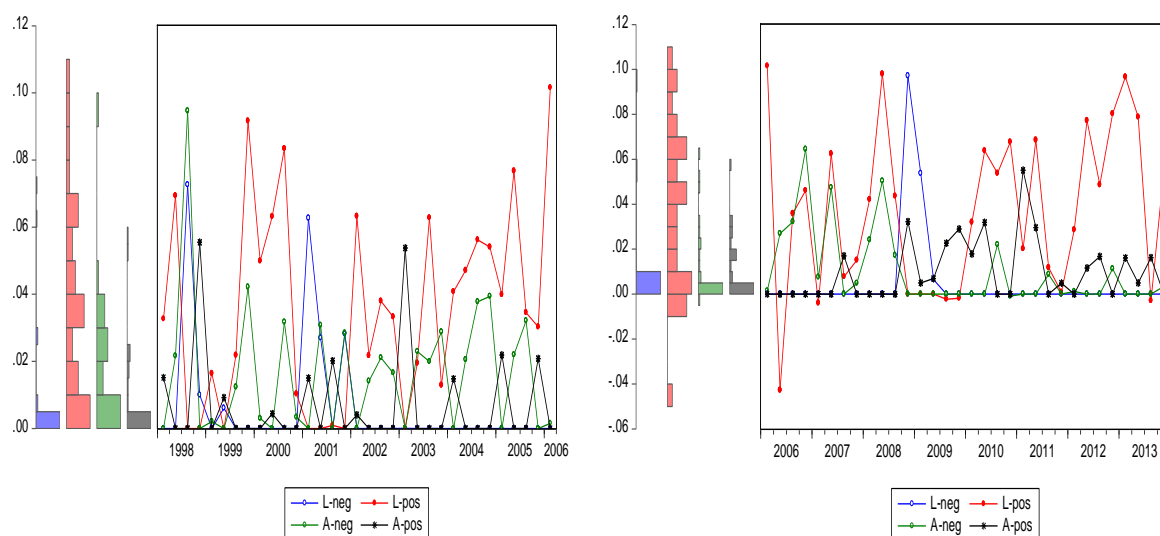

Figure 3. Capital flows in four-way decomposition analysis

As identified by the EMP model, a crises occurs following the Marmara earthquake starting in the fourth quarter of 1999, reaching a peak in the middle of the first quarter of 2000, and losing its strength at the end of the second quarter of 2000.

During the first two quarters and the middle of the third quarter of 1999, the exit of foreign capital (L^-) leads to the return of local investors (A^+) in a converse fashion. When this crisis period is viewed through a four-way decomposition, however, it can been seen that the inflow of domestic capital (A^+) increases during the first two quarters of 1999, but bottoms out as the return of local investors trickles off.

During the same period, foreign capital inflows (L^+) show a very large increase, reaching a peak in the fourth quarter of 1999. During the same quarter, domestic capital flows out (A^-), although at slower rates.

According to these findings, foreign capital fills the void left behind by domestic capital during the crisis following the 1999 earthquake in the same proportions. Furthermore, it is possible to conclude that this is caused by interest rates, which climb from the beginning of 1999 and reach a peak in August.

The standard two-way analysis only looks at the inflow and outflow of foreign capital during 1999 and shows that foreign capital continues to flow in during the crisis-falling throughout the crisis but then increasing again at the end. Therefore, it forces one to conclude that the 1999 crisis had no significant effect on capital flows.

The February 2001 crisis begins in the first quarter of 2001 and reaches a peak in the middle of the second quarter of 2001. Similar to the previous crisis, outflows of foreign capital (L^-) rise during the crisis, and the return of assets remains stagnant. This leads to increasing outflow (A^-) of capital from the country.

Conversely, inflow of foreign capital (L^+) remains at or around zero levels during the crisis. While the crisis in 2001 spurs the flow of domestic capital, it causes foreign capital to remain steady.

Starting at the peak of the crisis at the end of February and the beginning of March, as the crisis lost intensity, inflows of domestic capital (A^+) begin to decline while outflows of domestic capital (A^-) begin to increase. Foreign capital inflows and outflows (L^+ and L^-) maintain their levels around zero as the crisis climaxes and begins its descent. Furthermore, while foreign capital inflows remain stagnant during the 2001 crisis, domestic capital flows are much more variable.

The 2008 crisis, the ripple effects of the global mortgage crisis, begins in the last quarter of 2008 and reaches a peak at the end of the same quarter. Foreign capital flows out of the country at the same rate that it entered in the previous year. During this period foreign capital inflows (L^+) contract to negative levels, where they remain throughout the duration of the crisis. The most striking development is that exits of foreign capital (L^-) remain around zero from the final quarter of 2001 up to this point. This crisis triggers exits of foreign capital unseen in over seven years.

Furthermore, as the global crisis engulfs the world and foreign capital flees Turkey, the inflow of domestic capital (A^+) shows a highly significant increase. The exit of domestic capital (A^-) remains stable around zero. These findings demonstrate that returning domestic capital fills the void left by foreign capital fleeing Turkey in the wake of the global mortgage crises, albeit not at the same levels.

The standard method shows that during the third quarter of 2008, foreign capital inflows remain at levels higher than any experienced from 2008 to 2013. With the crisis, this number falls from this high level to nearly zero, demonstrating the gravity of the crisis.

Therefore, the flight of foreign capital and stagnant level of foreign capital inflows leads to the return of domestic capital. As a result, Turkey's economy is merely grazed by the 2008 crisis.

5. Conclusion

Crises emerge suddenly, are unforeseen, create both threats and new opportunities, are periodic, and have the potential to spread. They are one of the greatest enemies of economic development. With increasing globalization and liberalization, capital flows must be better analyzed in order to better recognize oncoming crises.

It has been suggested that the standard tow-way decomposition method for analyzing short-term capital flows is no longer sufficient and that the analysis must be performed on decomposition of gross rather than net capital flows. For this reason, economists recommend analyzing capital flows using a four-way decomposition method.

This study identifies financial crises experienced in Turkey from 1998 to 2013 using the EMP index and analyzes the gross capital flows during these crisis periods. This study identifies crises utilizes quarterly data from the past 15 years along with the EMP index model originally developed by Rose and Wyplosz (1995, 1996), which is not very common in studies dealing with Turkey.

The EMP model used here successfully identifies the economic crisis following the 1999 Marmara earthquake, the February 2001 crisis and the effects of the 2008 global financial crisis in Turkey. Furthermore, the four-way

decomposition analysis of the capital flows during these crisis periods yield more revealing results than the standard two-way decomposition.

The results indicate that capital moves differently during crises periods as compared with during normal times. This proves especially true when comparing the behavior of domestic and foreign investors. Foreign capital is seen to flow heavily into Turkey prior to both the 1999 and 2008 crises and exit at the same rate at the height of these crises. Meanwhile, domestic capital is found to rush in to fill the void left behind by foreign investors.

The empirical results show that four-way decomposition of capital flows seems to be more enlightening than two-way decomposition for the latest economic crises experienced in Turkey as other various parts of the world.

Further studies using more advanced econometric models into whether or not composition of gross capital flows are a factor leading to crises may be beneficial.

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