



**UNIVERSITA' DEGLI STUDI DI PADOVA**

**DIPARTIMENTO DI SCIENZE ECONOMICHE ED AZIENDALI  
"M.FANNO"**

**CORSO DI LAUREA MAGISTRALE / SPECIALISTICA IN  
ECONOMICS AND FINANCE**

**TESI DI LAUREA**

**"CREDIT BOOMS AND CURRENCY CRISES:  
THE CASE OF TURKEY"**

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**ANNO ACCADEMICO 2019 – 2020**

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A handwritten signature in black ink, appearing to read "Andrea Lippi", is written over a light gray rectangular background. The signature is cursive and fluid.

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# 1 Introduction

The term "emerging market economy" was first used in 1981 by Antoine W. Van Agtmael of the International Finance Corporation of the World Bank.

Emerging markets are economies of countries that are in the progress of becoming a developed country and typically are moving toward mixed or free markets. Emerging markets typically have a lower-to-middle per capita income. This means that the per capita income of the countries' economies is generally lower than other more developed. Those economies have another common feature, i.e. foreign investors can buy stocks in their financial markets. While emerging markets often have a higher rate of growth compared to developed countries, they are often plagued by higher sociopolitical instability and volatility, indeed until the global financial crisis banking crisis in 2008 banking crises had predominantly been a low and middle- income country phenomenon, at least from lately 1960s; sovereign debt crisis were exclusively matter of the emerging economies until the 2008 which brought about sovereign debt crises in development economies and even currency crises are a rare phenomenon among developed countries, including during the global financial crisis, in part due to the reserve currency status of some of these economies.

According to the Morgan Stanley Capital International Emerging Market Index, 26 developing countries qualify as emerging markets - including Argentina, Brazil, Chile, China, Colombia, Czech Republic, Egypt, Greece, Hungary, India, Indonesia, Korea, Malaysia, Mexico, Pakistan, Peru, Philippines, Poland, Qatar, Russia, Saudi Arabia, South Africa, Taiwan, Thailand, Turkey and United Arab Emirates.

This thesis will focus on Turkey in particular its recent currency crisis. Turkey has been considered as an emerging economy for several decades and one among the world's developed countries according to the CIA World Factbook. Recently, we witnessed that Turkey has elevated its status to an emerging power. With its large population, growing economy, rising military power, active diplomacy and strong national identity, Turkey has increased its outreach and influence to the global scale. It has also increased its capacity and autonomy. Turkey has the world's 19th-largest nominal GDP, and 13th-largest GDP based by purchase price parity (PPP).

However, before the latest currency crisis in 2018, Turkey experienced other two major crisis. The first one was the currency crisis in 1994 which was caused by typical problems of most emerging countries: high interest rate, an important currency account deficit and public deficit. This led to a devaluation of the TL of almost 50 percent. The second was the financial crisis in 2001 that has a different origin which was the stabilization program and the IMF agreement in 1999. They had disastrous effect on the Turkish economy but managed to recover

rapidly. In the following 10 years Turkish GDP has been grown by more than 5.5 percent (considering also the year of the great financial crisis) even if during the first years of 2010s appeared warnings about a potential crisis in the forthcoming future. Interest rates in Turkey have been relatively high over the period from 2001 until 2011, although they never reached the double digit . On the contrary, interest rates in the advanced economies have been historically low, especially starting from 2008. The aforementioned conditions contributed to massive capital inflows to Turkey. These inflows have led to dramatic credit expansions, fueled investments and generated an economic boom.

Growth in Turkey became increasingly dependent on externally-funded credit and demand stimulus it means that a slight fall in flows can create huge disruption in the credit market and cause negative balance sheet effects for firms and, hence, affect their investment decisions. As a result, Turkey's economy began running above potential with a large current account deficit and high inflation. These imbalances left the economy susceptible to a change in market sentiment that triggered sizeable lira depreciation (IMF,2019), moreover to avoid financial disruptions caused by rapid depreciation central banks in emerging economies (CBRT in this case)keep interest rates high. In addition, the global financial tightening in 2018 (described in a IMF resource by Tobias Adrian) hurt emerging markets and Turkey was among the most notable victims, as it suffered from a currency crisis followed by a recession. The Turkish Lira (TL) lost 30 per cent of its value against the US Dollar (USD) in 2018, depreciating much further in the first eight months. In 2019 the unemployment rate reached record level, even higher than during the great financial crisis in 2008. The debt restructuring framework of the banking sector, revised in October 2018, helped banks restructure loans worth 20 billion USD, without the IMF loans (\$30 millions), many are skeptic that Turkey will never fully recover from the lasting after-effects of the August rout, underpinned by strong dollarization and also the recent pandemic make Turkish economy more crisis. On the other hand, according to the available data, the Turkish economy slipped into recession in the second half of 2018, although the average annual growth remain positive at 2.8 percent also 2019 followed the residues of 2018 in the first with two quarters in slightly recession but it ends with a steep growth that ensured a positive sign (0.9 percent).

The paper is structured as it follows. Section 2 offers a brief presentation of the definition of financial crises, which category are inside the family of financial crises and the similarities among the different types of crises. Section 3 and 4 describe in a more detailed way two types of crises: banking and currency respectively. Section 5 is about credit booms; how are defined, methodology to classify them and the correlation with output and financial crises. Section 6 offers an overview of the last

40 years of economic events in Turkey, starting from the idea of financialisation and finishing with 2018 currency crisis and the present of Turkey (late 2018-early 2020). Section 7 is the experimental part of this paper: firstly will be reported the model of currency crises from Krugman Flood and Garber, then it will be compared with Turkish data to understand if this model fit with the case of Turkey even if some assumptions differs from the basic model. Section 8 concludes.

## 2 Financial crisis

Crises are, at a certain level, extreme manifestations of the interactions between the financial sector and the real economy. The financial crisis can be defined as the disruption in financial markets, the negative impact of the performance of financial institutions or intermediary institutions in financial markets, and this negative effect spreads to the whole economy and causes the resources not to be distributed effectively. (Kalkavan and Ersin, 2019).

### 2.1 Type of financial crisis

Reinhart and Rogoff (2009) distinguish two types of crises: those classified using strictly quantitative definitions; and those dependent largely on qualitative and judgmental analysis. The first group mainly includes currency and sudden stop crises and the second group contains debt and banking crises. Regardless, definitions are strongly influenced by the theories trying to explain crises (Claessens and Kose, 2013).

While financial crises can take various shapes and forms, the literature has been able to arrive at concrete definitions of many types of crises. First group give a definition for the two type of crisis:

1. a currency crisis involves a speculative attack on the currency resulting in a devaluation, or forcing the authorities to defend the currency by expending large amount of international reserves, or sharply raising interest rates, or imposing capital controls;
2. a sudden stop can be defined as a large fall in international capital inflows or a sharp reversal in aggregate capital flows to a country, likely taking place in conjunction with a sharp rise in its credit spreads;

since these are measurable variables, they lend themselves to the use of quantitative methodologies (Claessen et al.,2013).

The other group variables are not easy to measure, allow them more to the use of qualitative methodologies. This group is associated to adverse debt dynamics and banking system turmoil (Claessen and Rose,2013):

1. foreign debt crisis takes place when a country cannot service its foreign debt. It can take the form of a sovereign or private debt crisis;
2. a domestic public debt crisis takes place when a country does not honor its domestic fiscal obligations in real terms, either by defaulting explicitly, or by inflating or otherwise debasing its currency, or by employing some (other) forms of financial repression



3. a systemic banking can induce banks to suspend the convertibility of their liabilities or compel the government to intervene to prevent this by extending liquidity and capital assistance on a large scale.

Now I am going to briefly introduce currency and banking crisis (since Section 2 and Section 3 are focus on this type of crisis) and explain in a little bit wider way sudden stops quantitative models and debt crisis.

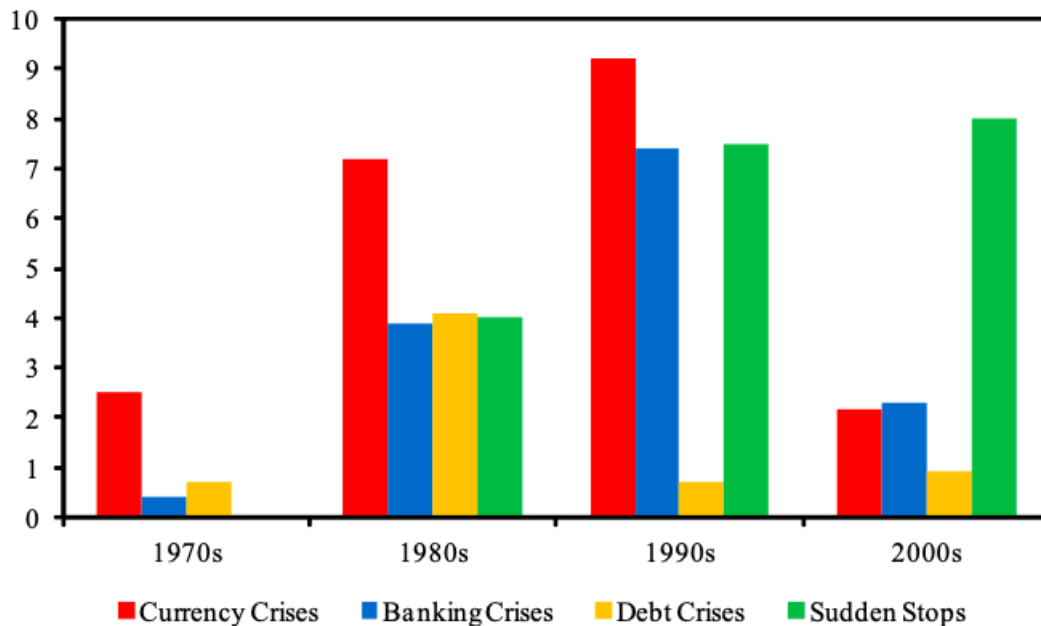


Figure 1: Average of financial crises over the decades  
Taken by Claessens and Rose(2013)

Currency crisis theories have evolved over the time and moved the focus from a a focus on the fundamental causes of currency crises, to emphasizing the scope for multiple equilibria, and to stressing the role of financial variables, especially changes in balance sheets, in triggering currency crises. Three are the model to explain currency crisis. The first generation model is based on the paper of Krugman (1979) and Flood and Garber (1983) and hence called 'KFG' model. The second generation models stress the importance equilibria; many authors work on this topic (Obsterfeld and Rogoff, 1986; Flood and Marion, 1997; Frankel and Rose, 1996 and many others). The third generation model explores how rapid deteriorations of balance sheets associated with fluctuations in asset prices, can lead to currency crises. Also those models include the role played by the banks and the self-fulfilling nature.

Sudden stop models deal with disruptions in the supply of external financing. These models resemble the latest generation of currency crises models in that they also focus on balance sheet mismatches – notably currency, but also maturity – in financial and corporate sectors (Calvo et al., 2006). These models can account for the current account reversals and the real exchange rate depreciation typically observed during crises in emerging markets. The models explain less well the typical sharp drops in output and total factor productivity (TFP); models with financial frictions help to account better for the dynamics of output and productivity in sudden stops but in most models, a sudden stop with currency crisis generates an increase in output, rather than a drop. This happens due to an abnormal raising in net exports resulting from the currency depreciation. This has led to various theories explaining why sudden stops in capital flows are associated with wide output losses. Models typically include Fisherian channels and financial accelerator mechanisms, or frictions in labor markets, to generate an output drop during a sudden stop, without losing the ability to account for the movements of other variables (Claessens and Kose, 2013). These types of amplification mechanisms can make small shocks cause sudden stops. Relatively small shocks can trigger collateral constraints on debt and working capital, especially when borrowing levels are high relative to asset values. Fisher’s style debt-deflation mechanisms can then cause sudden stops through a spiraling decline in asset prices and holdings of collateral assets (Fisher, 1933). Generally sudden stops occur in which country small tradable sector and large foreign exchange liabilities (Claessens et al., 2013). Main papers on this topic are (Calvo et al., 2004 and 2008; Milesi-Ferretti, 2011 and Rose and Spiegel, 2011).

Theories on foreign debt crises and default are closely linked to those explaining sovereign lending. A sovereign debt restructuring can be defined as an exchange of outstanding sovereign debt instruments, such as loans or bonds, for new debt instruments or cash through a legal process. Sovereign debt, here, refers to debt issued or guaranteed by the government of a sovereign state.

One can generally distinguish two main elements in a debt restructuring (Das et al., 2012):

1. Debt rescheduling, which can be defined as a lengthening of maturities of the old debt, possibly involving lower interest rates. Debt reschedulings imply debt relief, as they shift contractual payments into the future;
2. Debt reduction, which can be defined as a reduction in the face (nominal) value of the old instruments

Default events and debt restructurings are closely related but not identical. A default is the failure of a government to make a principal or interest payment on

due time. Models developed rely, as a gross simplification, on either intertemporal or intratemporal sanctions. Intertemporal sanctions arise because of a threat of cutoff from future lending if a country defaults (Eaton and Gersovitz, 1981). These models imply that inability or unwillingness to pay, while default, can result from different factors. Such models are unable, however, to fully account why sovereigns default and why creditors lend as much as they do. Many models actually predict that default does not happen in equilibrium as creditors and debtors avoid the dead-weight costs of default and renegotiate debt payments (Claessens and Kose,2013). countries do not always default when times are bad, as most models predict: Tomz and Wright (2007) report that in only 62 percent of defaults cases output was below trend.

Since 1998, with the debt crises in Pakistan, Russia and Ukraine, there have been 17 distressed sovereign bond exchanges with foreign bondholders in 13 countries. In addition, there have been six bond restructurings mainly aimed at domestic creditors (Ukraine (1998), Russia (1998), Argentina (2001), Uruguay (2003), Dominican Republic (2005), and Jamaica (2010)). This does not mean, however, that bank debt restructurings are a phenomenon of the past. Recent loan restructurings include a number of debt buybacks in low-income countries, but also bank debt restructurings such as in Pakistan (1999), Serbia and Montenegro (2004), the Dominican Republic (2005), and Iraq (2006) (Das et al.,2012).

Although domestic debt crises episodes have been prevalent throughout history, these events had received only limited attention in the literature until recently. Economic theory assigns a trivial role to domestic debt crises since models often assume that governments always honor their domestic debt obligations —the typical assumption is of the “risk-free” government assets. However, recent reviews of history (Reinhart and Rogoff, 2009) shows that few countries were able to escape default on domestic debt, with often adverse economic consequences. Debt defaults in the form of inflation are often followed by currency crashes. In the past, countries would often “debase” their currency by reducing the metal content of coins or switching to another metal. This reduced the real value of government debt and thus provided fiscal relief (Claessens and Rose,2013).

Banking crisis are quite common, but maybe the least understood type. Banks are inherently fragile, making them subject to runs by depositors and giving rise to possible problem of coordination. Moreover, problems of individual banks can quickly spread to the whole banking system. Banks heavily depend on the information, legal and judicial environments to make investment choices and collect on their loans. With institutional weaknesses, risks increase. Coordination problems arise when investors and/or institutions take actions merely out of fear that others also take similar actions. The typical example of coordination problem is the bank

run (the primal reference is Diamond and Dybvig, 1983).

## 2.2 Similarities across the crises

Although the relative importance of the sources of the current crisis will be debated for some time, the run-up to the current episode shares at least four major features with earlier episodes: rapid increases in asset prices; credit booms; a dramatic expansion in marginal loans; and regulation and supervision that failed to keep up with developments (Claessens et al.,2013). Combined, these factors sharply increased the risk of a financial crisis.

**Asset Price boom and busts.** While the specific sector experiencing a boom can vary across crises, asset price booms are common. Sharp increases in asset prices, sometimes called bubbles, and often followed by crashes have been around for centuries. Asset prices sometimes seem to deviate from what fundamentals would suggest and exhibit patterns different than predictions of standard models with perfect financial markets. A bubble, an extreme form of such deviation, can be defined as “the part of a grossly upward asset price movement that is unexplainable based on fundamentals” (Garber, 2000).Such historical cases include the Dutch Tulip Mania from 1634 to 1637, the French Mississippi Bubble in 1719-20, and the South Sea Bubble in the United Kingdom in 1720 (Garber, 2000).During the great financial crisis was house prices that sharply increased prior to the crisis, including in the U.S., the U.K., Iceland, Ireland, Spain and other markets that subsequently ran into problems.

Formal models attempting to explain asset price bubbles have been developed for some time. Some of these models consider how individual rational behavior can lead to collective mispricing, which in turn can result in bubbles. Others rely on microeconomic distortions that can lead to mispricing. Some others assume “irrationality” on the part of investors. Although there are parallels, explaining asset price busts (such as fire-sales) often requires accounting for different factors than explaining bubbles (Claessens and Kose,2013). In the first group of model, for example, Blanchard and Watson (1982), under rational expectations, the asset price does not need to equal its fundamental value, leading to “rational” bubbles.

**Credit boom and busts.** Later, in Section 4, I will focus on this topic; now I only give a little introduction. A rapid increase in credit is another common thread running through the narratives of events prior to financial crises. While historically not all credit booms end up in a crisis, the probability of a crisis increases with a boom, especially the larger its size and the longer its duration. The mechanisms linking credit booms to crises include increases in the leverage of borrowers and lenders, and a decline in lending standards. In the recent episode, both channels

were at work. Increased leverage, in part due to inadequate oversight, left households vulnerable to a decline in house prices, a tightening in credit conditions and a slowdown in economic activity (Claessens et al.2013). Both distant past and more recent crises episodes typically witnessed a period of significant growth in credit (and external financing), followed by busts in credit markets along with sharp corrections in asset prices. The patterns before the East Asian financial crisis in the late-1990s resembled those of the earlier ones in Nordic countries as banking systems collapsed following periods of rapid credit growth related to investment in real estate. Credit booms can be triggered by a wide range of factors, including shocks and structural changes in markets. Sharp increases in international financial flows can amplify credit booms. Most national financial markets are affected by global conditions, even more so today, making asset bubbles easily spill across borders. Many authors uses model to find correlations between credit booms and financial crisis, in particular banking and currency crisis.

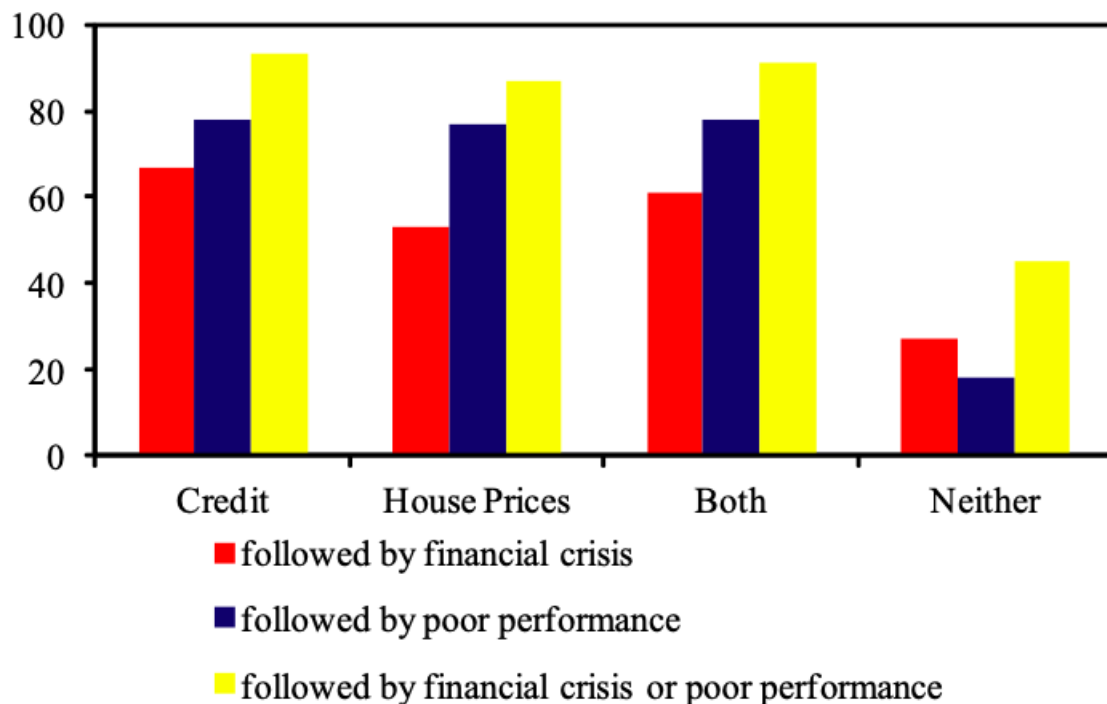


Figure 2: Coincidence of booms and financial crises (in percentage)  
 Taken by Claessens and Rose(2013)

**Marginal Loans and Systemic Risk.** Credit booms or rapid growths in financial markets, are often associated with a deterioration in lending standards. In 2008, in the USA a large portion of the mortgage expansion consisted of loans ex-

tended to borrowers with limited credit (FICO score under 500) and employment histories, and often on terms poorly suited to the borrowers' conditions. Debt servicing and repayment were, hence, vulnerable to economic downturns and changes in credit and monetary conditions. This maximized default correlations across loans, confirmed ex-post through high non-performing loans (Claessens et al. 2013). Such exposures had been common before, for example in the corporate and financial sectors before the Asian crisis of the late 1990s.

**Poorly designed liberalization.** Poorly developed or regulated domestic financial systems have often ended up unable to intermediate large capital inflows effectively in the wake of capital account liberalizations. Deficiencies in oversight often led to currency and maturity mismatches and to large and concentrated credit risks (Claessens et al., 2013). In past, shadow banking, the market of derivatives grew so much that create the potential to become a systemic risk.

### 3 Banking crisis

Laeven and Valencia (2013) defined a banking crisis as an event that meets two conditions:

1. Significant signs of financial distress in the banking system (as indicated by significant bank runs, losses in the banking system, and/or bank liquidations).
2. Significant banking policy intervention measures in response to significant losses in the banking system.

Laeven and Valencia(2017) consider the first year that both criteria are met to be the year when the crisis became systemic to ensure that date the crisis at the first signs of major problems in the banking system. When the losses in the banking sector and liquidations are severe, they treat the first criterion as a sufficient condition to date a systemic banking crisis. Losses are severe when: a country's banking system exhibits significant losses resulting in a share of nonperforming loans above 20 percent of total loans or bank closures of at least 20 percent of banking system assets or fiscal restructuring costs of the banking sector are sufficiently high, exceeding 5 percent of GDP. Laeven and Valencia (2017) consider policy interventions in the banking sector to be significant if at least three out of the following six measures have been used:

1. deposit freezes and/or bank holidays;
2. significant bank nationalizations;
3. bank restructuring fiscal costs (at least 3 percent of GDP);
4. extensive liquidity support (at least 5 percent of deposits and liabilities to nonresidents);
5. significant guarantees put in place; and
6. significant asset purchases (at least 5 percent of GDP);

The above categories cover all policy interventions that have been employed to resolve a banking crisis (Honohan and Laeven, 2005, and Laeven and Valencia, 2008). Since not all policies are used in all crises, we require that at least three measures have been put in place. It is worth noting that setting thresholds sufficiently high helps us avoid labeling a non-systemic event or the preemptive use of some of these policies as a systemic banking crisis.

The policy variables that Laeven and Valencia (2017) used in crisis definition are more specifically defined as follows:

1. Deposit freeze and bank holidays: indicates whether the government introduced restrictions on deposit withdrawals or a bank holiday. If implemented, we also collect information on the duration of the deposit freeze and bank holiday, and the affected instruments.
2. Significant nationalizations: takeovers by the government of systemically important financial institutions, including cases where the government takes a majority stake in the capital of such financial institutions.
3. Significant bank guarantees: a significant government guarantee on bank liabilities, indicating that either a full protection of liabilities has been issued by the government or that government guarantees have been extended to non-deposit liabilities of banks. Actions that only raise the level of deposit insurance coverage are not included.
4. Liquidity support: It is measured as central bank claims on other depository institutions (from IFS) and liquidity support directly provided by the Treasury. We normalize this variable by the total deposits and bank liabilities to non-residents. We consider liquidity support to be extensive when this ratio exceeds 5 percent and more than doubles relative to its pre-crisis level.
5. Bank restructuring costs: defined as gross fiscal outlays directed to the restructuring of the financial sector, with the most important component being recapitalization costs. We consider restructuring costs to be significant if they exceed 3 percent of GDP, excluding liquidity assistance provided directly from the treasury. We focus on gross fiscal costs instead of net because it takes time to record recoveries. However, wherever data on recoveries were available we report also net fiscal costs.
6. Asset purchases: This variable refers to purchases of assets from financial institutions implemented by the central bank, the treasury, or a government entity (such as an asset management company). We define significant asset purchases as those exceeding 5 percent of GDP.

Laeven and Valencia choose this approach to date banking crises is to reduce the use of subjective criteria in identifying these events, which gives an advantage over existing databases in addition it focuses only on systemic events, where subjectivity in the identification of crises is further reduced. And finally, it is a relatively simple definition that allows a consistent implementation across time periods and countries of different income levels. More recent studies have explored alternative crisis dating strategies, such as Romer and Romer (2017), who rely on a narrative approach to identify episodes of financial distress in 24 OECD countries; Baron and others (2018), who identify crises in 46 countries by looking



at large declines in banks' stock prices; and Chaudron and de Haan (2014), who study four crises for which the timing strongly differs across databases. Chaudron and de Haan (2014) conclude that using information on the number and size of bank failures allows determining the timing of banking crises more precisely. Their dating for these four episodes corresponds closely with ours. More generally, all these studies note important similarities with our crisis dating to the extent that the samples overlap. However, our approach allows a more comprehensive coverage of countries.

### **3.1 Banking crises causes**

Banks are inherently fragile, making them subject to runs by depositors. Moreover, problems of individual banks can quickly spread to the whole banking system. While public safety nets – including deposit insurance – can limit this risk, public support comes with distortions that can actually increase the likelihood of a crisis. Institutional weaknesses can also elevate the risk of a crisis. For example, banks heavily depend on the information, legal and judicial environments to make prudent investment decisions and collect on their loans (Claessens and Kose, 2013). With institutional weaknesses, risks can be higher. While banking crises have occurred over centuries and exhibited some common patterns, their timing remains empirically hard to pin down.

Financial institutions are inherently fragile entities, giving rise to many possible coordination problems. Because of their roles in maturity transformation and liquidity creation, financial institutions operate with highly leveraged balance sheets. Hence, banking, and other similar forms of financial intermediation, can be precarious undertakings. Fragility makes coordination, or lack thereof, a major challenge in financial markets. Coordination problems arise when investors and/or institutions take actions – like withdrawing liquidity or capital – merely out of fear that others also take similar actions. Given this fragility, a crisis can easily take place, where large amounts of liquidity or capital are withdrawn because of a self-fulfilling belief – it happens because investors fear it will happen (Laeven and Valencia, 2017). Small shocks, whether real or financial, can translate into turmoil in markets and even a financial crisis. A simple example of a coordination problem is a bank run. It is a truism that banks borrow short and lend long. This maturity transformation reflects preferences of consumers and borrowers. A run occurs when a large number of customers withdraw their deposits because they believe the bank is, or might become, insolvent. As a bank run proceeds, it generates its own momentum, leading to a self-fulfilling prophecy (or perverse feedback loop): as more people withdraw their deposits, the likelihood of default increases, and this encourages further withdrawals. This can destabilize the bank to the point where it faces bankruptcy as it cannot liquidate assets fast enough to cover its

short-term liabilities.

Furthermore, micro-prudential regulation, with supervision to enforce rules, is designed to reduce risky behavior of individual financial institutions and can help engineer stability. Deposit insurance can eliminate concerns of small depositors and can help reduce coordination problems. Lender of last resort facilities (i.e., central banks) can provide short-run liquidity to banks during periods of elevated financial stress. Policy interventions by public sector, such as public guarantees, capital support and purchases of non-performing assets, can mitigate systemic risk when financial turmoil hits (Laeven and Valencia, 2013). Although regulation and safety net measures can help, when poorly designed or implemented they can increase the likelihood of a banking crisis. Regulations aim to reduce fragilities (for example, limits on balance sheet mismatches stemming from interest rate, exchange rate, maturity mismatches, or certain activities of financial institutions). Regulation (and supervision), however, often finds itself playing catch up with innovation. And it can be poorly designed or implemented.

Although funding and liquidity problems can be triggers or proximate causes, a broader perspective shows that banking crises often relate to problems in asset markets. Banking crises may appear to originate from the liability side, but they typically reflect solvency issues. Banks often run into problems when many of their loans go sour or when securities quickly lose their value. Problems in asset markets, such as those related to the subprime and other mortgage loans, also played a major role part during the great financial crisis of 2008.

Although the exact causal sources are often not easy to understand and discover, and risks can be difficult to forecast before, looking back banking crises and other financial panics are rarely random events. Panics can also be policy induced. Panics can take place when some banks experience difficulties and governments intervene in an ad-hoc manner, two examples are Thailand in 1997 and Argentina in 2001.

## 3.2 Banking crises episodes

Laeven and Valencia (2017) definition identifies 151 banking crises since 1970, of which 4 episodes started since 2011: Cyprus (2011), Guinea Bissau (2014), Moldova (2014), and Ukraine (2014). The complete dataset is included in the accompanying data file with the main variables reported in the appendix. The banking crises dates—years for all cases, and year and month whenever feasible—include borderline systemic crises, defined as cases where our definition is close to being met. Most countries have experienced at least one systemic banking crisis during 1970–2017, with many going through multiple episodes (Figure 3). However, only three countries experienced more than two systemic banking crises during the past 48 years: Argentina (4), the Democratic Republic of Congo (3),

and Ukraine (3).

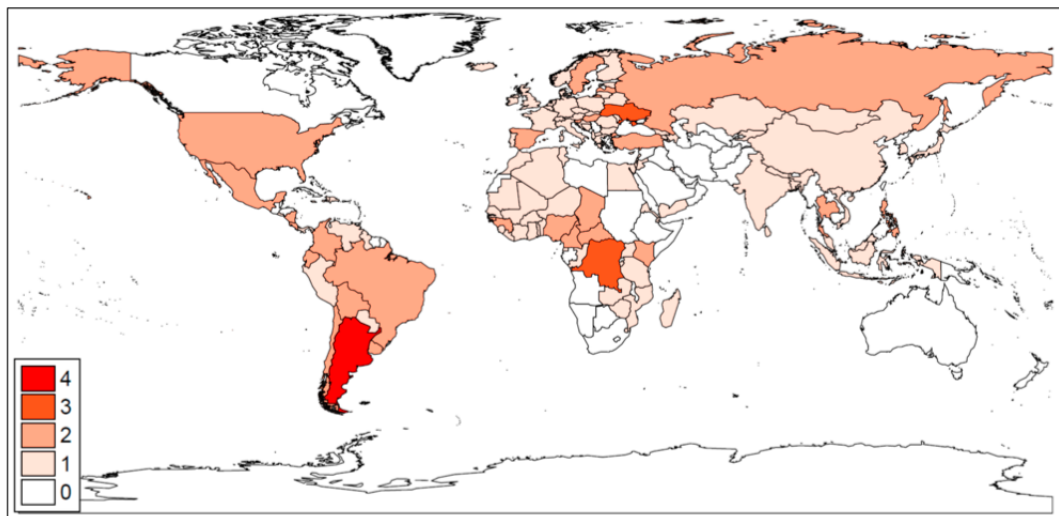


Figure 3: Frequency of banking crisis  
Taken by Laeven and Valencia (2017)

Following the World Bank’s historical income classification, they classify episodes according to the income level of the affected country at the start of the crisis. Systemic banking crises are not single-country events, starting with the episodes in Latin America in the early 1980s, the crises in the aftermath of the breakup of the Soviet Union, the Tequila Crisis, the Asian crisis, and more recently the global financial crisis. The period around the mid-2000s was unusual in terms of the low incidence of crises, which was disrupted by the global financial crisis. Since then, globally we are facing again a period of relative calm. Late eighties and nineties included some episodes in high-income countries, reflecting the savings and loans crisis in the United States, the crises in the Nordic countries in the early 1990s, and the one in Japan in the late 1990s. However, prior to the 2008 global financial crises, banking crises had predominantly located towards low and middle- income country phenomenon.

As noted by Reinhart and Rogoff (2009), the global financial crisis made it clear that “financial crises are an equal opportunity menace” for high-and low and middle-income countries.

### 3.3 Crisis response

The authority of a country have usually responded by using three type of instrument. First central bank response to bank distress typically includes the deployment of liquidity support to the banking sector, particularly in response to bank

Type of crisis	Number of events
Banking	107
Currency	177
Sovereign debt	42
Twin crisis	53
Triple crisis	11

Table 1: Financial crisis from 1970  
Data taken from Laeven and Valencia database (2017)

runs. The provision of extensive liquidity support during systemic banking crises is pervasive in our sample. During the early stages of banking crises, and often in combination with liquidity support, governments have introduced state guarantees on interbank deposits aimed at preventing a collapse of the interbank market, to help stem bank runs and alleviate liquidity pressures on these entities. They typically buy policymakers time to develop more comprehensive resolution and restructuring plans. Laeven and Valencia (2012) examine the experience of 42 crisis episodes, of which 14 made use of explicit guarantees on bank liabilities and find that these guarantees do help to reduce liquidity pressures on banks. Altogether, they report in their database 34 crisis episodes where blanket guarantees were announced, of which 19 cases corresponded to high-income countries, mostly during the 2008 global financial crisis. Guarantees are often left in place for many years and are only gradually removed. At end-2016, European Union governments collectively still had 120 billion euros in outstanding guarantees issued in support of the financial system, according to the European Commission’s 2017 State Aid Scoreboard. While this amount represents a sharp decline from its peak of 835 billion euros in 2009, it remains non-trivial.

In cases where liquidity pressures have been significant, countries have in some cases resorted to administrative measures, suspending the convertibility of deposits into cash and restricting foreign payments. These “deposit freezes” have often been preceded by bank holidays—the temporary closure of banks—often by design as banks need some time to adapt their IT systems and procedures to the new regime. However, bank holidays and deposit freezes have been rarely used.

In 70 percent of episodes for which Laeven and Valencia (2012) collected data, a deposit insurance scheme was already in place when the crisis erupted. Moreover, the data show that emerging economies are more likely to adopt deposit insurance around the time of a crisis. Only in 40 percent of cases, losses are imposed on bank creditors, suggesting that implicit guarantees are important (Laeven and Valencia, 2012).

### 3.4 Banking crisis remedies and output

The solutions in the short-term will invariably involve a return of Keynesian economics. First and foremost governments will have to sustain aggregate demand by increased spending in the face of dwindling tax revenues. Large budget deficits will be inevitable and also desirable. Attempts at balancing government budgets would not work, as it would likely lead to Keynes' savings paradox. As private agents attempt to increase savings (because they reduce their consumption plans) the decline in production and national income actually prevents them from doing so. This paradox can only be solved by government dissaving.

Second, in the process of recapitalising banks, governments will substitute private debt for government debt.

Bank recapitalization is a tool that has been used in most crises that Laeven and Valencia (2017) report in their database in particular in high-income countries, and it is also the most important component of direct fiscal costs from government intervention in the financial sector. Government capital injections, encompassing often a combination of preferred and common equity, have also been accompanied by conditions or restrictions, for instance requiring board seats for government representatives, and limiting or prohibiting dividend payments (Laeven and Valencia, 2008). These recapitalizations can often lead governments to own a majority share of a bank's capital, in which cases we classify the intervention as a nationalization, together with outright nationalization cases.

Third, governments and central banks will also have to support asset prices, in particular stock prices. The deleveraging process of the banking system will continue to put downward pressure on asset prices. In order to stop this, governments and central banks may be forced to intervene directly in stock markets and to buy shares. (De Grauwe, 2008).

Laeven and Valencia (2017) database is conform to these solution only for the high-income countries since short-term interest rates declined to a median level very close to zero in the year after the start of the crisis, from a median of about 5 percent and also the median primary balance tends to deteriorate sharply in high-income countries; while in the low and middle-income the median short-term interest rate increases in low and middle-income countries this is due to concerns about currency depreciation and the impact on private balance sheets exposed to an exchange risk at the time of financial distress force these countries to raise interest rate.

Although the trend of primary balance moves in opposite direction both groups increase in public debt, the median of the three years after the banking crisis reaches 21.1 percent of GDP and 16.4 percent of GDP in low and middle-income countries.

Cerra and Saxena (2008), employing panel data from 192 countries, find strong

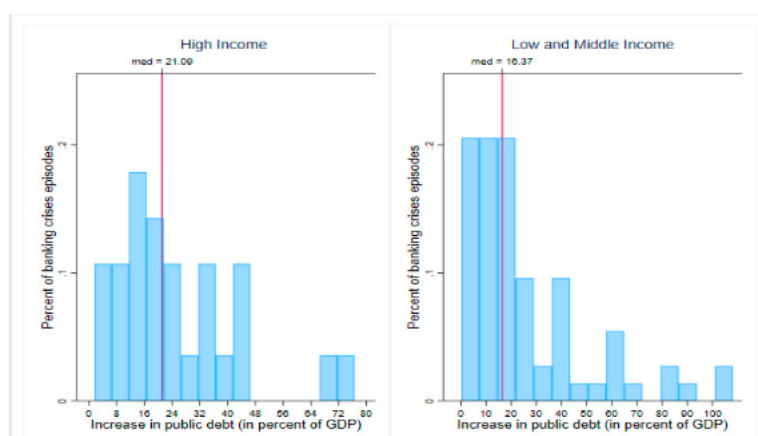


Figure 4: Debt over GDP increment in banking crisis period  
Taken by Laeven and Valencia (2017)

evidence of a large reduction in economic output. Similar evidence is provided by Cecchetti et al. (2009); looking at 40 crises since 1980, their results show sharp and persistent contractions in output. Hoggarth et al. (2002) suggest that output loss is about 15-20% of annual GDP, on average. Reinhart and Rogoff document that unemployment rises, on average, for five years with an average rate of seven percentage points. Real GDP per capita falls by an average of about nine per cent, and the duration of the economic downturn is two years. Housing and equity markets are severely hit; the decline is about 35% and 56%, respectively. Laeven and Valencia (2017) report output losses associated with banking crises episodes, computed as deviations of actual GDP from its trend. Output losses in high-income countries tend to be much larger than those in low and middle-income countries this gap could be explained by the presence of larger and deeper financial systems in high-income countries, whose disruption has stronger effects on the real economy.

## 4 Currency crisis

A currency crisis can be broadly defined as any situation in the foreign exchange markets where a currency suddenly and/or unexpectedly loses substantial value relative to other currencies. For an economy with a fixed exchange rate regime, a currency crisis usually refers to a situation in which the economy is under pressure to give up the prevailing exchange rate peg or regime. In a successful attack the currency depreciates, while an unsuccessful attack may leave the exchange rate unchanged, but at the cost of spent foreign exchange reserves or a higher domestic interest rate. A speculative attack often leads to a sharp exchange rate depreciation despite a strong policy response to defend the currency value.

The question here is how big a change in the exchange rate is qualified as a currency crisis (Frankel and Rose, 1996; Glick and Moreno, 1999). A lot of paper determine an arbitrary threshold; if the indicator value exceeds this specified threshold, any month, quarter or year is classified as a crisis episode.

For Frankel and Rose (1996), an annual depreciation of at least 25% is considered as currency crisis. For the countries with high inflation rates and correspondingly high rates of depreciation, the authors put another criterion to not consider each of these depreciations as an independent crisis episode: the change in the exchange rate should also exceed the previous year's change in the exchange rate by a margin of at least 10%.

For Moreno and Glick (1999) episodes of sharp currency depreciation for each country are defined as those in which the percentage change in the exchange rate exceeds the mean plus two standard deviation, computed over the full sample period.

Others define a currency crisis those cases where caused by potential early warning indicators or under speculative pressure. In this second definition are included both the situation where there is an effective speculative depreciation and where the authority defend the currency by selling the reserves or rising interest rate. This speculative situation can be predicted by some indicators in particular: the behavior of international reserves, the real exchange rate, domestic credit, credit to public sector and domestic inflation (Kaminsky et al. 1998). This second definition is also referred to as Fiscal Pressure Index (FPI) in literature.

Both approaches have strengths, but also weaknesses. The devaluation approach may be criticized for its limited crisis definition given that every speculative attack leads to some economic cost even if the attack is successfully defended by the government. Thus, this methodology mostly captures currency crashes, but not necessarily currency crises as pointed out by Frankel and Rose (1996).

However, this approach might be justified, because speculative attacks lead in general to depreciation of the currency, particularly in emerging market economies. Hence, including foreign reserves and interest rates may not have any effect on

the crisis indicator. Including foreign reserves and interest rates may lead to a misleading interpretation of crisis. Frankel and Rose (1996) consider that reserve movements are notoriously noisy measures of exchange market intervention for almost all countries (in particular in Thailand 1997). Glick and Moreno (1999) explain this issue by the fact that government interventions in currency markets may be used for debt payments, not only to defend the currency.

On the other hand, the inclusion of interest rates into the crisis index is criticized for two reasons. First, some authors like Kaminsky and Reinhart (1999) argue that the data on market-determined interest rates in developing countries is incomplete and inadequate.

Selling reserves and rising interest rates are the more frequent practical tools used by monetary authorities to face speculative attacks. This defence policy tries to stabilize the exchange rate. Therefore, it is justified to consider currency crises as high pressures on the currency. The inclusion of reserves and interest rates as a measure of crisis incidence allows one to observe an increase in market pressure that may not be captured through changes in exchange rate (Ari and Cergibozan 2016). This is particularly meaningful for countries that adopted fixed exchange rate regime, where capital outflows and crisis are manifest through larger drops in reserves and/or increasing interest rates rather than exchange rate weaknesses (Frankel and Saravelos, 2010).

## 4.1 Currency crisis models

Starting from those definitions there are three generations of models that typically are used to explain a currency crisis and Claessens and Kose (2013) describe comprehensively:

1. The first generation of models are so called the "KFG" and derive from the model of Krugman (1979). They show that a sudden speculative attack on a fixed or pegged currency can result from rational behavior by investors who correctly foresee that a government has been running excessive deficits financed with central bank credit. Investors continue to hold the currency as long as they expect the exchange rate regime remain intact, but they start dumping it when they anticipate that the peg is about to end. This run leads the central bank to quickly lose its liquid assets or hard foreign currency supporting the exchange rate. The currency then collapses.
2. The second generation of models stresses the importance of multiple equilibria. These models show that doubts about whether a government is willing to maintain its exchange rate peg could lead to multiple equilibria and currency crises (Obstfeld and Rogoff, 1986) and a speculative currency attack can take



place and succeed even though current policy is not inconsistent with the exchange rate commitment. This is because the policies implemented to defend a particular exchange rate level, such as raising domestic interest rates, may also raise the costs of defense by dampening economic activity and/or raising bank funding costs. The private sector understands the dilemma facing the government, and may question the commitment to fixed exchange rate when other macroeconomic objectives are compromised. The second generation models are in part motivated by episodes like the European Exchange Rate Mechanism crisis, where countries like the UK came under pressure in 1992 and ended up devaluing, even though other outcomes (that were consistent with macroeconomic fundamentals) were possible too.

3. The third generation of crisis models explores how rapid deteriorations of balance sheets associated with fluctuations in asset prices, including exchange rates, can lead to currency crises. Some models stress how distortions may emerge in the form of credit constraints. Aghion, Bacchetta, and Banerjee (2001), for example, highlight that an initial depreciation of a currency raises the cost of foreign-currency debt obligations of firms and lowers profits, which in turn may limit borrowing capacity when credit is constrained. The subsequent fall in investment and output associated with these borrowing limitations may lower the demand for domestic currency and trigger a currency crisis.

There are other third-generation models highlight how financial liberalization and government guarantees of private sector liabilities can generate moral hazard and unsustainable fiscal deficits that can lead to crises (McKinnon and Pill, 1995; Chang and Velasco, 2002; Dooley, 2000). These models are largely motivated by the Asian crises of the late 1990s.

## 4.2 Currency crises episodes

Currency crises are often associated with other types of financial crises, such as banking crises. The occurrence of so-called twin crises may be attributable to a number of channels of causation: a bank crisis leading to a currency crisis, a currency crisis leading to a bank crisis, or joint causality.

A bank run can cause a currency attack if the increased liquidity associated with a government bailout of the troubled banks erodes their ability to maintain the prevailing exchange rate commitment (Velasco, 1987; Calvo, 1997). Or, as discussed above, a weak banking sector may precipitate a currency crisis if speculators anticipate that policymakers would prefer to give up exchange rate stability in order to avoid bankruptcies and further strains on the banking sector rather

than endure the costs of defending the domestic currency (Obstfeld, 1994). A possible reverse chain of causality, from currency crises to the onset of banking crises, is also well recognized. If banks hold significant holdings of unhedged foreign liabilities, a currency crisis shock can adversely alter the banking sector directly by causing a deterioration of bank balance sheets as currency depreciation raises the domestic currency burden of these liabilities.

The joint occurrence of currency and banking may also reflect a response to common factors. Banks and firms are exposed to liquidity shocks if they finance long-term lending and investment with short-term borrowing (Chang and Velasco, 2001). Consequently, an international liquidity crunch may trigger twin crises. The global financial crisis of 2007-08 had similar effects on currency values and banking sector health in many countries. Although started by losses associated with subprime mortgage derivative products (e.g. asset-back securities and credit default swaps) in the U.S. and Western Europe, it quickly led to a world-wide deleveraging process where institutions moved to limit their foreign currency exposure. A flight to the U.S. dollar—the global reserve and payments currency—ensued, forcing very large currency devaluations in many advanced and developing countries.

Currency crises may be associated with other types of financial crises, such as sudden stops of foreign capital inflows, sharp rises in capital outflows, and sovereign debt defaults. Calvo, Izquierdo, and Talvi (2002), for example, provide a sudden-stop interpretation for the 2001-02 financial crisis in Argentina in which international investors lost faith in the country's ability to finance its growing fiscal indebtedness while also maintaining a currency peg to the dollar at a time that the economy was in the midst of a three year- recession. The resulting capital flow reversal prompted a bank run, which in turn forced the end of its currency peg and a sharp currency depreciation. The depreciation significantly worsened the government's already weak fiscal position and led Argentina to default on its public debt.

**Figure 5** shows the incidence of currency crises in period, 1975-2007 using data from Laeven and Valencia (2017). They define a currency crisis as a nominal depreciation of the currency of at least 30 percent that is also at least a 10 percent increase in the rate of depreciation compared to the year before. For countries that meet the criteria for several continuous years, they use the first year of each 5-year window to identify the crisis. This methodology identifies 236 currency crises over the period. The figure indicates that currency crises are a common phenomenon, averaging more than five per year since 1975, with relative peaks in the early 1980s, the early 1990s and in 1998 at the time of the The 3-year period, 2005-07 appears to be a period of relative tranquility. However, the global financial crisis in 2008-09 caused widespread financial market turmoil. Twenty-three countries experienced exchange rate depreciations of 25 percent or more during the 9-month

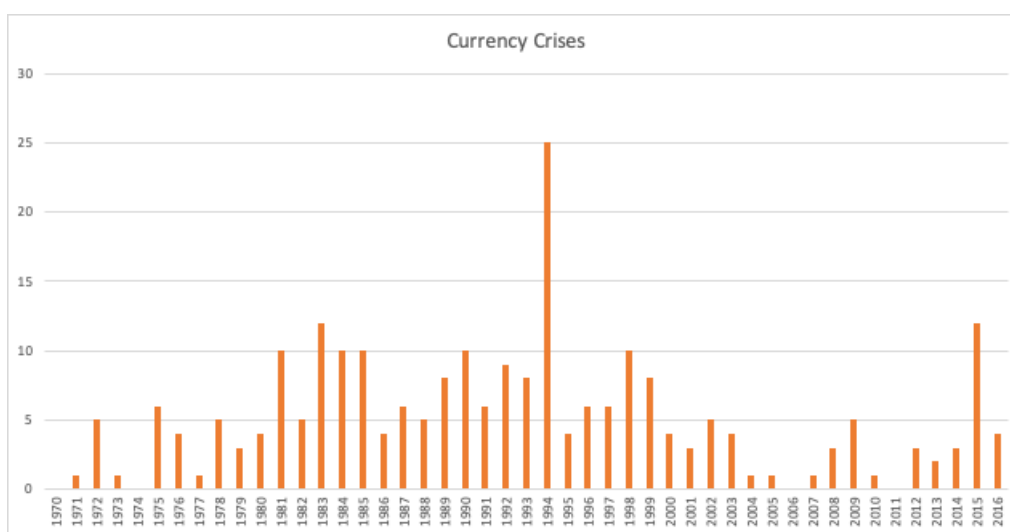


Figure 5: Currency crises episodes from 1979  
Database Laeven and Valencia (2017)

period between August 2008 and February 2009, many of which would satisfy the formal definition of currency crisis used above. Their incidence increased in 2015 due to the large currency depreciations in many commodity-exporter countries triggered by a decline in commodity prices (Kohlscheen et al., 2016).

To better identify a crisis sequencing pattern, Laeven and Valencia show in [Figure 6](#) the incidence of currency and sovereign debt crises along a time scale (in years) in countries that experienced a banking crisis in year  $T$ . A clearer pattern now emerges. Currency and sovereign debt crises, on average, tend to coincide or follow banking crises, with currency crises peaking at one year after the beginning of the banking crisis; it is common for banking crises to happen at the same time or precede currency and sovereign debt crises. The 1990s was the peak period of twin crises, abstracting from the 2008-09 global financial crisis for which complete data on banking crises are not yet available.

[Figure 7](#) compares the association of currency crises and the cessation of net capital inflows, using results from a study by Hutchison and Noy (2006) of sudden stops in 24 emerging market economies over the period 1975-2002. It shows that currency crises coincide with sudden stops roughly half of the time. Of the 60 currency crises identified in emerging markets during this period, 34 coincided with a sudden stop and 26 did not. On the other hand, there are many more instances of sudden stops that do not coincide with currency crises. Of the 119 sudden stops, 85 did not coincide with a currency crisis (Hutchinson and Noy, 2011)<sup>1</sup>.

<sup>1</sup>In [Figure 7](#) numbers in parentheses express these numbers as a percent of available country-year observations

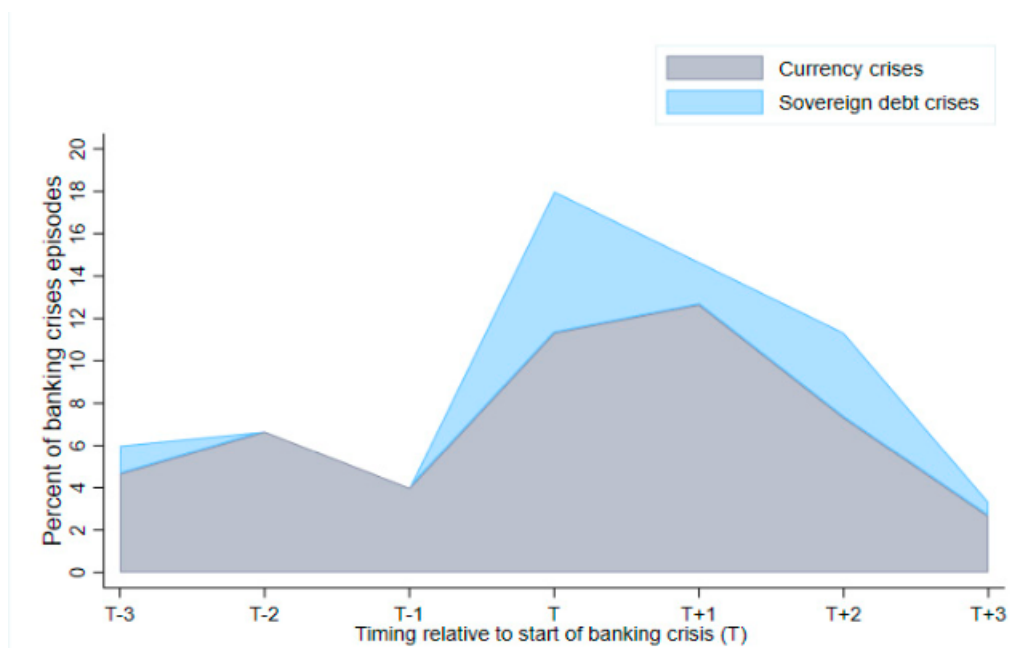


Figure 6: Crises sequence  
Taken from Laeven and Valencia (2017)

	Currency Crisis	No Crisis
<b>A. Normal Crises and Sudden Stops</b>		
Sudden Stop	34 (6%)	85 (16%)
No Sudden Stop	26 (5%)	389 (73%)
<b>B. Major Crises and Major Sudden Stops</b>		
	Currency Crisis	No Crisis
Major Sudden Stop	26 (5%)	49 (9%)
No Major Sudden Stop	23 (4%)	436 (82%)

Figure 7: Correlation currency crises and sudden stop  
Taken from Hutchinson and Noy (2011)

### 4.3 Currency crises outcome on economic activity

There are several ways in which a currency crisis may affect economic activity. On the one hand, a depreciation of the domestic currency that occurs in a successful

currency attack, may expand the tradable goods sector and spur growth by correcting an overvalued currency or by making the exchange rate more competitive. On the other hand, a depreciation may be contractionary by increasing the repayment costs of external debts denominated in foreign currencies, particularly in dollars. In addition, sudden stops or the reversal of capital inflows during a crisis can slow down growth by lowering investment activity, while a rise in the external debt burden from devaluation in the presence of liability valued in dollars can lower investment activity and growth. The mainstream, until currency crises episodes during the 1990s view was that any negative effects from a currency depreciation were ultimately offset by the positive effect of stimulus to net exports, leading to an the overall expansionary effect of a depreciation on output. However, recent literature emphasizes the contractionary effects of depreciations, particularly in developing countries.

Gupta, Mishra, and Sahay (2003), find that more than three-fifths of the crises in the sample were contractionary, and that output contraction was more likely greater in large and more developing economies than in small and less developing economies, and crises in countries preceded by large capital inflows were more likely to be associated with contraction during crises. Hutchison and Noy (2005, 2006) investigate the output effects of currency and banking crises in emerging markets during 1975-97 and find that currency crises are very costly, reducing output by about 5 to–8 percent over a 2 to4 year period. They also show that currency crises accompanied by sudden stops have especially severe economic consequences, as the abrupt reversal in foreign credit inflows in conjunction with a realignment of the exchange rate typically cause a sharp drop in domestic investment, domestic production, and employment.

## 5 Credit booms

There is now a rich body of evidence showing that credit growth predicts crises where credit growth is typically defined as the previous three years or five years of cumulative growth. There is no consensus in the literature about the definition of a “credit boom.” A credit boom is defined in general as an episode in which credit to the private sector grows by more than during a typical business cycle expansion and often are associated to period of economic turbulence.

But, what triggers a lending booms? There are various leading theories that could be divided into four categories: real business cycle(a), financial development and liberalization(b), capital inflows(c) and wealth shocks(d).

a) A lending boom is a by-product of a large real business cycle in which the output-elasticity of the demand for credit is highly procyclical. The ultimate origin of a boom under this story is a technological or terms of trade shock (Mendoza, 1995). Investment boom that arises with lending boom is a typical outcome in this type of model. This story also explains why the incidence of banking and balance-of-payment crises after a lending boom is not larger than during tranquil times.

b) This theory holds that a lending boom is the natural outcome of a significant liberalization of an initially repressed financial system. If a country has interest rate caps, lending that is centrally allocated, and an over-regulated banking industry, then the credit-to-GDP ratio is considerably lower than in a country without any of these regulations. The lending boom following a financial liberalization might become large and troublesome if domestic real interest rate rise very significantly (Galbis,1993) and there is a higher probability of both banking and balance-of-payment crisis (Kaminski and Reinhart, 1999). Moreover, the liberalization may trigger an investment ( and consumption) boom which, in turn, causes external disequilibrium such as real exchange rate overvaluation and a large current account deficit. Larger capital inflows and debt concentration in short maturities may also follow a liberalization, especially when this involves opening the capital account.

An alternative theory (Aghion et al., 1999) argues that lending booms and subsequent macroeconomic instability may be the consequence of partial financial liberalization, in economies that exhibit some financial constraints. Financial liberalization increases capital inflows. Initially, this increases output and wealth of investors. Since personal wealth can be pledged as collateral on domestic investment projects, this increases further the demand for credit. In the models to identify credit booms, increases in wealth and output, lead to a surge in the demand for non-traded inputs into production( such as real estate). The result is real appreciation of the real exchange rate and a surge in the price of domestic assets. This eventually chokes off the initial expansion and lead to a decline in

output. As the economy contracts, demand for nontradable input falls leading to a real depreciation and a collapse in asset prices. Aghion et al. (1999) show that the resulting volatility occurs for intermediate levels of financial development as measured by the severity of the financing constraint. In their theory, incomplete financial liberalization may leave a country exposed to financial and macroeconomic instability. This theory makes a number of predictions about the chain of events leading to a crisis. Large capital inflows and current account deficit, real exchange rate appreciation and output expansion coincide with the increase in investment and lending.

c) A lending boom is the domestic counterpart of large capital inflow surge triggered by so-called external factors (Calvo, Leiderman and Reinhart, 1993). Episodes occur in waves because of common external fundamentals. International real interest rates are rather low during the lending upswing. There is a bunching of episodes because of common external fundamentals. The banking system intermediates the funds by increasing credit to the private sector which raises both consumption and investment.

d) A lending boom occurs when a large investment or consumption expansion needs financing. New discoveries of natural resources, a large exogenous change in relative prices, or relevant structural reforms may trigger this expansion. This theory predicts higher growth and macroeconomic stability.

## 5.1 Methodology to classify credit boom

There is now a rich body of evidence showing that credit growth predicts crises where credit growth is typically defined as the previous three years or five years of cumulative growth. A lot of authors are interested in the relationship between credit booms and crises. Gourinchas et al. (2001) “define a lending boom episode as a deviation of the ratio between nominal private credit and nominal GDP from a rolling, backward-looking, country-specific stochastic trend”. They require that the deviation be larger than a given threshold. Mendoza and Terrones (2008) use real credit per capita and detrend with the Hodrick-Prescott filter. Richter et al. (2017) also use a version of the Hodrick-Prescott filter that is based on Hamilton (2018). Hodrick and Prescott analyzed U.S. data over a period during which there was no financial crisis in the United States. Separating the growth component from the deviation led to the view that the growth component is driven by technological change, while deviations are due to technological “shocks”. Prescott (1986) argues that technology shocks (measured by Total Factor of Productivity) are highly procyclical and “account for more than half the fluctuations in the postwar period.” Financial crises pose challenges for macroeconomists. Schularick and Taylor (2012) show that credit booms precede crises. Mendoza and Terrones (2008) claim that not all credit booms end in crises. Herrera et al. (2014) argue that crises are not

necessarily the result of large negative shocks, but also of political considerations. There is a need for models displaying financial crises that are preceded by credit booms and that are not necessarily the result of large negative shocks.

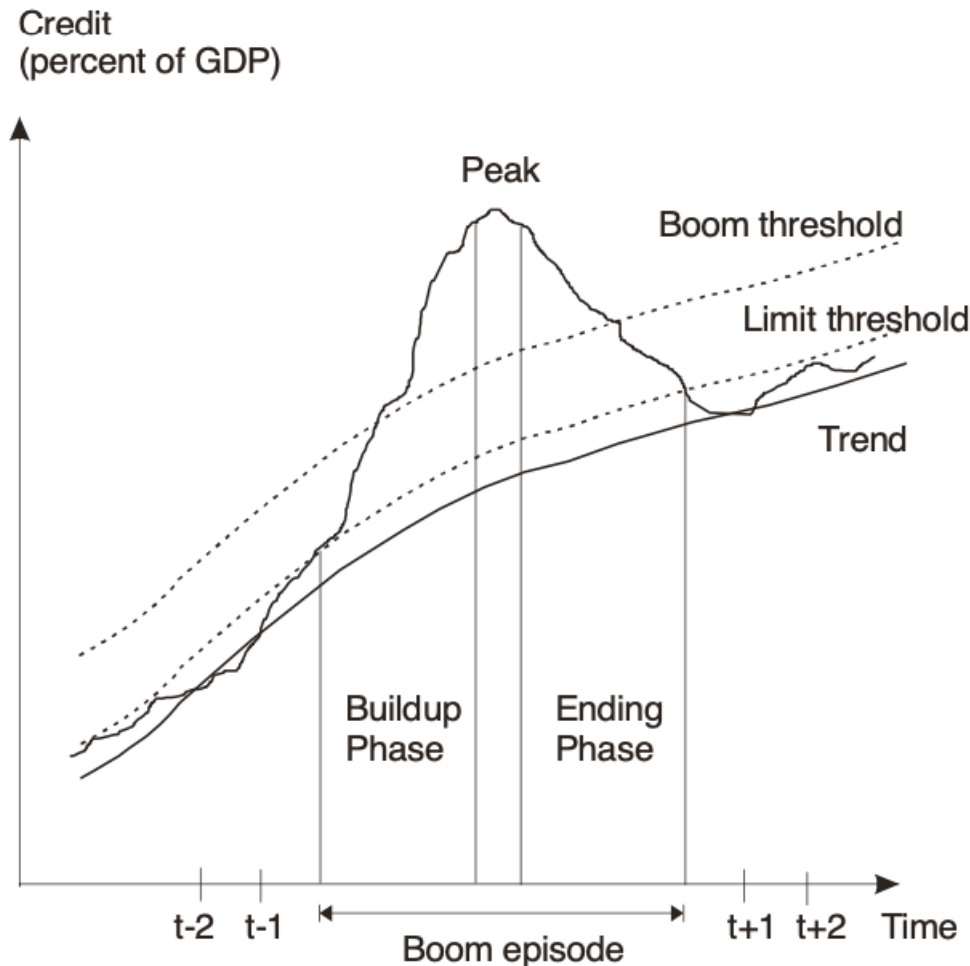


Figure 8: Credit boom definition  
 Taken from Gourinchas,Valdes and Landerretche(2001)

Gourinchas,Valdes and Landerretche(2001) as cited above they require that the trend has to be larger than a certain threshold. They thought that is the correct approach because some increases in lending may lead to permanent financial deepening while others lead to reversals. They consider two threshold definitions: relative deviation and absolute deviation. The first is based on the relative difference between predict and real credit-to-GDP ratio, implying that different countries may experience different lending boom independently on their financial deepening. The second is based on the absolute difference between predict and real



credit-to-GDP ratio, implying that more financial developed countries experience easily lending boom.

Mendoza and Terrones (2008) proposed a new methodology for measuring and identifying credit booms and showed that it was successful at identifying credit booms with a clear cyclical pattern in both macro and micro data. It is called "threshold method". They use this method which works by first splitting real credit per capita in each country into its cyclical and trend components, and then identifying a credit boom as an episode in which credit exceeds its long-run trend by more than a given "boom" threshold, defined in terms of a tail probability event. The duration of the boom is similarly set by "starting" and "ending" thresholds. The long-run trend is calculated using the Hodrick-Prescott (HP) filter with the smoothing parameter set at 100, as is typical for annual data. Country  $i$  is defined to have experienced a credit boom when we identify one or more contiguous dates for which the credit boom condition  $l_{i,t} \geq \phi\sigma(l_i)$  holds, where  $\sigma$  is the boom threshold factor. Thus, during a credit boom the deviations from trend in credit exceed the typical expansion of credit over the business cycle by a factor of  $\phi$  or more. The baseline value of  $\phi$  is set at 1.65, because the 5 percent tail of the standardized normal distribution satisfies  $\text{Prob}(l_{i,t} / \sigma(l_i) = 1.65) = 0.05$ .

Schularick and Taylor (2012) pursue an event-analysis approach to study the co-evolution of money and credit aggregates and real economic activity in the five year window following a financial crisis event, using a set of event definitions based on documentary descriptions in Reinhart and Rogoff (2009). They develop the analysis in two periods (1870-1939; 1945-2009) because these two periods reflect very different monetary and regulatory framework after WW2, namely the shift away from gold to fiat money, and the expanded role of the Lender of Last Resort. The two core definitions of their work are: total lending or bank loans which is defined as the end-of-year amount of outstanding domestic currency lending by domestic banks to domestic households and non-financial corporations and total bank assets which is defined as the year-end sum of all balance sheet assets of banks with national residency (excluding foreign currency assets).

Gorton and Ordoñez (2016 and 2020) propose a definition of a "credit boom" that is very simple with regard to trends. They detrend implicitly using the ratio of credit to the private sector divided by GDP. This means that credit has to grow faster than GDP to possibly be part of a credit boom. They define a credit boom as starting whenever a country experiences three consecutive years of positive credit growth (as a fraction of GDP) that average more than  $x^s$ . The boom ends whenever a country experiences at least two years of credit growth (also as a fraction of GDP) not higher than  $x$ . In our baseline experiments we choose  $x^e = 5\%$  and  $x^e = 0\%$ . They choose these thresholds based on the average credit growth in the sample.

Richter, Schularick and Wachtel (2018) their criteria for credit booms is based on detrended real private credit per capita, where the credit data come from Schularick and Taylor (2012). To detrend the data they follow Hamilton (2018) who shows that the use of a HP filter introduces spurious dynamic relations into the data that have no basis in the underlying data generating process. The procedure is based on the assumption that the trend component of credit at time  $t$  is the value we could have predicted based on historical data. In particular let  $h$  denote the horizon for which we build such a prediction, then the cyclical component is the difference between the realized value at time  $t$  and the expectation about the value at time  $t$  formed at time  $t - h$  based on the data available at that time. Hamilton proposes that this residual should be based on a regression of the value  $y$  at time  $t$  on four most recent values of  $y$  at time  $t - h$ . Formally, this regression can be written as:

$$y_t = \beta_0 + \beta_1 y_{t-h} + \beta_2 y_{t-h-1} + \beta_3 y_{t-h-2} + \beta_4 y_{t-h-3} + v_t \quad (1)$$

They choose a horizon of 3 years, so the residual is the deviation of the realized value  $y_t$  from the expectation formed at time  $t - 3$  based on information on  $y_{t-3}, y_{t-4}, y_{t-5}$  and  $y_{t-6}$ . They define that a credit boom episode occurs when real credit per capita exceeds expectations by more than a specific amount and it is based in terms of the country specific standard deviation of the detrended credit variable as in Mendoza and Terrones.

## 5.2 Data

Gourinchas, Valdes and Landerretche (2001) used a sample of ninety-one country over the period 1960-1996. All the countries have more than 500,000 inhabitants and more than twelve year of credit data available from the International Financial Statistics. They measure private credit as claims on the non-banking private sector from banking institutions. Credit correspond to a stock variable so they consider the geometric average of GDP in two consecutive years as the relevant measures of GDP in the ratio calculations and they estimate the trend of credit to credit-to-GDP using the HP filter. They observe with a relative high threshold a significant number of episodes (23 with relative deviation and 33 with absolute deviation). They computed the duration of a credit boom which on average fluctuates between 5.5 years and 6.5 years with build-up phase which takes almost 2.5 years.

They find that the number of countries experiencing a lending boom varies under the two criteria: under the relative criterion emerge two peaks the early 1980s and the mid 1990s; under absolute criterion there is a natural upward trend in the number of cases, due to financial deepening, with a peak between 1991 and 1993.

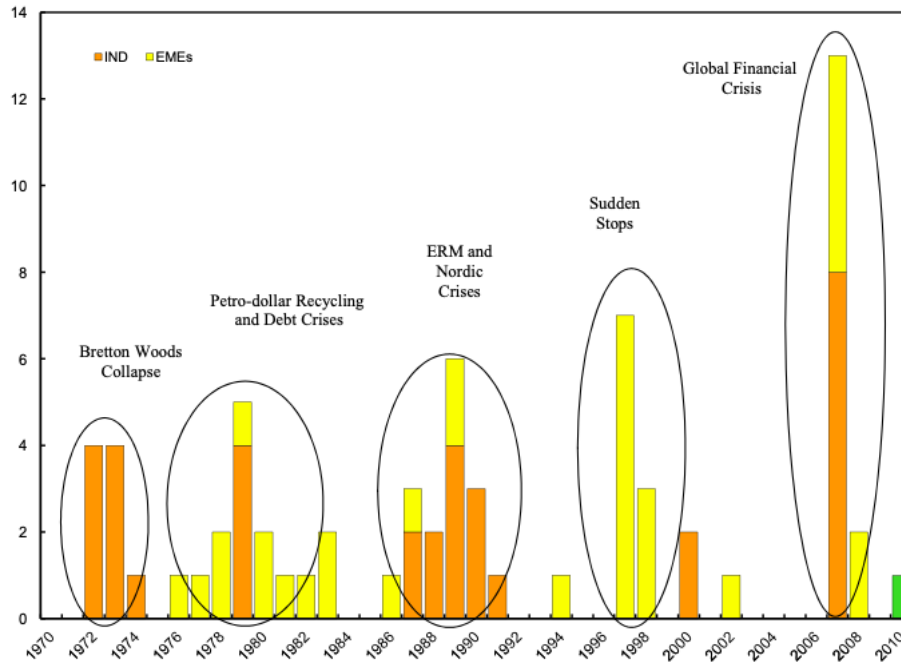


Figure 9: Frequency of credit booms (from 1970 to 2010)  
From Mendoza and Terrones (2012)

Mendoza and Terrones (2012) use data on credit from the financial sector to the private non-financial sector obtained from the IMF's International Financial Statistics for a sample of 61 countries, 21 industrial and 40 emerging economies for the 1960-2010 period. The measure of credit is the sum of claims on the private sector by deposit money banks plus, whenever available for the entire sample period for a given country, claims on the private sector by other financial institutions. Real credit per capita is calculated as the end-of-year observations of nominal credit per capita deflated by their corresponding end-of-year consumer price index. They identified 70 credit booms in data, 35 in ICs and 35 in EMEs (Figure 9).

As shown in Figure 10, at the peak of the booms, the average expansion in real credit per capita reached about 30 percent above trend in EMEs, twice what is observed in ICs. Normalized by the standard deviation of the cyclical component of credit in each country, however, credit booms in the two groups of countries show a similar distribution, with medians of 2 and 2.1 for ICs and EMEs respectively.

The results based on medians indicate that EMEs and ICs show booms with similar duration of about 3-6 years results very similar compared with Gourinchas et al.(2001), and the fraction of the boom spent in the upswing and downswing phases is about the same. Using means, however, EMEs seem to show longer and

more asymmetric booms. Credit booms tend to be clustered geographically and not limited to a single region: 40 percent of the booms experienced by emerging economies were observed in East Asia and 32 percent in Latin America. Likewise, 33 percent of the credit booms in industrial countries were observed in the G7 and 18 percent in the Nordic countries. Credit booms tend to be synchronized internationally and centered around big events.

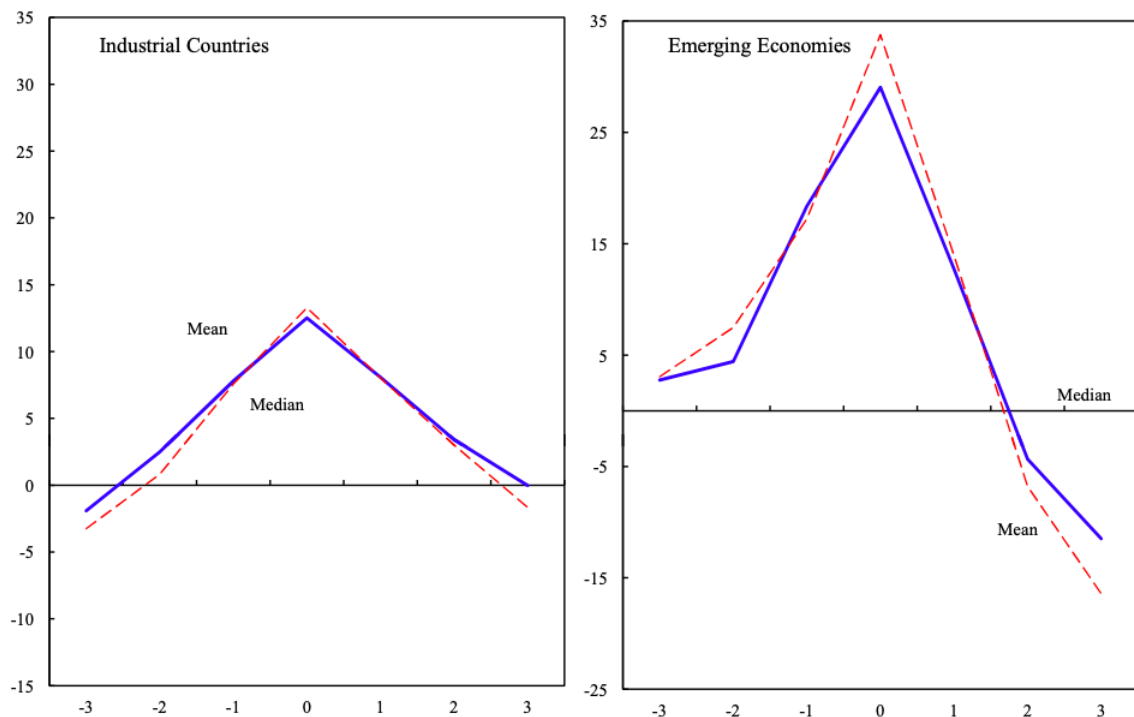


Figure 10: Deviation in real credit pro-capita  
From Mendoza and Terrones (2012)

Gorton and Ordoñez (2016 and 2020) from the dataset of Laeven and Valencia (2013) find 87 booms by their definition. Once they have identified these credit booms, they start classifying them between bad or good depending on whether they are accompanied by a financial crisis in a neighborhood of three years of the end of the boom, or not, respectively. In their sample there are 47 crises identified by Laeven and Valencia (2013). [Table 2](#) taken from their work in 2016. shows that 34 of those crises happened at the end of one of the 87 booms identified (hence 34 bad booms are in the sample). There were eight crises that did not occur at the end of a boom (but occurred during a boom), and there were five crises that were not associated with any boom. So, there are good booms and bad booms, but also crises unrelated to the end of booms, or with no booms at all.

Number of crises occurring at the end of a boom	34
Number of crises occurring not at the end of a boom	8
Number of crises not associated with booms	5
Total number of crises in the sample	47

Table 2: Credit Booms  
Gorton and Ordoñez(2020)

### 5.3 Characteristics of credit booms. Are they good or bad?

Credit booms are often cited as the culprit behind financial crises, particularly in emerging economies (Eichengreen and Arteta, 2002). If this is the case, credit booms should be closely associated with financial crises.

Mendoza and Terrones (2012) construct a seven-year event windows of the cyclical components of macro aggregates centered on the peak of credit booms. The windows show the cross-country means and medians of output (Y), private consumption (C), public consumption (G), investment (I), the output of nontradables (YN), the real exchange rate (RER), the current account-output ratio (CAY) and total capital inflows as share of output (KI). Except for RER in the EMs group, there is little difference in the dynamics produced by country means and medians, indicating that the results are not driven by outliers. For EMs Y, C and G rise 2 to 5 percentage points above trend in the build up phase of the credit boom, and drop to between 2 to 3.5 percent below trend in the recessive phase. I, YN and RER follow a similar pattern but display significantly larger expansions and recessions. Investment rises up to about 20 percent above trend at the peak of credit booms and then drops. Only current account ratio and capital inflows follow the opposite pattern.

Also the ICs shows several similarities with those for emerging economies but the amplitude of these fluctuations is smaller. They then studied the behavior of inflation, equity prices and housing prices during credit booms finding that credit booms are usually not associated with sharp changes in inflation. In contrast, housing and equity prices show a clear pattern of rising prices in the upswing and declining prices in the downswing. These movements in asset prices are important because they are consistent with theoretical explanations of credit booms and busts that rely on financial accelerators and balance sheet effects.

A similar work was made by Gourinchas et al.(2001), to investigate the origins of a lending boom and to evaluate its macroeconomic impact; instead of using only 7 macroeconomic indicators they used 14 indicators that can be grouped in four categories : domestic macroeconomic variable, domestic policy, international variable and external factors. The trend of those indicators is similar of those obtained

by Mendoza and Terrones in their work 10 years later. Output gap, investment, consumption (that are included in the domestic macroeconomic variables) follows the same pattern increasing in the build-up phase in a level higher than during a tranquil periods and declines after the peak. Also the patterns of International variables (current account to GDP, real exchange rate, private capital inflows) are in line with findings of Mendoza and Terrones (2012).

Richter, Schularick and Wachtel (2018) defined a "bad" boom those booms that end in a banking crisis. The Jordá-Schularick-Taylor Macrohistory Database provides for the first time extensive historical information on a wide variety of characteristics. These characteristics fall into four broad categories:

1. The first set of variables are characteristics of the detrended credit variable, such as duration of the credit boom and the deviation from trend (Dell'Ariccia et al. (2016));
2. The second set of variables are real economic fundamentals including GDP, consumption, investment, the current account balance and interest rates, where the literature suggests that we should expect a deteriorating current account balance to be associated with a higher risk of banking crisis;
3. The third set of variables relates to the financial sector itself. Here, the risk of a banking crisis might be related to the financing of credit on the liability side (capital-to-asset ratio and wholesale funding), aggregate illiquidity measures such as the loan-to-deposit ratio and the size of the financial sector;
4. A last set of variables refers to asset prices, especially in stock and housing markets.

They use Hamilton procedure for each country time series and they normalized by the country specific standard deviation to account for different volatilities across countries. To compare boom observations, we use the value of each variable one period before the peak of the boom in order to capture vulnerabilities before the boom collapses.

They also examined the mean characteristics of the booms during the 1950s and 1960s, a period in which there were 31 credit booms in our sample countries, all of which were good.

Mendoza and Terrones (2012) create a table ( similar to [Table 3](#)) about the percentage of banking crises, currency crises and Sudden Stops that occurred during the seven-year window of the credit boom events in EMs, ICs and all countries combined. The percent of crises that occurred before, at, and after the peak of the credit booms are listed in separate columns. This table shows credit booms

	Banking crises	Currency crises	Sudden stops
All countries	0.44	0.54	0.24
Industrial countries	0.36	0.44	0.14
Emerging market economies	0.51	0.63	0.34

Table 3: Percentage of booms turned into a crises  
From Mendoza and Terrones (2012)

in both EMs and ICs are often associated with currency crises, banking crises, and Sudden Stops, although the first two are observed more often than the third. Banking crises are observed in 44 percent of all credit booms, 1/3rd of IC credit booms and 1/2 of EM credit booms. Currency crises are observed in 54 percent of all credit booms, in 44 percent of IC credit booms and 2/3rds of EM credit booms. Sudden Stops are observed in about 1/4 of all credit booms, in 14 percent of IC credit booms and 1/3rd of EM credit booms. Thus, clearly not all credit booms end in crisis, but odds are about 1 out of 4 that once a country enters a credit boom it will end with a currency or a banking crisis, and a little less that it will end in a sudden Stop. These findings are broadly consistent with those reported in Schularick and Taylor (2012). They examined whether credit growth is a significant predictor of banking crises for a sample of fourteen developed countries over the 1870 to 2008 period, and found that indeed credit growth helps predict these crises.

Gorton and Ordoñez (2020) create a table which present a summary statistics of a number of variables over different periods, which include total credit as a fraction of GDP, credit to households and to the corporate sector, TFP, patents, real GDP, investment, and labor productivity. The table also provides an overview of booms periods compared to non-boom periods and it compares booms that end with a crisis with booms that did not end in crises.

Comparing boom periods to non-boom periods what stands out is that all measures of credit (the first four rows) are significantly larger during booms. The average change in capital expenditures (the variable “INV growth”) is significantly higher during booms compared to non-booms, consistent with investment booms coinciding with credit booms. Real GDP growth (rGDP) is also higher during booms as is credit both to the corporate sector and to households.

At the onset of credit booms TFP grows at 1.5% compared to an average of 1% in the previous three years for good booms and 1% versus an average of 0.2% for bad booms. A similar path is followed by the LP which remain lower in bad booms with respect of good booms.

Gorton and Ordoñez (2020) create a model to estimate the type of a credit

	Whole sample	Non booms	Booms	Booms with a crisis	Booms without a crisis
Avg. credit growth %	3.83	-2.41	8.96	9.84	8.30
Avg. total Cr'd growth %	8.09	1.59	13.43	13.95	13.03
Avg. TFP growth %	0.83	0.78	0.87	0.47	1.17
Avg. Pt Gnt'd growth %	3.87	3.72	3.99	2.33	5.48
Avg. rGDP growth %	2.56	2.29	2.78	2.40	3.07
Avg. LP growth %	2.52	2.45	2.57	2.06	2.96
Avg. duration (years)			10.68	11.76	9.98
Number of booms			87	34	53
Sample size (years)	1695	776	929	400	529

Table 4: Caption

boom based on changes of TFP and LP

$$Pr(BadBooms_{j,t}|Booms_{j,t}) = F_L(\alpha + \beta\Delta X_{j,t}) \quad (2)$$

They find that If the change in TFP, for example, is on average declining over the boom, then the coefficient on the prediction of bad booms should be negative, that is, a positive change in TFP is making the boom less likely to be a bad boom; conditional on being in a boom, an increase of one standard deviation in TFP reduces the probability of being in a bad boom (a boom that will end in a crisis) by 6%.



## 6 The case of Turkey

### 6.1 Recent economic Turkish history

The term ‘financialisation’ was coined in the early 1990s; the first to use this term were Arrighi (1994) and Phillips (1994) and has since been interpreted in varying ways, resulting in different research strands across a range of academic disciplines, including economics, sociology and geography. Initially, researches about financialisation centred on the US economy. The working definition of the phenomenon used by many economists is Epstein’s (2005) broad understanding of financialisation as ‘the increasing role of financial motives, financial markets, financial actors and financial institutions in the operations of the domestic and international economies’. This broad definition means that different interpretations of the phenomenon exist at the same time.

Karwowski and Stockhammer (2017) identify six interpretations:

1. financial deregulation and the integration of EMEs into the global financial system drives financialisation in these countries;
2. foreign financial inflows result in financialisation in EMEs;
3. Financial liberalisation encourages asset price inflation in EMEs, which is an important aspect of financialisation;
4. The shift from a bank-based to a market-based financial system causes financialisation in EMEs;
5. Debt levels among businesses in EMEs have been seen with concern as sign of financialisation;
6. The increased involvement of households in finance, e.g. strongly rising indebtedness of individuals, characterises household financialisation.

In the 1970s, the rather inward-looking development models of the Mediterranean countries (e.g. Spain and Egypt) entered into crisis. Economically, the crisis was particularly acute in Turkey. The country faced serious balance of payments problems. Due to the dearth of foreign exchange, bottlenecks emerged for some key commodities, particularly energy. At the same time, trade union militancy and political conflicts increased. With the so-called 24 January measures, the Turkish government adopted a very tough liberalisation and austerity program, which was backed by the International Monetary Fund (IMF) and the World Bank in 1980 (Becker,2016). This program signalled the abandonment of the import substitution model of 1980 and the switch towards new-liberal policies. In the years after 1980, three predominant traits of accumulation can be identified:

1. Export-orientation (1980-1988);
2. State-centred financialisation (1989-2001)
3. Mass-credit-based financialisation (since 2002)

### 6.1.1 Export-oriented accumulation

The 24 January programme signalled the switch towards an export-oriented strategy, which was to last until 1988 (Becker,2016). The export promotion strategy was essentially based on low wages. While the trade unions were ruthlessly repressed and labour legislation amended in favour of capital, real wages declined by 40% between 1980 and 1988 (Becker,2016). Turkey was already known for its export in agricultural products. However due to low international terms of trade for agriculture products, it was not possible to increase the current account numbers. New sectors had to replace agriculture so industrial products and service sectors were used in exports. There were loads of unused capacities in the industry and new external loans which led to export of products. Exports were additionally promoted by the devaluation of the Turkish lira and specific export support measures. Indeed, exports increased from 2.3 bn to 11.7 bn US\$ between 1980 and 1988. The export profile displayed a clear trend of de-primarisation. The share of industrial goods in exports increased from 36.8% to 80% (Becker,2016). The average current account deficit amounted to a relatively moderate 1.4% of GDP between 1980 and 1988 (Becker,2016) (Figure 11). This could be described as the primal period of financialisation in Turkey due to creation of Capital Market Council. The severe debt crisis of the periphery put a massive brake on capital flows to the periphery in the 1980s, due to an increasing of the interest rate because banks were racing to collect deposits. Many small companies were unable to repay the loans they got and became insolvents, government financed these small firms who were in jeopardy; what came out from this situation was a disaster, many banks were bankrupting. This was a structural impediment to financialisation in Turkey in those years. Internal and external loans started the decade at a value around the 12% and ended the decade (1988) at a level of almost 90%.

Since this liberalization ended up in failure, deposits and interests rates were regulated by the Ministry of Finance and later the Central Bank of Turkey. It was only with the restructuring and securitisation of Third World debts, which was set into motion by the Brady Plan, that capital again started to flow massively into the periphery from 1989 onwards (Becker,2016).

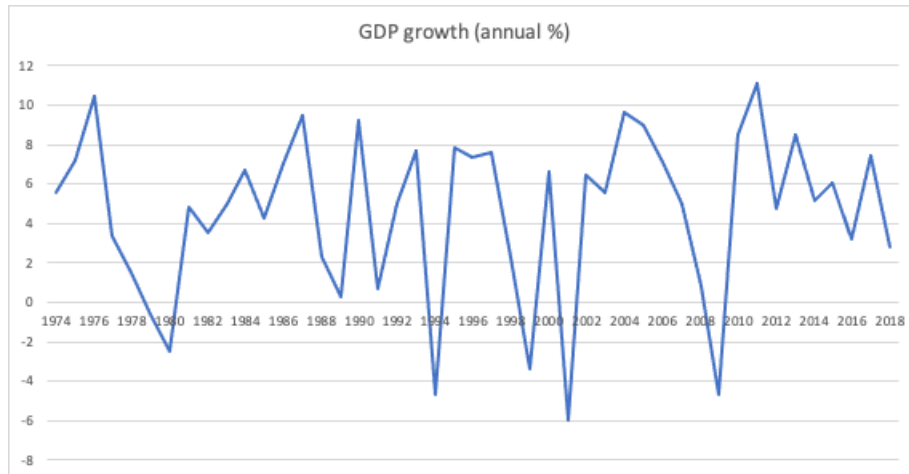


Figure 11: GDP growth %  
 Data: <https://data.worldbank.org/>

### 6.1.2 State-centred financialisation

1989 was the year that marks the beginning of financialisation as the defining trait of the Turkish accumulation model. The financialisation period can be sub-divided into two sub-periods. The first one stretches from 1989 to 2001 and was based particularly strongly on the state debt. A rapidly increasing private household debt is a key feature of the second period. Both periods have a common massive reliance on capital inflows (Becker,2016). Thus, Turkish financialisation can be characterised as a ‘dependent financialisation’.

By the mid-1980s import quotas were mostly removed, customs tariffs were reduced, and generous incentives were offered to exporters. Trade liberalization was followed by the liberalization of the capital account and the convertibility of the Turkish Lira (TL) in 1989. Foreign exchange controls on capital outflows were removed, and both the current and capital accounts were completely liberalized. Capital account liberalization was concomitant to domestic financial market liberalization. Interest rate controls were abandoned in the 1980s and Istanbul stock exchange Market was established in 1986. The weight of public sector in financial markets gradually decreased.

Turkish financialisation started at a difficult juncture for the right-wing government in Turkey. In the late 1980s, workers pressed vehemently for higher wages and forced concessions on government and capital. It was no longer possible to deal with the balance of payments problem by export promotion based on wage repression. The way out was to be the promotion of capital imports. In 1989, Turkey radically liberalised external capital flows (Becker,2016). As the 1980s was a “lost decade” for many countries in Latin America the 1990s had qualified as

a lost decade for Turkey as its economy was in deep recession by the mid-1990s ensuing the 1994 economic crisis (Arıcanlı and Rodrik, 1990; Boratav and Yeldan, 2006). Turkey offered high interest rates in order to attract foreign capital. Turkish banks, which used to be part of diversified economic groups, lent the money at even higher interest rates to the state. The state was the principal borrower under Özal government. The high interest rates were a key driver for the exploding credit needs of the state. In 1999, interest payments on the domestic debt alone swallowed 35.1% of total state expenditure.

Since the liberalization of 1980s, Turkish economy has aspired to achieve an export-driven growth. However, even though the volume of trade has raised significantly, the contribution of net exports to growth has remained below zero. Imports grew more rapidly than exports, and the average current account deficit reached 0.5% of the GDP between 1989 and 2001 – albeit with significant fluctuations (Becker, 2016). Continuous current account deficits have meant accumulation of liabilities which should be sooner or later paid back. Unless the current account balance is not improved, debt servicing capacity of developing countries would be vulnerable to sudden stops or reversals in financial flows.

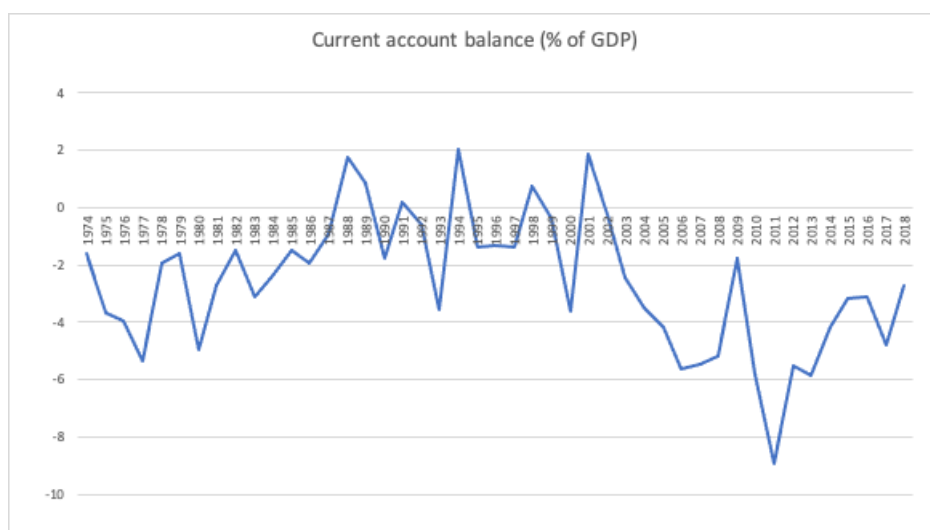


Figure 12: Current account % GDP  
 Data: <https://data.worldbank.org/>

The financialised accumulation model was highly dependent on capital inflows and highly volatile. Increasing dollarisation was a key factor for increasing the vulnerability to crisis. This trend could be ascribed to two factors. On the one hand, the high rate of inflation diminished the trust in the national currency. This was an incentive for arbitrage business – for example banks providing high interest TL credits to the state which were refinanced by cheaper international loans. The

high degree of dollarisation was one of the main factors behind the policies of a ‘strong’ Turkish lira. Increase in import demand is inevitable when high appreciated foreign exchange rate and liberalized import is present. The Turkish people started to buy cheap foreign products. Such increase in demand also increases foreign currency demand and foreign currency outflow. Measures released by the IMF stability program in 1989 were ignored by Turkey between 1989 and early 1993. Inflation was high (almost 60%) while the foreign exchange rate was stable at a level of 45%-50%. The result of these two components was an highly appreciation of Turkish Lira. Current deficits and public sector deficits had to be financed externally. Internal and external debt stocks were increased. The effect of the cumulative troubles showed the first signs at the beginning of 1994. Foreign exchange started to get appreciated heavily. Credit ratings were downgraded so people started to demand more foreign currency. The inflation as response surged at level of 115%<sup>2</sup>. Government decided to lower interest rate that were hanging public budget. The 1994 started from this background. The causes of the crises could be summarised (Durgut,2002) :

1. Public sector borrowing requirements (PBSR) ratio increased on a sustained basis until it hit a record of 15.2% in 1993 leading to a continuous deterioration of macroeconomic fundamentals in the Turkish economy during the pre-crisis period, increasing price level and Turkish lira was devaluated;
2. The current account deficit was raising to fast. Capital account liberalization was implemented to it but the government did not apply any structural reforms to dampen any oncoming instability in the future;
3. High domestic interest rates enabled Turkey to attract capital inflows. Financing of the public debt through short-term capital inflows, however, raises another problem that domestic debt financing is not sustainable when real interest rates surpass the real economic growth rate

The 1994 economic crisis significantly affected the Turkish economy; in the aftermath of the crisis, the Turkish economy one of the highest output losses. The economy contracted by 6%. Between January and April 1994; for example, the Turkish Lira depreciated by more than 60% against the United States Dollar. Level of inflation was extremely high and also the interest rates were. Reserves halved, dropping from \$7 Millions to \$3 Millions in April to curb depreciation in the Turkish Lira. The high depreciation ratio of the Turkish Lira significantly contributed to the output loss in the Turkish economy by causing bankruptcies among businesses. Businesses that had foreign-currency denominated loans could not afford their payments and went bankrupt, causing a drastic decrease in national output

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<sup>2</sup>CBRT data

and increasing unemployment. The unemployment rate increased from 11.2% in the first half of 1993 to 12.6% during the same period in 1994 (Durgut,2002). International agencies began downgrading Turkey's credit rating. The moved from BBB in May 1992 to a B+ in August 1994 (Standard & Poor's)<sup>3</sup>

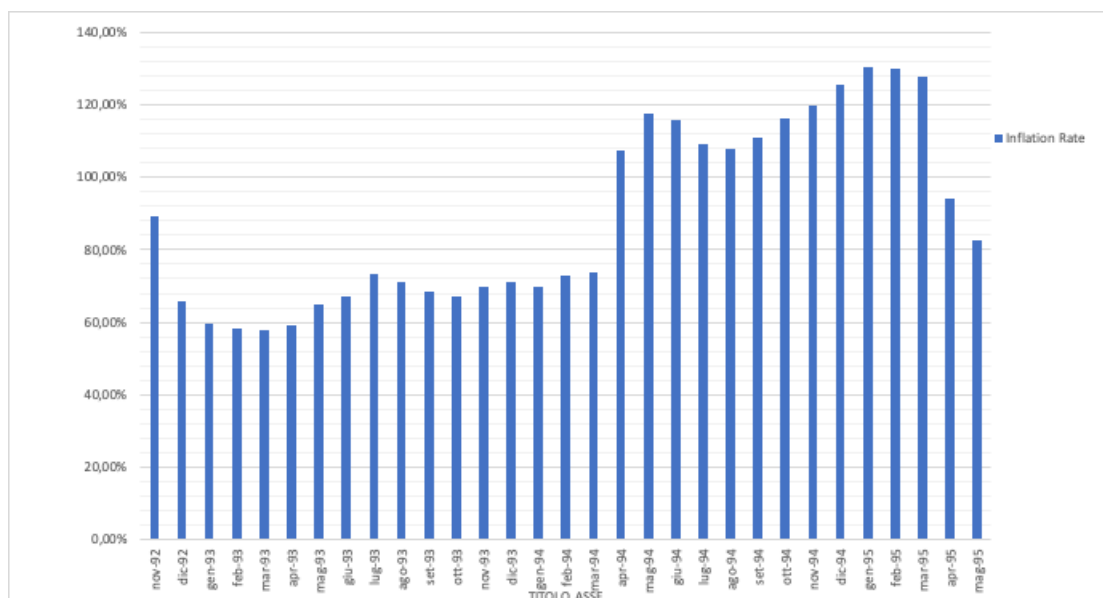


Figure 13: Inflation rate (annual change on CPI)

Data: <https://tradingeconomics.com/turkey/inflation-cpi>

The government responded to the 1994 economic crisis by announcing a stabilization program on April 5, 1994 which main objectives were facing high inflation, high external debt, unsustainable public-sector budget deficits, and balance of payments crisis. The main measures of the April 5 stabilization program were(Durgut,2002):

1. devaluation of 39% of Turkish Lira;
2. abolition of the 5% tax on the revenues earned in the government securities market;
3. one-time tax surcharge on private enterprises
4. Liberalization of the exchange rate determination. With the new system,the exchange rates would be determined according to the data provided by 10 major commercial banks along with the Central Bank

<sup>3</sup>data from <https://www.theglobaleconomy.com>

5. increase in public sector prices (tobacco,sugar, liquor, tea and fuel)
6. reduction in public expenditure
7. privatization of some important enterprises
8. increase of interest rate

In the short term stability achieved its short-term goals, such as stabilizing the financial markets and the Turkish Lira; however, it failed to achieve its long-term goals of reducing the public deficit and high inflation on a permanent basis while did not reach long-term goals such as privatization, social security, and structural reforms. All this led IMF in 2000 to sign an agreement with Turkish government (the IMF-backed stabilisation program) which was similar to agreements signed by IMF in Latin America in 1970s and early 1990s.

This policy penalised exporting companies and stimulated imports with the consequence of a deteriorating current account. Maintaining growth and the exchange rate was highly dependent on attracting capital inflows.

### **6.1.3 Mass-credit-based financialisation**

Turkey experienced the worst macroeconomic crisis of the post-World War II period in 2000 and 2001. During the crisis the output contracted at a rate of -5.7 percent. Nevertheless, this contraction was expected prior to the crisis since the Turkish economy had given the signs of fragilities and vulnerabilities throughout the 1990s. It was marked by one major crisis erupted in 1994, political instability (consecutive short-lived coalition governments), increase of the level of public debt to an unprecedented level, increasing real interest rates and social distress. The average growth rate of the 1980s was 5.2 percent while it was 3.0 percent for the 1990s.

The high government debt stock and debt servicing has put enormous burden on government budget and forced the government to cut its expenditures significantly from time to time. Permanent instability led to successive IMF ‘stabilisation’ programs in particular the 1998 IMF agreement to reduce government debt. In addition Turkey government announces a stabilization program which main policies (Memorandum Turkey, 1998) : an increase in the primary surplus of the budget; a shift in the management of key variables such as public sector wages; a supportive and closely coordinated monetary policy; structural reforms to ensure the progressive strengthening of public finances; stepped up privatization to lower the domestic borrowing requirement. The program became effective from December 1999. Meanwhile, IMF agreement aim was to introduce reforms in three major policies fiscal, monetary and structural. From the point of fiscal

reform the aim was to reduce the debt through privatization proceeds and limiting expenditures. Main action in monetary policy was to implement a monetary and exchange rate policy consistent with reducing inflation to 50 percent by end-1998 and 20 percent by end-1999 (Memorandum Turkey, 1998). Structural policies regard lot of sector in particular petroleum prices and retirement age. The currency kept appreciating in real terms but it lead to currency flight. There was an outflow of US \$ 5.3 billion (Orhangazi and Dufour, 2007). The sudden and rapid outflows of capital led the economy to crumble. The financialised accumulation model was highly dependent on capital inflows and highly volatile. Increasing dollarisation was a key factor for increasing the vulnerability to crisis and during this period caused an uncontrollably fluctuation of foreign exchange reserves.

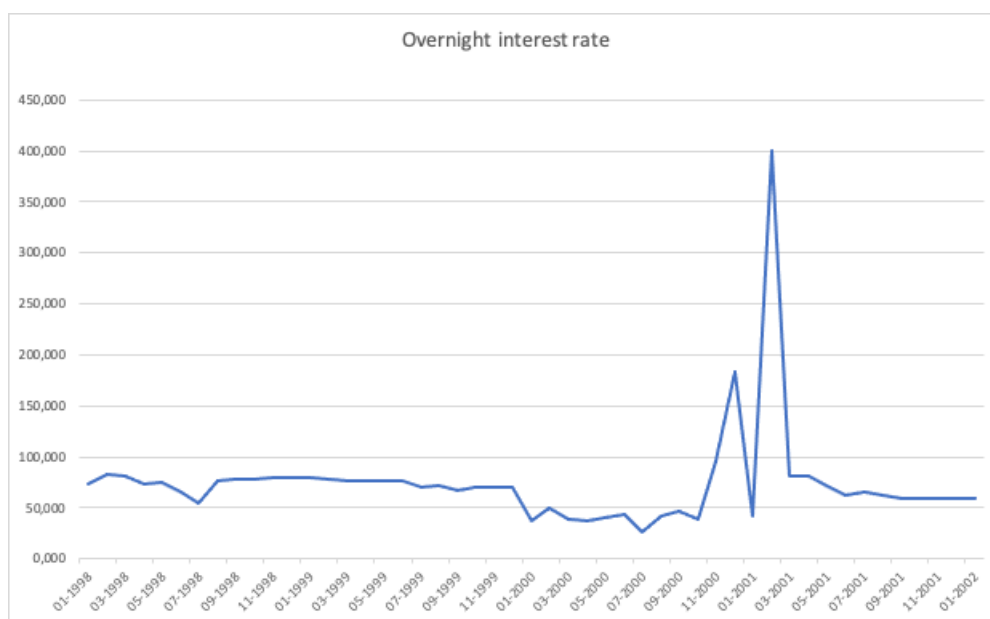


Figure 14: Overnight interest rate (Q1-1995 Q1-2002)  
Database Fed of St. Louis

Policymakers tried to maintain a managed exchange rate regime during the turmoil. This cause an increase in money supply hence a devaluation of TL, this also led to the abandonment of the pegged exchange regime. Debt to GDP nearly doubled, inflation was on the rise, and interest rates were high as ever and more. IMF program aim was not reached. In addition of an high level of external debt which raise from \$72 billions in 1995 to over \$ 110 billions in 2001 also internal debt increase from 14% to over 45% <sup>4</sup>.

There were other fragilities: a high level of corruption (Turkey was ranked

<sup>4</sup>CBRT data



at the 50<sup>th</sup> place in the corruption perception index); a poor governance and a blemish banking sector. Regarding the poor government is exemplifying the fact that government expenditures have swelled rapidly between 1990-2000 from expenses incurred out of extra-budgetary funds and revolving funds. There was malpractice with the government's money. Governments were spending on their own without accounting to the Parliament, according to (Koch and Chaudhary, 2001), government spent around \$16 billion from an unknown source out of the budget without accounting it to the Parliament in 2000.

Meanwhile financial was following in a dangerous way. Both private and public banks were suffering from insolvency. Banks were purchasing foreign currencies from the open market to pay the loans when the foreign creditors called their loans back during the crisis. The result was that domestic currency reserves reduced and pressure increased on exchange rates.

All those factor led to the crisis. The crisis did indeed affect the economy in many sectors. During 2000-2001 was a nightmare for workers and labors. Main reason was the taxation system. Real wages and the labor share decreased markedly after the crisis. The difficult post-crisis economic conditions, such as an unemployment rate exceeded 10%. The government cut the wages of public employees and froze the real wages of civil servants too. Such decisions and the rising unemployment rate meant a disaster to the employment market. The organized labor union was deteriorating and strikes were rising up which resulted with a major wage concessions. Real wage facing even worse situation.

Government spent \$47.2 billion to bail out the Turkish financial system, including \$25.3 billion to rescue private banks.

Debt repayment and interest charges were covered up by the domestic resources because of the increase in foreign debt. Turkey was submerged by debts. When a state is in an analog situation with international debt, IMF and other important international creditors have advantage in making new economic policies. A state with such deficiencies at debt level will be willing to do and accept any reforms to repay the debt. Nonetheless, the IMF was satisfied with the governments act for putting the governmental guarantee on private banks' liabilities. Consequently, these loans became risk free and the entire cost of the adjustment in domestic financial markets was shifted to the domestic population. The only way international capital could lose was through its direct investments and portfolio. The events after the crisis had pros and cons. For domestic capitalists, they benefited from policies forced on Turkey thanks to the leverage that international capital held over the government. But restrictions on foreign investment were eased in various sectors at a moment when domestic capital was not in a good position to compete.

The new privatization strategy was projected and included the full privati-

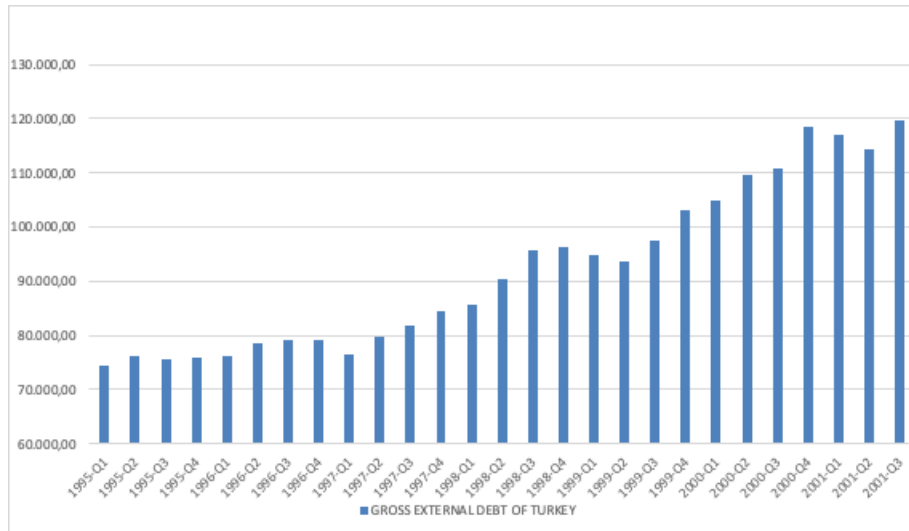


Figure 15: External debt from Q1-1995 to Q3-2001  
Database CBRT

zation of Turk Telekom, sales of government monopolies in sugar, tobacco, and gas sectors, Turkish Airlines, steel, petroleum refineries and lastly the privatization of the companies responsible for the generation and distribution of electricity. The other development was the establishment of an inflation targeting system and the CBRT's gaining independent status from the government and cutting direct borrowing lines between the CBRT and the Treasury (Becker,2016). In addition to the IMF program, the new financial reforms were anchored by Turkey's official European Union candidacy status. Consequently, capital inflows skyrocketed during this period, which was mainly characterized by increasing household and non-financial corporate debt. The diminishing public sector borrowing requirement following the 2001 restructuring pushed Turkish banks to pursue new outlets for profitable lending. Domestic mergers and acquisitions that produced sectoral consolidation and the internalization of foreign finance capital gave way to changes in bank assets control and diversification of financial products attracting households(Becker,2016).

After the crisis, the TCMB started to implement floating exchange rate regime. Although the year 2002 was the first year of floating exchange rate regime and it was completely new and unknown for all market participants, the intervention was quite rare and it was limited to extremely volatile movements that were not justifiable through fundamentals including market sentiment. The TCMB announced that it would intervene in the markets only in cases of excess volatility, without affecting the long-run equilibrium level of the exchange rates(Görmez and Yilmaz, 2007). The predominance of state fictitious capital in the financial markets did

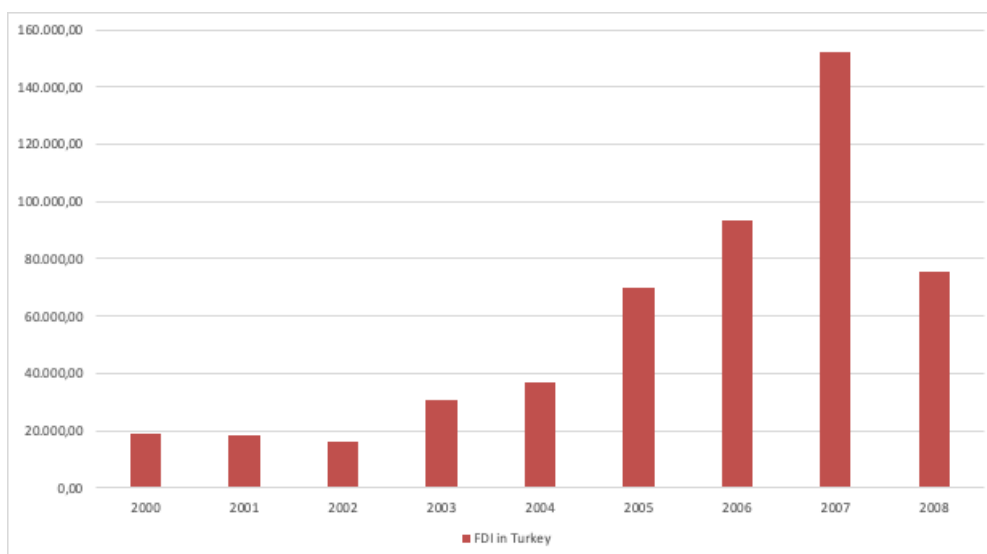


Figure 16: Foreign direct investment from 2000 to 2009  
Database CBRT

not end in the post-2001 years. On the contrary, declining interest rates between 2002 and 2005 enabled bondholders to benefit from holding such capital. Given the primary surpluses of the state and a declining public sector borrowing requirement, the new focal point became the consumer credit market. This phase that began after 2001 crisis, was characterized by the growth of household indebtedness, a new phenomenon in Turkey, even though the ratio of household debt to disposable income was still lower than in most ACCs. Key elements of this program, whose basic lines the AKP governments continued to follow after assuming office in 2002, included the reorganisation of the banking sector and the creation of independent regulation authorities as key components (Becker, 2016). Turkish lira as the world's least valuable currency in 1995 and 1996, and again from 1999 to 2004. The Turkish lira had slid in value so far that one original gold lira coin could be sold for almost 154 Millions of Turkish lira, so in December 2003 Turkish government passed a law that allowed for redenomination by the removal of six zeros from the Turkish lira, and the creation of a new currency which was introduced in January 2005.

The second phase of mass-credit-based financialisation began after 2008 international financial crisis and lasted until 2013. Since resolving the public debt rollover in the post-2001 period did not satisfy 'crowding out thesis' proponents by providing cheap and accessible resources to capital groups, securitization and development of the corporate bond market became a hot topic in 2006-2007. Given this background, reinforcing securitization and strengthening market (non-bank) fi-

nance characterized the post-2008 medium-term government responses to Turkey's 2008-2009 crisis. Thousands of Turkish firms, had to resort to bank finance as in previous decades. In June 2009, amidst a year-long collapse of the Turkish economy (4Q of 2008 to 4Q of 2009), the Council of Ministers made it easier for corporations without foreign exchange revenues to borrow in foreign currencies (Akçay, Güngen; 2019). During the peak of financial crisis AKP governments implemented policies that were attractive for foreign capital.

Firstly, relatively high interest rates which induced the inflow of money capital though Turkish monetary policies have been more openly contentious and ambiguous. However, the capital flows into Turkey were resumed relatively soon after the peak of the crisis since international capital regarded the country as one of the 'emerging markets'. The policies of almost zero interest rates and quantitative easing of the core countries' central banks made 'emerging markets' like Turkey attractive destinations for financial placements(Becker,2016). As a direct result of the policy responses to the Great Recession in the ACCs, it was becoming easier to obtain cheap USD loans. Following this step, non-financial corporate debt increased from 66 billion USD to 177 billion USD between 2009 and 2013.

Secondly, massively accelerated privatisation attracted foreign direct investment. Banking has been one of the key sectors of FDI accounting, like manufacturing. The rapid increase in household debt has been a defining feature of the last decade. Starting from a very low level of only 3.0% of GDP in 2003, household debts increased to 19.6% of GDP in 2013 (Figure 17). Real wage growth was very low (Becker,2016) and consumption credits contributed to sustaining or even increasing consumption. Low income earners account for a very significant share of consumption credits: in recent years, debtors with monthly incomes below 2000 TL incurred between 40% and 50% of all consumption credits (Becker, 2016).

The policy of the 'strong' Turkish lira, however, particularly favoured imports whose price competitiveness was enhanced by the Turkish exchange rate policies. Until 2011 and 2012, the current account deficits increased rapidly until they reached almost 10% of GDP. On average, the current account deficit was 5.7% of GDP between 2002 and 2012 (Becker,2016). This is clearly beyond the critical level. While the average growth rate of 5.1% between 2002 and 2012 was relatively high (higher than in the two earlier phases of neoliberalism in Turkey), economic growth has slackened since 2013. The external capital inflow stimulus has considerably weakened, which affects the growth motor – namely, debt-financed real estate and consumption. Moreover, the structure of external debt has consistently worsened over the last years. External shocks, especially those that cause a rise in domestic inflation and capital reversals, have been harshly depressed by CBRT mainly through monetary contractions and an upward trend in the TL. Other examples of such episodes include(Caliskan and Karimova,2017):

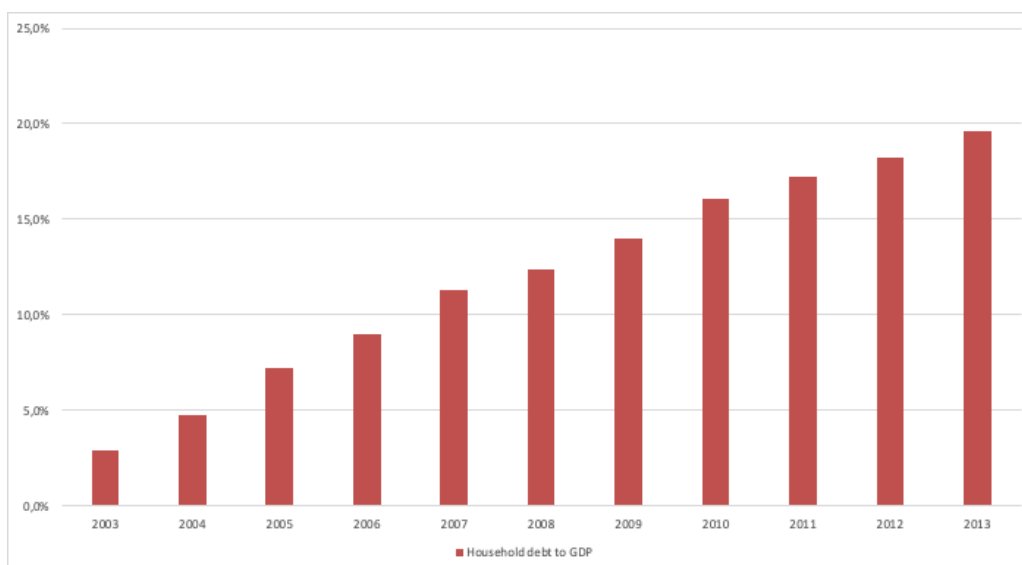


Figure 17: Increasing household debt in Turkey (2003-2013)  
 Database <https://www.theglobaleconomy.com>

1. Considerable rise in the overnight interest rate from 16.25% in April to 22.50% in July during 2006 , as a response to a hike (or an expectation of it) in Japanese interest rates;
2. Monetary contraction in 2007 and 2008 in reaction to an increase in food and energy prices (CBRT 2009);
3. Tightening in October 2011 due to rising domestic inflation caused by economic crisis in the Eurozone;

In addition, after the ACC central banks created massive amounts of money via quantitative easing (QE) from 2009 onwards, these capital flows reversed to boost the Turkish economy. Turkish policymakers did not take measures to prevent a sharp increase in the non-financial sector's foreign exchange debt. Despite attempts by the CBRT and Banking Regulation and Supervision Agency (BRSA) to prevent rapid credit expansion and an explosion in household debt in 2010- 11, there was no significant policy change. On the contrary, as capital market regulations and state-level strategies to deepen the market based finance imply, the AKP cadres hoped for a qualitative break in the near future, with significant increases in private sector debt securities.

## 6.2 Recent developments until currency crisis in 2018

Household indebtedness peaked in 2013 before declining due to increasing interest rates resulting from adverse international financial conditions after the Fed's tapering announcement. That is, the dependent nature of ECC financialization became apparent through the channel of higher borrowing costs when ACC interest rates were increasing (Akçay and Güngen, 2019). Despite the increasing indebtedness of the corporate sector, crisis tendencies were evident in 2015, pushing large conglomerates to keep their short-term foreign exchange liabilities below their short-term assets. The long-term liabilities of non-financial corporations exceeded their assets by 190 billion USD in late 2015 and continued increasing until the abortive coup attempt of 2016. Since the industrial structure is highly dependent on the imported inputs, depreciation of the TL pushed inflation higher on the one hand while not providing competitive advantages to the extent desired by large conglomerates on the other. Post-2016 Turkey therefore became more vulnerable to capital flows. The share of portfolio flows in the financing of the current account deficit increased further after the 2016 coup attempt, to reach 51 per cent in 2017. The TL was losing ground faster than other emerging market currencies in 2017 while both inflation and interest rates were much higher than in other middle-income countries (Akçay and Güngen, 2019).

Since 2013, Turkish economy faces a bottleneck, which paralysed the top level AKP cadres and it is marked by three episode of crisis tendencies. Policymakers successfully postponed the first two, but not the final one they use this strategy of postponing crisis after intense political turmoil (five elections between 2013 and 2018). In the middle of a depreciation of national currency the main contradiction of Turkish economy was that on one hand policymakers wanted to sustain a lower interest rate policy even though international financial conditions were changing while on the other hand, insisting on a lower interest rate policy for the sake of strong economic growth triggered currency shocks.

This caused a currency shock and a raising of inflation, which pressure policymakers to increase interest rates. In other words during the period 2013-2018; lower are the interest rates, higher is the probability of currency shock crisis.

Akçay and Güngen (2019) agree that the first episode of crisis tendency is between 2013 and 2014. Policymakers avoided increasing interest rates until 27 January 2014, although there were negative developments in both international financial conditions and Turkey's political stability. In particular, it ends the informal ruling coalition between AKP and the Gülen organization. The failed coup attempt provoked the second episode of the intensification of crisis tendencies in mid-2016. To counter the impact of a small currency shock and interest rate hike, policymakers resorted to state-sponsored credit expansion from late 2016 onwards. The aim was not only to avoid economic recession but also to consolidate polit-

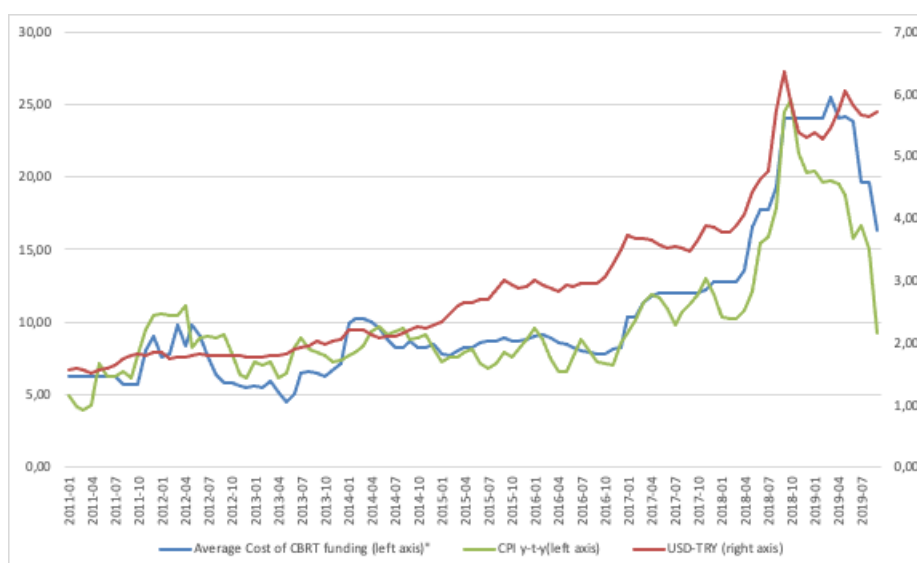


Figure 18: Risks of falling into a crisis  
Data taken from the CBRT database

ical support before the critical 2017 referendum on political regime change. The economic strategy to overcome crisis tendencies in this second episode was based on tremendous support to the small and medium-sized enterprises by providing three-year loans with no payments in the first year (Akçay and Gungen, 2019). Policymakers resume the Credit Guaranteed Fund (CGF) mechanism to tighten the amount used by commercial banks as collateral; the aim of these policy was to socialise the financial risk of this loan. The fiscal deficit increased in 2017, due to temporary tax reductions, continued minimum wage subsidies, and employment incentives. The outcome was a nominal credit volume expansion amounted to 18 per cent, implying that the AKP government overcame this second economic bottleneck by state-sponsored credit expansion. In turn, falling interest rates would provide an incentive for domestic consumption, but it will result in further depreciation of Lira, however despite the efforts to keep interest rate at low level at the beginning of 2017 an increasing in interest rate occurred. Depreciation of TL would also mean increased burden for corporations heavily indebted in foreign exchange. Monetary policy has been tightened but inflation rose to almost 12 percent during 2017. Despite the trying of stabilize the currency; TL depreciate of almost 17% during the period September 2016-September 2017 (from 2.93 to 3.45).<sup>5</sup>

The third episode was the inevitable currency crisis during the summer of 2018.

<sup>5</sup>data taken from CBRT data base [https://evds2.tcmb.gov.tr/index.php?/evds/serieMarket/collapse\\_2](https://evds2.tcmb.gov.tr/index.php?/evds/serieMarket/collapse_2)

The large boost to credit in 2017, led by the Credit Guarantee Fund, lifted growth that year to very rapid pace. Turkey entered 2018 with an economy running above potential, a positive credit gap, and high inflation. Large current account deficits, mainly financed by debt, resulted in a weak net international investment position and large currency mismatches, especially in the private sector sowing the seeds for the Balance of Payments (BoP) “sudden stop” in August 2018. The FX liabilities of the real sector reached 339 billion USD by May 2018 (IIF,2020). Before the elections in June 2018, current account deficit to GDP ratio exceeded 6 per cent and the money needed to rollover private and public sector debt for the coming 12 months surpassed 180 billion USD. The desperate search for new funds did not yield any result and the portfolio flows financing the deficit economy of Turkey lost pace by 2018 (Akçay and Güngen, 2019). In addition, political uncertainty reigns during that period (presidential and parliamentary elections). The value of lira against dollar plummeted, the fastest drop in the history of lira; in a matter of just several months, lira depreciated from 3.78 in January 2018 to intraday high of 7.24 in August 2018 (as of 2 August 2019, USD/TRY is 5.60, and nowadays is 7.47 that is its highest value ever recorded), meaning that Turkish Lira lose more than 90 percent of its value and fell by almost 40 percent in the only month of August .

Consumer price index peaked at 25.24% in October 2018 (highest in a decade), which in fact doubled from August 2017 level. Producer price index saw the largest spike; from 2-3% in October 2016, it almost hit 50%. International investment position dropped significantly after August 2018, which saw further decline after President Erdoğan sacked the CBRT governor. Short-term external debt on a maturity basis is little over \$175 billion (\$75 billion of debt matures in 2019). Interest rates for bank loans and deposits are still very high, this situation has been a huge strain on the economy; peaked at around 26%; currently, approximately 22% for deposits and 30% for commercial loans(Taskinsoy, 2018).

According to CBRT data, residents not only continued to invest in foreign stocks and bonds in a similar tempo to previous months but also transferred abroad massive amounts of their savings through banks between May and August 2018, residents transferred 17.4 billion USD of their savings abroad. GDP growth on a quarter to quarter basis, shown in Figure 5, indicates that there was zero growth in the second quarter of 2018, prior to the currency crisis.

### **6.3 The post-crisis (late 2018-2019)**

After the crisis the first goal was a stabilization of the TL, which consisted of a dramatic increase in interest rates in September 2018 and the announcement of the New Economic Program (NEP) as the key document outlining the main roadmap of policy responses. The NEP assumes that deleveraging has largely been



completed and that further rebalancing will be achieved through high productivity growth in the tradable sector, mostly on account of policy initiatives, including further credit expansion. According to the authorities, tradable sector growth would result in strong import substitution, reducing external imbalances, while the expansion of domestic food production and a shift towards renewable sources of energy should lower food and energy price inflation.

For the last 3 months of 2018 there was a tax reduction in particular in sectors which experienced more difficulties (automotive and household appliances received more helps). According with NEP, growth has since resumed, aided by extensive policy support. Buoyed by expansionary fiscal policy, rapid credit expansion by state-owned banks, and more favorable market sentiment, the economy registered positive growth in the first half of 2019 despite the continued sharp decline in investment. Growth was slightly positive for 2019 as a whole - about 1/4 percent - despite the large negative carryover effects from the 2018 recession (IMF,2019). As market pressures abated, and the current account adjusted, the lira stabilized.

Turkish unemployment rate surged to 14.7% in February 2019, which is the highest level in a decade. Out of the working-age population of 32.3 million, about 14% or 4.2 million people are unemployed; in 2017, only three million were unemployed. The biggest jump was in the youth (between 15 and 24 years old) unemployment rate, surged from circa 17% in 2017 to 23% in 2018 (an increase of 37 percent).

Inflation had reached about 25 percent-five times the target- in October 2018 due, in large part, to high exchange rate pass-through and rising inflation expectations. But strong negative base effects and a lira recovery have since contributed to steep disinflation, although inflation expectations remain well above the target. Following the dismissal of the central bank governor in July 2019 and changes in senior management in August, the CBRT has delivered large policy rate cuts, bringing the official repo lending rate to 14 percent. It also began providing lira liquidity to primary dealers at 100 basis points below the official policy rate and to all participating banks at rates settled under longer-term FX swaps. CBRT still continued its monetary easing with a rate cut of 200 basis points in December and another of 75 basis points in January, thereby reducing the policy rate gradually to 11.25% due to the fact in period between July and December the net funding amount provided through open market operations remained low.

Reserves remain low, despite recent increases, encouraging the use of unconventional policies. At the height of the depreciation in 2018, the authorities imposed measures on the repatriation and conversion of export proceeds, while the Banking Regulation and Supervision Authority (BRSA) capped banks' swap positions to discourage shorting of the lira in the offshore market. Both measures constitute capital flow management measures under the Fund's Institutional View. In

late-March 2019, during a period of lira volatility, reports emerged of large FX interventions through state-owned banks and questions arose over the net reserve position of the CBRT (IMF,2019). In late 2019 the CBRT has started to rebuild reserves, including through the export rediscount credit facility under which credit is provided to exporters in lira and is typically repaid in FX, an indirect form of FX intervention. On 28 December 2019, to support financial stability and the real loan growth-linked reserve requirement practice, reserve requirement ratios for FX deposits and participation funds by were raised by 200 basis points for all maturity brackets, resulting in withdrawal of FX liquidity from the market. Moreover, the CBRT decided to apply these ratios 200 basis points lower for banks that complied with the real loan growth conditions so that these banks would not be affected by this increase.(CBRT,2020)

With the higher fiscal deficit and tight domestic financing conditions, the authorities increased Eurobond issuance and domestic FX debt issuance, drew down Treasury deposits, and shortened borrowing maturities. Lira depreciation, higher interest rates, and lower growth have weighed on the health of the corporate sector. Lira depreciation and weak domestic demand led to strong import compression and a marked improvement in the current account, which was also helped by strong tourism receipts and a normalization of gold imports.

After declining for several years, the primary balance of the central government fell to zero in 2018 (-2.22% of GDP) worsening in 2019 (-2.71% of GDP)<sup>6</sup>, lowest level from the currency crisis of 2001. Central government primary balance is still increasing also in the first half 2020 led by a rising in central government primary budget expenditures by 14.8%.

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<sup>6</sup>data taken from CEIC data

## 7 Analysis of Turkey 2018 currency crisis

It is difficult to place Turkey 2018 case in one of the three generation model of currency crisis because all the models have some familiar points with Turkish episode but also there are some assumption are far from what happened in Turkey in 2018. But, the model which is closer and I decided to choose to analyze the currency crisis is Krugman model written in 1979 and refined by Flood and Garber (1984) due to Krugman tries to identify in government budget deficits the main source of currency crisis; even if in Krugman model the exchange rate is fixed while in Turkey is floating for simplicity I assume that that the TL is pegged with the dollar.

### 7.1 Conventional Approach

#### 7.1.1 Krugman 1979

A fundamental proposition of open-economy macroeconomics is that the viability of a fixed exchange-rate regime requires maintaining long-run consistency between monetary, fiscal, and exchange-rate policies. “Excessive” domestic credit growth leads to a gradual loss of foreign reserves and ultimately to an abandonment of the fixed exchange rate, once the central bank becomes incapable of defending the parity any longer. A large formal literature has focused on the short- and long-run consequences of incompatible macroeconomic policies for the balance of payments of a small open economy in which agents are able to anticipate future decisions by policymakers. In a pioneering paper, Krugman (1979) showed that under a fixed exchange-rate regime, domestic credit creation in excess of money demand growth may lead to a sudden speculative attack against the currency that forces the abandonment of the fixed exchange rate and the adoption of a flexible-rate regime. Moreover, this attack will always occur before the central bank would have run out of reserves in the absence of speculation, and will take place at a well-defined date. First of all we start with the basic model of Agénor and Montiel (2008).” Consider a small open economy whose residents consume a single, tradable good. Domestic supply of the good is exogenous, and its foreign-currency price is fixed. The domestic price level is equal, as a result of purchasing-power parity, to the nominal exchange rate. Agents hold three categories of assets: domestic money (which is not held abroad), and domestic and foreign bonds, which are perfectly substitutable. There are no private banks, so that the money stock is equal to the sum of domestic credit issued by the central bank and the domestic-currency value of foreign reserves held by the central bank. Foreign reserves earn no interest, and domestic credit expands at a constant nominal growth rate. Finally, agents are endowed with perfect foresight.” The model is defined by the following set of

equations:

$$m - p = y - \alpha i \quad \alpha > 0 \quad (3)$$

$$m = \gamma d + (1 - \gamma)R \quad 0 < \gamma < 1 \quad (4)$$

$$\dot{d} = \mu > 0 \quad (5)$$

$$p = e \quad (6)$$

$$i = i^* + \dot{e} \quad (7)$$

All variables, except interest rates, are measured in logarithms.  $m$  denotes the nominal money stock,  $d$  domestic credit,  $R$  the domestic-currency value of foreign reserves held by the central bank,  $e$  the spot exchange rate,  $p$  the price level,  $y$  exogenous output,  $i^*$  the foreign interest rate (assumed constant), and  $i$  the domestic interest rate. [Equation 3](#) relates the real demand for money positively to real income and negatively to the domestic interest rate. [Equation 4](#) is a log-linear approximation to the identity defining the money stock as the stock of reserves and domestic credit, which grows at the nominal rate  $\mu$  ([Equation 5](#)). [Equation 6](#) and [Equation 7](#) define, respectively, purchasing-power parity and uncovered interest parity. Setting  $\delta = y - \alpha i^*$  and combining [Equation 3](#), [Equation 6](#) and [Equation 7](#) yields

$$m - e = \delta - \alpha \dot{e} \quad \delta > 0 \quad (8)$$

Under a fixed exchange-rate regime,  $e$  and  $\dot{e} = 0$ , so that

$$m - \bar{e} = \delta \quad (9)$$

which indicates that the central bank accommodates any change in domestic money demand through the purchase or sale of foreign reserves to the public. Using [Equation 4](#) and [Equation 9](#) yields

$$R = (\delta + \bar{e} - \gamma d)/(1 - \gamma) \quad (10)$$

and using [Equation 5](#)

$$\dot{R} = -\mu/\Theta \quad \Theta \equiv (1 - \gamma)/\gamma \quad (11)$$

[Equation 11](#) indicates that if domestic credit expansion is excessive, reserves are run down at a rate proportional to the rate of credit expansion. Any finite stock of foreign reserves will therefore be depleted in a finite period of time.

### 7.1.2 Flood and Garber 1984

Suppose that the central bank announces at time  $t$  that it will stop defending the current fixed exchange rate after reserves reach a lower bound,  $R_l$ , at which point it will withdraw from the foreign exchange market and allow the exchange rate to float freely thereafter. To avoid losses arising from an abrupt depreciation of the exchange rate at the time of collapse, speculators will force a crisis before the lower bound on reserves is reached. The issue is thus to determine the exact moment at which the fixed exchange-rate regime is abandoned or, equivalently, the time of transition to a floating-rate regime. The length of the transition period can be calculated by using a process of backward induction, which has been formalized by Flood and Garber (1984).

In equilibrium and under perfect foresight, agents can never expect a discrete jump in the level of the exchange rate, because a jump would provide them with profitable arbitrage opportunities. Speculators compare the fixed exchange rate with the exchange rate that would prevail if the exchange rate were free to float (shadow exchange rate) and the reserves have fallen to the minimum. If the shadow floating rate falls below the prevailing fixed rate ( $\tilde{e} < \bar{e}$ ), speculators would not profit from driving the government's stock of reserves to its lower bound and precipitating the adoption of a floating-rate regime, because they would experience an instantaneous capital loss on their purchases of foreign currency. On the other hand, if the shadow floating rate is above the fixed rate ( $\tilde{e} > \bar{e}$ ), speculators would experience an instantaneous capital gain.

To find the solution for the shadow floating exchange rate, which can be written as

$$e = k_0 + k_1 m \quad (12)$$

where  $k_0$  and  $k_1$  are as-yet-undetermined coefficients and, from (Equation 4),  $m = \gamma d + (1 - \gamma)R_l$  when reserves reach their lower level. Taking the rate of change of (Equation 12) and noting from (Equation 4) that under a floating-rate regime  $\dot{m} = \gamma \dot{d}$  yields

$$\dot{e} = k_1 \mu \quad (13)$$

In the post-collapse regime, therefore, the exchange rate depreciates steadily and proportionally to the rate of growth of domestic credit.

Substituting (Equation 13) in (Equation 8) yields, with  $\delta = 0$  for simplicity,

$$e = m + \alpha k_1 \gamma \mu \quad (14)$$

Comparing (Equation 14) and (Equation 12) states that

$$k_0 = \alpha \gamma \mu \quad k_1 = 1 \quad (15)$$

From (Equation 5),  $d = d_0 + \mu t$ .

Using the definition of  $m$  given above and substituting in [Equation 14](#) yields

$$e = \gamma(d_0 + \alpha\mu) + (1 - \gamma)R_l \quad (16)$$

The fixed exchange-rate regime collapses when the the prevailing parity,  $\bar{e} = e$ . From [Equation 16](#) the exact time of collapse,  $t_c$ , is obtained by setting  $\bar{e} = e$ , so that

$$t_c = [\bar{e} - \gamma d_0 - (1 - \gamma)R_l] / \gamma\mu - \alpha \quad (17)$$

or, because, from [Equation 9](#) and [Equation 9](#),  $\bar{e} = \gamma d_0 + (1 - \gamma)R_0$ ,

$$t_c = \Theta(R_0 - R_l) / \mu - \alpha \quad (18)$$

where  $R_0$  denotes the initial stock of reserves.

## 7.2 Does the model fit with Turkish data?

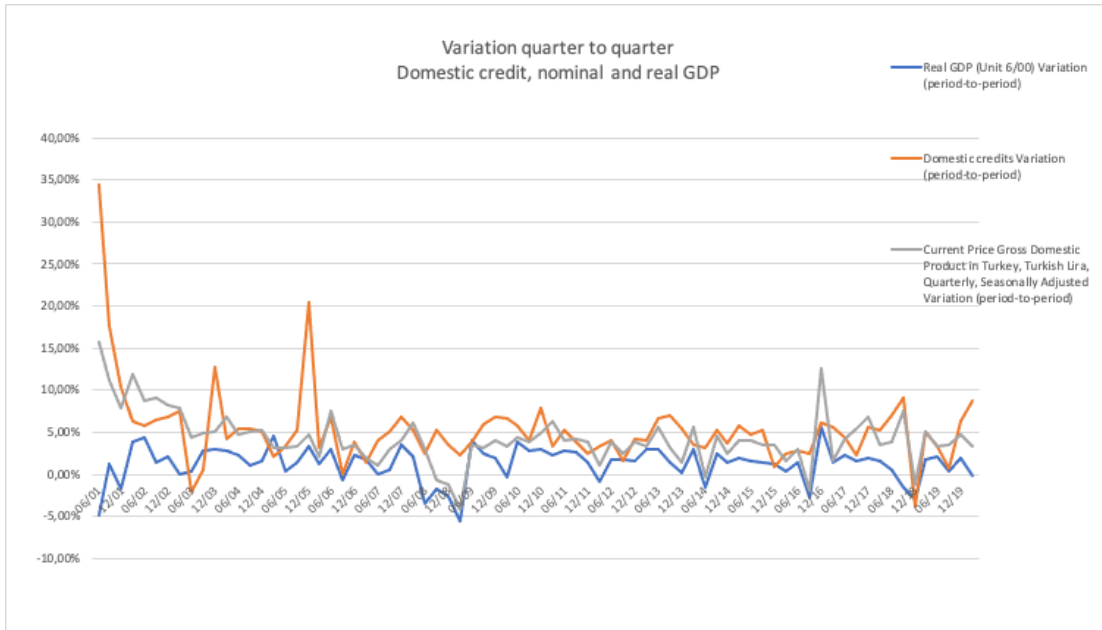
As mentioned at the beginning of this section, I had to assume that the exchange rate is pegged with another currency (for simplicity to find data the chosen currency is US dollar), while in the reality Turkey has a floating exchange rate regime even if is Turkish Lira is a managed flexible exchange rate regime (or dirty float) in which the country's central bank may occasionally intervene in order to direct the country's currency value into a certain direction. This is generally done in order to act as a buffer against economic shocks and hence soften its effect in the economy. So, it is an halfway between a fixed exchange rate and a clean float regime. The data of 2018 in Turkey are summarised in [Table 7](#), [Table 8](#) and [Table 9](#).

Data are not easy to be read, so I summarize the main findings. First of all, I assume that in [Equation 3](#) and [Equation 10](#) all the value are expressed in rate of growth, since money supply and GDP are related a growing in GDP coincides also with an hike in money supply. If the growth in money supply is high enough, reserves could not drop as the model predict. Money supply rose by more than 15% in the two period preceding the crisis. Interest rate hikes to 24 percent in September 2018 while six month before were at a level of 12 percent.

The second table shows one month data wherever are available. Also here we can see a weird behavior of reserves: they have a drop just a little before the currency crisis and they drop consistently the months after the crash (October and November 2018) which is reasonable since the TL lira appreciates by 8% and 8,3% in those periods respectively. To have a clearer situation of the movements of reserves in relation to GDP, domestic credit and exchange rate I plotted two graphs:

### Domestic credit and GDP (Nominal and Real)

(a)



### Exchange rate and foreign reserves (Millions USD)

(b)

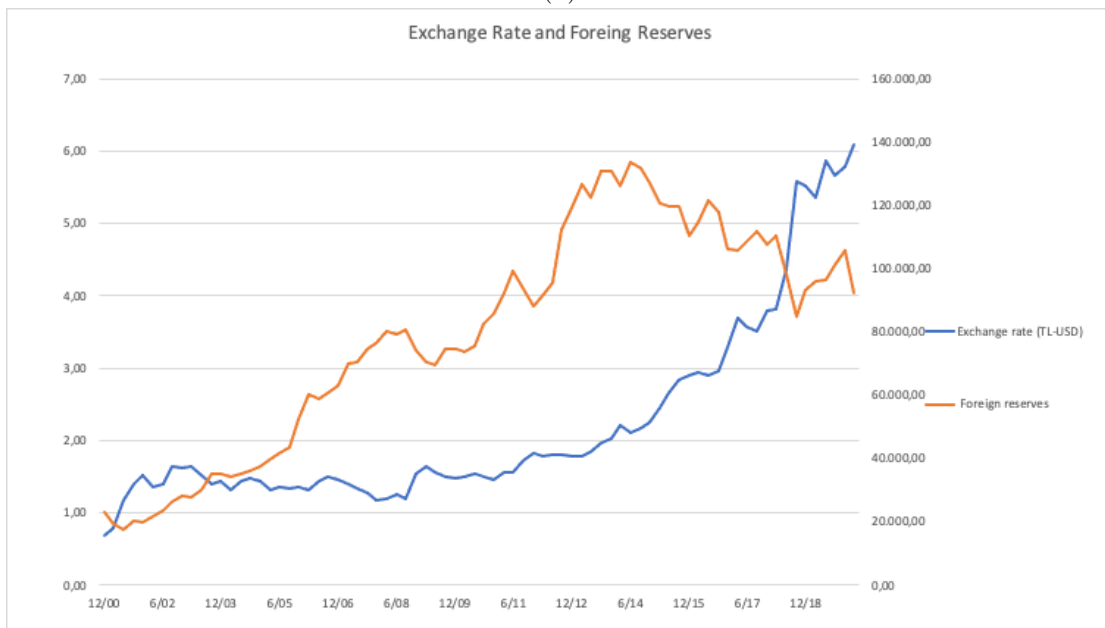


Figure 19: Data taken from CBRT and Fed Reserve of St. Louis

Graphs are not simple to read. Looking in a little deeper way it is possible to understand that rGDP, nominal GDP and domestic credit moves in a very similar paths with different amplitude. In the bottom graph foreign reserves drop in moments when the devaluation of the Turkish Lira is higher, underlying the nature of the Turkish exchange rate regime. Overlapping the two graphs it is possible to see that exchange rate reacts one period later than GDP and domestic credit. Since it is not easy to evaluate the fitness for the model only seeing those data we should go further using a linear regression similar to this :

$$\dot{R}_t = \beta_0 + \beta_1 \dot{y}_t + \beta_2 \dot{d}_t + \beta_3 i_t^* + \epsilon \quad (19)$$

and another one that makes the model more coherent with data:

$$\dot{R}_t = \beta_0 + \beta_1 \dot{y}_t + \beta_2 \dot{d}_t + \beta_3 i_t^* + \beta_4 \dot{e} + \epsilon \quad (20)$$

Results on quarterly data with 78 observation give us a good point to start reasoning how we can improve the model. As mentioned before exchange rate moves a period later than GDP and domestic credit, so it is plausible that also the foreign reserves denominated in domestic currency (our target) moves similarly. I modified the starting model in this way:

$$\dot{R}_t = \beta_0 + \beta_1 \dot{y}_{t-1} + \beta_2 \dot{d}_{t-1} + \beta_3 i_t^* + \beta_4 \dot{e} + \epsilon \quad (21)$$

The results are shown in [Table 5](#).

The result with lag improve the model, two variables are significant at the level of 1 percent, the  $R^2$  is very high and also the R-Adjusted is high too. What is not coherent with the model is the value of interest rate that theoretically should be negative while here in this last regression is positive even if not significant. In conclusion is that we cannot discard the Krugman model, on the contrary it explain more than half the movements of the foreign reserve; of course there multiple motivation that also explain why the model does not explain everything: the lack of monthly data (only GDP in our case is not available) that could give a more precise situation of reserve's trend; maybe some variable that a model like this do not consider like the volatility due to a balance of payment crisis or GDP and domestic credit influenced reserves with more than one lag.

Official reserves are usually used to finance imbalances generated in other voices of the BoP. The import of by domestic resident of foreign products (or in general assets) represent an outflow that it appears as a debit in the financial account. In this case, central bank intervene in foreign exchange markets by selling official reserves. For this reason from the starting model I added another variables which is the import variation period to period. As mentioned in the paragraph before I created other two regression with respectively two and three period lags on GDP



Coefficients	Normal regression	Regression with exchange rate	Regression with one period lag	Regression with one period lag and exchange rate
Intercept	0.002835 (0.015641)	0.015604 (0.013975)	-0.012467 (0.15302)	-0.012095 (0.12085)
Domestic credit variation (p-t-p)	0.689804 ** (0.223095)	0.1146 (0.229639)	0.509506 * (0.211839)	0.162114 (0.175230)
Foreign interest rate	0.001185 (0.005321)	0.003379 (0.004689)	0.005731 (0.005242)	0.005623 (0.004140)
GDP Variation (p-t-p)	0.184051 (0.340245)	0.163718 (0.005242)	0.637385 . (0.327725)	0.705806 ** (0.259026)
Exchange rate variation (p-t-p)		0.494368 *** (0.103309)		0.506656 *** (0.076004)
R <sup>2</sup>	0.2184	0.407	0.2823	0.5586

Table 5: Log regressions to compare the model  
Significance level: '.' 0.1; '\*' 0.05; '\*\*' 0.01; '\*\*\*' 0.001

and domestic credit. The results are shown in the [Table 6](#) and in the appendix ([Figure 26](#), [Figure 27](#) and [Figure 28](#)). The starting model is the regression with one period lag and exchange rate ([Equation 21](#)).

Coefficients	Starting model	Regression with two period lag	Regression with three periods lag	Starting model plus imports
Intercept	-0.012095 (0.12085)	-0.009746 (0.013975)	0.003781 (0.15463)	-0.012967 (0.012155)
D. credit	0.162114 (0.175230)	0.180730 (0.185171)	-0.108288 (0.225422)	0.186301 80.177950)
D. credit lag 2		-0.061867 (0.180262)	-0.064139 (0.184616)	
D. credit lag 3			0.026959 (0.180020)	
Foreign interest rate	0.005623 (0.004140)	0.005831 (0.004393)	0.005007 (0.004359)	0.005184 (0.004181)
GDP Variation)	0.705806 ** (0.259026)	0.739721 ** (0.274925)	0.711015 * (0.297718)	0.653740 * (0.266890)
GDP Variation lag 2		-0.039612 (0.270702)	-0.010288 (0.273459)	
GDP Variation lag 3			-0.006771 (0.284379)	
Exchange rate variation	0.506656 *** (0.076004)	0.504640 *** (0.095423)	0.480368 *** (0.095401)	0.532793 *** (0.082293)
Imports				0.061434 (0.073252)
R <sup>2</sup>	0.5586	0.46	0.3485	0.563

Table 6: Log regressions with lags and imports

**Table 6** does not tell much more than the previous table did. Regression with lags worsen the model, coefficient are not significant and the F-Statistic dropped and also the  $R^2$  goes down meaning that the reserves are not affected by GDP and domestic credit with a lag higher than one period.

Imports are meaningless in the regression, surprisingly compared to what one would expect. Usually, if in the previous period the GDP increased the current account should decrease and vice versa. These movements, therefore, affect the level of reserves. This result lead me to affirm that Krugman model is already completed with those variables. The assumption that Turkey is under a fixed rate regime and the model is simply made with variation period to period of the variables (while Krugman suppose log-linear equation) probably play an important rule in the definitions of the whole model, in addition some variables can not be measured for example variability and people's fear in period of rapid devaluation of a currency which could improve the predictability value of the model.

## 8 Conclusion

With this paper, it emerges that Turkey had and still has a lot of vulnerability that started from the development of depend financialisation. Money lent from international financial markets mainly financed state borrowing in the 1990s, and these inflows helped Turkish Lira to appreciate and diminish the competitive attractiveness of many corporations in the longer term. Credit expansion in Turkey, starting in the early 2000s, brought formerly excluded segments of society into the loan market and the government decision to open borrowing operation in foreign currency increases the external debt in USD. Turkey continue along this path for too much time till the currency crisis of 2018.

Through the first generation model of currency crisis (Krugman), I tried to give a more complete explanation about the currency crisis and how this model can predict the movements of the reserves, even with some important constraints. An analogue lecture could be done for the 2020 of Turkey and the TL in particular that loses more than 25% against the dollar between January and August and the Turkish currency was the worst performer throughout the year. The result that the regression model still explain those movements, even are more highlighted. Real interest rate is negative inflation year-over-year is by far higher than 10% and the foreign reserves reached a new low in August (40 billions), that means that in domestic currencies are almost 290 billions in Turkish Lira while it started year at a level of 440 billions of TL, this means that Turkey's gross-currency reserves have fallen at a much faster pace than the few peers that have also seen a reduction. Most emerging markets have preserved or increased their cash piles even as the trade slump undermines export revenue (Bloomberg,2020).

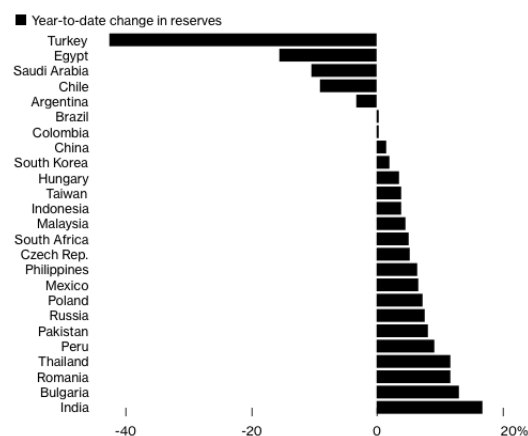


Figure 20: Changing in reserves  
Taken from <https://www.bloomberg.com/>

The dynamics on output, which is in negative sign for both of the first two quarters compared to the previous one; and on exchange rate lead to accept once again the model and also the values of coefficients. Returning on current events in May interest rate reach the low of 8.25% while there was an boom in domestic credit growth by almost 40% from March to June with a peak in May and 29 percent y-o-y by August. Until August, according to an estimate by US investment bank Goldman Sachs, the country has spent \$65 billion (€55.2 billion) this year on managing its currency. As a result, its gross currency buffers have dropped by more than a third this year.

Timothy Ash, senior emerging markets sovereign strategist at BlueBay Asset Management on the recent devaluation in august stated "the hard defense of the lira around the 6.85 had failed. They blew \$65 billion in defense of the lira and for little benefit as they are now accepting they have to let the lira go weaker to balance out the external financing requirement". Even with the opposition of President Erdogan (who hates hiking interest rates) in September, the CBRT decided to increase the policy rate by 200 basis points to restore the disinflation process and support price stability. The Banking Regulatory and Supervision Agency (BRSA) introduced forbearance measures that relaxed the definitions of nonperforming loans and Stage-2 loans, making it challenging to assess banks' true asset quality.

What the future holds for Turkey? World bank in its economic outlook said the Turkish economy will decline by 3.8 percent in 2020, led by the massive deterioration in the current account due to its high integration in global value chains and dependence on tourism and transport two of the most heavily affected sectors by Covid-19, lower consumption on the demand side, and declines in both services and manufacturing output. Economic growth could recover to 4 percent in 2021 and 4.5 percent in 2022. Inflation is expected to average nearly 12 percent over 2020 and fall to 9.4% at the end of 2021 and 2022. The current account is expected to remain in deficit over these years, as exports struggle to fully recover while global markets continue to suffer from weaker demand. The general government deficit for 2020 is projected to increase to 5.4 percent of GDP. Turkey's external risk profile is heightened as gross international reserves have fallen and can now scarcely cover one year's national debt service, with much of the reserves borrowed from the banking sector.

Although Turkey's vulnerability have been exacerbated during last year, they are not insurmountable. Turkey must learn from its mistakes made after crises of 1994,2001 and 2018. They should set the economy on a path to stronger and more resilient growth moving the focus from short-run growth to medium/long-term growth. I have two personal suggestions to move Turkey's focus. The first one is the stabilization of Turkey's fiscal deficit (has deteriorated by almost 2% in

the last two years)and therefore the stabilization of debt. The second one is about the human capital: Turkey's population is expected to grow to 90 million and young compared to advanced economies; government should invest in education to improved the quality of human capital (high skill);the positive developments would be able to support a gradual move towards higher value-added industries, potentially allowing a number of centres of excellence.

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## A Percentage of credit booms turned into crisis

	Banking crises <sup>2/</sup>				Currency crises <sup>3/</sup>				Sudden Stops <sup>4/</sup>			
	Before	Peak Boom	After	Total	Before	Peak Boom	After	Total	Before	Peak Boom	After	Total
All countries	0.11	0.08	0.24	0.44	0.23	0.08	0.23	0.54	0.04	0.06	0.14	0.24
Industrial Countries	0.06	0.06	0.25	0.36	0.17	0.03	0.25	0.44	0.00	0.00	0.14	0.14
Emerging Market Economies	0.17	0.11	0.23	0.51	0.29	0.14	0.20	0.63	0.09	0.11	0.14	0.34

Figure 21: Percentage of credit booms turned into crisis  
*Taken from Mendoza and Terrones (2008)*

## B Turkey data

	Domestic credits	Nominal money stock (Billions)	Foreign interest rate	Overnight turkish interest rate	Current Price Gross Domestic Product in Turkey, Turkish lira, Quarterly, Seasonally Adjusted	Foreign reserves	Exchange rate (TL-USD)	Domestic-currency value of foreign reserves (Millions TRY)
	Turkish lira (Thousand)	Turkish lira (Thousand)	%	%	Turkish lira (Thousand)	USD (Millions)		Turkish lira (Millions)
31/12/2000	61.253.920,48	33.530.572,00			47.581.128,29	23.369,00	0,68	15.804
31/3/2001	71.768.791,10	40.861.811,00	6,40	81,19	51.170.458,40	19.607,00	0,78	15.327
30/6/2001	96.437.434,10	41.952.137,00	5,31	63,00	50.140.928,28	17.643,00	1,18	20.836
30/9/2001	113.511.863,50	44.700.964,00	3,97	59,03	85.840.418,72	20.217,00	1,39	26.164
31/12/2001	125.206.383,38	49.422.890,00	3,57	59,00	71.006.392,07	19.961,00	1,52	30.426
31/3/2002	133.030.591,43	52.673.083,00	2,02	54,73	79.432.045,65	21.608,00	1,36	29.351
30/6/2002	140.717.466,80	56.418.624,00	1,73	48,00	86.399.429,90	23.446,00	1,40	32.932
30/9/2002	149.710.039,30	60.356.627,00	1,75	46,00	94.131.935,20	26.164,00	1,64	43.145
31/12/2002	159.793.773,24	64.802.152,00	1,75	44,00	102.046.000,00	28.094,00	1,61	45.301
31/3/2003	171.681.475,20	69.567.189,00	1,24	44,00	110.029.000,00	27.791,00	1,65	45.767
30/6/2003	168.069.246,50	73.875.612,00	1,25	38,23	114.858.000,00	29.955,50	1,52	45.198
30/9/2003	168.868.894,70	81.584.082,00	1,22	30,05	120.553.000,00	35.349,90	1,39	49.096
31/12/2003	180.454.427,81	88.104.608,00	1,11	16,00	126.732.000,00	35.169,10	1,44	50.581
31/3/2004	198.364.209,60	90.806.690,00	0,96	12,98	135.470.000,00	34.428,30	1,33	45.706
30/6/2004	208.943.289,40	104.992.913,00	1,10	12,00	141.783.000,00	35.396,80	1,45	51.120
30/9/2004	220.248.999,20	110.568.755,00	1,03	10,44	140.949.000,00	36.217,40	1,47	53.289
31/12/2004	231.579.771,96	115.839.027,00	1,11	10,69	156.683.000,00	37.611,90	1,44	54.520
31/3/2005	236.430.764,90	122.800.222,00	1,16	15,57	151.530.000,00	39.640,80	1,32	52.343
30/6/2005	244.261.256,40	137.705.399,00	1,13	14,30	156.583.000,00	41.605,80	1,36	56.486

Table 7: Quarterly Turkish data (Part 1)  
CBRT, Turkstat World Bank data

30/0/2005	256.009.853,30	150.443.079,03	5,04	10,25	172.072.030,04	49.529,00	1,55	56,09%
31/12/2005	300.473.679,05	261.306.434,80	8,62	19,57	180.061.030,04	52.378,00	1,52	70,71%
31/3/2006	313.049.128,28	270.658.557,50	4,26	13,56	182.706.066,04	60.498,10	1,38	80,15%
30/06/2006	349.084.485,47	302.530.958,20	4,59	15,06	177.062.066,04	59.017,70	1,48	85,54%
30/9/2006	340.853.406,88	303.201.593,40	4,56	17,55	209.572.066,04	60.798,00	1,49	80,25%
31/12/2006	354.010.562,06	318.366.185,20	5,25	17,56	240.515.066,04	63.185,50	1,45	81,64%
31/3/2007	359.149.748,81	326.211.468,72	5,26	17,56	234.765.066,04	69.035,60	1,40	78,30%
30/06/2007	373.731.218,13	341.570.798,33	5,26	17,56	227.071.030,04	70.656,70	1,33	84,13%
30/09/2007	392.753.214,25	357.160.801,55	5,25	17,30	223.430.030,04	74.064,80	1,29	95,50%
31/12/2007	419.664.812,13	368.120.186,37	4,64	15,06	222.007.066,04	76.415,00	1,19	90,56%
31/3/2008	441.755.153,71	397.854.044,54	4,24	15,75	246.789.066,04	85.631,30	1,20	85,76%
30/06/2008	452.353.642,48	401.418.139,27	2,61	16,06	254.014.066,04	79.422,70	1,25	89,24%
30/09/2008	476.122.514,52	423.287.905,21	2,09	16,75	252.442.066,04	80.861,60	1,29	87,37%
31/12/2008	492.389.696,81	426.142.246,15	1,83	15,03	249.577.066,04	70.258,90	1,32	112,84%
31/3/2009	503.629.219,30	471.548.548,20	0,56	11,03	238.812.030,04	70.567,60	1,85	116,43%
30/06/2009	522.779.754,50	475.728.498,60	0,58	9,03	247.228.030,04	69.362,80	1,57	106,60%
30/09/2009	553.824.373,20	485.154.804,00	0,21	7,58	254.052.066,04	74.647,20	1,49	111,48%
31/12/2009	591.587.947,50	518.007.376,70	0,15	6,52	265.266.066,04	74.826,90	1,48	110,85%
31/3/2010	531.174.920,40	534.197.625,10	0,32	8,50	272.546.066,04	73.608,80	1,50	510,51%
30/06/2010	667.022.908,40	557.691.061,30	0,76	0,50	285.237.030,04	75.061,40	1,32	115,87%
30/09/2010	692.676.451,00	571.770.870,60	0,58	6,30	296.687.030,04	62.526,80	1,51	124,54%
31/12/2010	700.241.842,43	617.442.358,16	0,59	1,03	311.081.030,04	65.067,90	1,46	125,24%
31/3/2011	713.210.742,50	642.048.072,03	0,38	1,56	320.087.030,04	62.142,50	1,52	144,69%
30/06/2011	813.599.807,80	573.338.126,56	0,34	1,56	342.861.066,04	69.379,30	1,90	154,86%
30/9/2011	845.512.146,80	598.058.593,57	0,05	5,06	355.266.066,04	65.812,10	1,78	161,56%
31/12/2011	806.004.245,13	708.766.982,76	0,08	5,06	372.124.066,04	88.340,20	1,83	161,77%
31/3/2012	805.488.523,50	709.526.530,63	0,01	5,06	375.884.030,04	61.342,00	1,79	163,51%
30/06/2012	821.001.878,27	735.846.398,18	0,13	5,06	390.404.030,04	65.493,90	1,80	171,69%
30/09/2012	805.637.453,50	759.474.076,30	0,16	5,06	399.292.030,04	112.085,60	1,80	201,17%
31/12/2012	805.636.356,00	781.475.092,72	0,14	5,06	425.116.030,04	110.167,50	1,79	212,54%

Table 8: Quarterly Turkish data (Part 2)  
*CBRT, Turkstat World Bank data*



31/3/2013	1 024 002 059,20	806 055 290,52	0,16	3,50	426 864 000,00	120 895,30	1,78	275 540
30/6/2013	1 091 890 190,80	809 675 872,52	0,16	3,50	452 952 000,00	122 817,50	1,00	275 520
30/9/2013	1 168 176 344,20	815 580 056,65	0,09	3,50	487 359 000,00	130 761,70	1,97	257 188
31/12/2013	1 272 360 421,80	868 560 546,65	0,08	3,50	494 232 000,00	131 954,70	2,09	246 408
31/3/2014	1 276 157 517,70	905 242 048,59	0,09	5,06	500 424 000,00	128 051,20	2,22	278 512
30/6/2014	1 337 180 414,20	985 377 927,18	0,08	5,06	495 950 000,00	133 534,10	2,11	281 378
30/9/2014	1 385 404 098,70	1 038 588 396,58	0,10	7,50	521 327 000,00	131 840,10	2,16	284 875
31/12/2014	1 435 856 355,10	1 070 136 917,08	0,05	7,50	534 196 000,00	127 308,00	2,26	287 866
31/3/2015	1 518 142 624,80	1 117 361 795,51	0,12	7,25	555 653 000,00	120 742,40	2,46	295 766
30/6/2015	1 590 582 522,30	1 155 738 406,30	0,11	7,25	578 340 000,00	119 508,00	2,67	318 916
30/9/2015	1 675 277 511,30	1 250 267 060,97	0,13	7,25	590 168 000,00	119 682,00	2,00	340 114
31/12/2015	1 690 745 971,70	1 232 262 803,91	0,10	7,25	618 800 000,00	110 583,00	2,91	325 251
31/3/2016	1 714 380 890,60	1 264 540 018,89	0,20	7,25	620 818 000,00	114 590,00	2,90	337 130
30/6/2016	1 780 071 300,87	1 305 864 385,22	0,36	7,25	647 511 000,00	120 793,50	2,88	351 364
30/9/2016	1 824 464 301,87	1 346 519 606,61	0,39	7,25	635 092 000,00	117 866,00	2,96	348 660
31/12/2016	1 910 784 183,97	1 452 354 633,00	0,00	7,25	715 318 000,00	108 111,30	3,28	347 828
31/3/2017	1 044 360 467,54	1 490 620 506,19	0,50	7,25	726 280 000,00	105 897,00	3,09	380 154
30/6/2017	2 154 780 898,80	1 502 194 358,17	0,79	7,25	756 755 000,00	108 705,10	3,58	389 017
30/9/2017	2 180 882 258,55	1 513 208 579,90	2,04	7,25	797 967 000,00	111 940,00	3,51	393 458
31/12/2017	2 304 610 790,79	1 555 379 870,92	1,15	7,25	852 592 000,00	107 730,00	3,85	408 884
31/3/2018	2 425 507 958,89	1 744 515 345,07	1,30	7,25	882 477 000,00	110 288,00	2,51	420 594
30/6/2018	2 594 716 686,75	1 875 337 445,42	1,51	10,25	917 009 000,00	98 385,00	4,37	428 651
30/9/2018	2 851 285 780,26	2 077 795 541,52	1,52	27,50	985 413 000,00	84 714,00	5,58	472 888
31/12/2018	1 720 065 941,50	1 944 690 000,14	1,55	22,50	975 617 000,00	91 026,00	5,52	511 159
31/3/2019	1 857 180 091,27	2 172 575 202,81	2,27	22,50	1 021 500 000,00	90 207,00	5,30	515 543
30/6/2019	2 250 394 314,11	2 254 588 885,68	2,01	22,50	1 057 420 000,00	90 320,00	5,07	585 880
30/9/2019	2 271 074 395,85	2 354 207 250,15	2,30	15,00	1 093 880 000,00	100 115,00	5,07	575 520
31/12/2019	3 160 186 711,00	2 554 042 033,00	2,04	10,50	1 145 400 000,00	105 690,00	5,75	600 480
31/3/2020	1 414 800 907,12	2 794 965 280,36	1,59	8,25	1 182 950 000,00	92 145,00	0,09	560 512

Table 9: Quarterly Turkish data (Part 3)  
*CBRT, Turkstat World Bank data*

## C Regressions results

```

Residuals:
    Min       1Q   Median       3Q      Max
-0.17683 -0.03783 -0.01031  0.03126  0.24449

Coefficients:
                Estimate Std. Error t value Pr(>|t|)
(Intercept)      0.002835   0.015641    0.181  0.85666
dati$Domestic.credits.Variation..period.to.period.  0.689804   0.223095    3.092  0.00282 **
dati$Foreign.interest.rate      0.001185   0.005321    0.223  0.82436
dati$GDP.Variation..period.to.period.      0.184051   0.340245    0.541  0.59020
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.07495 on 73 degrees of freedom
(1 observation deleted due to missingness)
Multiple R-squared:  0.2184,    Adjusted R-squared:  0.1863
F-statistic:  6.8 on 3 and 73 DF,  p-value: 0.0004176

```

Figure 22: Log regression quarterly measurement

```

Coefficients:
                Estimate Std. Error t value Pr(>|t|)
(Intercept)      0.015604   0.013975    1.117   0.268
dati3$Domestic.credits.Variation..period.to.period.  0.114600   0.229639    0.499   0.619
dati3$Foreign.interest.rate      0.003379   0.004689    0.721   0.474
dati3$GDP.Variation..period.to.period.      0.163718   0.298445    0.549   0.585
dati3$Exchange.rate.Variation..period.to.period.    0.494368   0.103309    4.785 8.83e-06 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.06574 on 72 degrees of freedom
(1 observation deleted due to missingness)
Multiple R-squared:  0.407,    Adjusted R-squared:  0.3741
F-statistic: 12.35 on 4 and 72 DF,  p-value: 1.057e-07

```

Figure 23: Log regression quarterly measurement and exchange rate

Coefficients:

	Estimate	Std. Error	t value	Pr(> t )
(Intercept)	-0.012467	0.015302	-0.815	0.4179
lag(dati\$Domestic.credits.Variation..period.to.period., 1)	0.509506	0.211839	2.405	0.0187 *
dati\$Foreign.interest.rate	0.005731	0.005242	1.093	0.2779
lag(dati\$GDP.Variation..period.to.period., 1)	0.637385	0.327725	1.945	0.0557 .

---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.07182 on 72 degrees of freedom  
(2 observations deleted due to missingness)  
Multiple R-squared: 0.2823, Adjusted R-squared: 0.2524  
F-statistic: 9.439 on 3 and 72 DF, p-value: 2.45e-05

Figure 24: Log regression quarterly measurement with lags

Coefficients:

	Estimate	Std. Error	t value	Pr(> t )
(Intercept)	-0.012095	0.012085	-1.001	0.32032
lag(dati\$Domestic.credits.Variation..period.to.period., 1)	0.162114	0.175230	0.925	0.35802
dati\$Foreign.interest.rate	0.005623	0.004140	1.358	0.17868
lag(dati\$GDP.Variation..period.to.period., 1)	0.705806	0.259026	2.725	0.00809 **
dati\$Exchange.rate.Variation..period.to.period.	0.506656	0.076004	6.666	4.78e-09 ***

---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.05672 on 71 degrees of freedom  
(2 observations deleted due to missingness)  
Multiple R-squared: 0.5586, Adjusted R-squared: 0.5337  
F-statistic: 22.46 on 4 and 71 DF, p-value: 5.146e-12

Figure 25: Log regression quarterly measurement with lags and exchange rate

Coefficients:

	Estimate	Std. Error	t value	Pr(> t )
(Intercept)	-0.009746	0.013867	-0.703	0.48457
lag(dati2\$Domestic.Credits.Variation..period.to.period., 1)	0.180730	0.185171	0.976	0.33252
lag(dati2\$Domestic.credits.Variation..period.to.period., 2)	-0.061867	0.180262	-0.343	0.73250
dati2\$Foreign.interest.rate	0.005831	0.004393	1.327	0.18884
lag(dati2\$GDP.Variation..period.to.period., 1)	0.739721	0.274925	2.691	0.00897 **
lag(dati2\$GDP.Variations..period.to.period., 2)	-0.039612	0.270702	-0.146	0.88409
dati2\$Exchange.rate.Variation..period.to.period.	0.504640	0.095423	5.288	1.42e-06 ***

---  
Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.05784 on 68 degrees of freedom  
(3 observations deleted due to missingness)  
Multiple R-squared: 0.46, Adjusted R-squared: 0.4124  
F-statistic: 9.656 on 6 and 68 DF, p-value: 1.133e-07

Figure 26: Starting model with 2 period lags on GDP and on domestic credit

```

Coefficients:
                                Estimate Std. Error t value Pr(>|t|)
(Intercept)                    0.003781  0.015463  0.245  0.8076
lag(dati2$Domestic.Credits.Variation..period.to.period., 1) -0.108288  0.225422 -0.480  0.6326
lag(dati2$Domestic.credits.Variation..period.to.period., 2) -0.064139  0.184616 -0.347  0.7294
lag(dati2$Domestic.credit.Variation..period.to.period., 3)  0.026959  0.180020  0.150  0.8814
dati2$Foreign.interest.rate    0.005007  0.004359  1.149  0.2549
lag(dati2$GDP.Variation..period.to.period., 1)              0.711015  0.297718  2.388  0.0198 *
lag(dati2$GDP.Variations..period.to.period., 2)            -0.010288  0.273459 -0.038  0.9701
lag(dati2$GDP.variation..period.to.period., 3)              -0.006771  0.284379 -0.024  0.9811
dati2$Exchange.rate.Variation..period.to.period.            0.480368  0.095401  5.035 4.04e-06 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.05704 on 65 degrees of freedom
(4 observations deleted due to missingness)
Multiple R-squared:  0.3485,    Adjusted R-squared:  0.2683
F-statistic: 4.346 on 8 and 65 DF,  p-value: 0.0003079

```

Figure 27: Starting model with 3 period lags on GDP and on domestic credit

```

Coefficients:
                                Estimate Std. Error t value Pr(>|t|)
(Intercept)                    -0.012967  0.012155 -1.067  0.2897
lag(dati$Domestic.credits.Variation..period.to.period., 1)  0.186301  0.177950  1.047  0.2987
dati$Foreign.interest.rate    0.005184  0.004181  1.240  0.2192
lag(dati$GDP.Variation..period.to.period., 1)              0.653740  0.266890  2.449  0.0168 *
dati$Exchange.rate.Variation..period.to.period.            0.532793  0.082293  6.474 1.12e-08 ***
dati$Import..period.to.period.  0.061434  0.073252  0.839  0.4045
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.05684 on 70 degrees of freedom
(2 observations deleted due to missingness)
Multiple R-squared:  0.563,    Adjusted R-squared:  0.5317
F-statistic: 18.03 on 5 and 70 DF,  p-value: 1.877e-11

```

Figure 28: Starting model with import