RAPID CREDIT GROWTH IN AZERBAJAN: CONVERGENCE OR BOOM? MACROECONOMIC IMPLICATIONS OF FAST CREDIT EXPANSION

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Abstract

This thesis investigates a credit boom in Azerbaijan in 2008 year. I also employ VECM to my model to figure out long-run and short-run dynamics and equilibrium level of credit. This paper also studies macroeconomic implications of high credit expansion. The study shows that credit boom creates non-trivial risk for macro aggregates and is followed by financial crisis in the economy.

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To the dearest memory of my father

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CHAPTER 1: INTRODUCTION

A good introduction to the work is almost the half of the success.
Haydar Aliyev

This thesis contributes to the detection and identification of credit booms in Azerbaijan in the period of 2000-2009 years. This issue has been the primary topic of many empirical researches in the last decade. Gourinchas et al. (2001) and Mendoza and Terrones (2008) discuss this issue in more detailed form and get interesting results though their methods of finding credit booms are different. In this study, I apply simple Hodrick-Prescott (HP) filter used by Mendoza and Terrones (2008) to analyze the difference between ordinary credit expansions and credit booms. Employing all their methods I find that Azerbaijan faced credit boom conditions in the May-October of 2008. This period is consistent with the period of significant fluctuations in macroeconomic aggregates, where these changes are typical for credit booms.

This paper also studies the macroeconomic implications of rapid credit expansions, determines the long-run and short-run equilibrium of credit level. The data for this study is obtained from the Central Bank of Azerbaijan Republic (CBAR). I take the sample of 120 monthly observations of the period 2000-2009 years. Here, I use credit/GDP ratio which is the primary indicator of financial deepening process that causes credit booms. Hofmann (2001), Duenwald et al. (2005) indicate credit to GDP ratio as the equilibrium level of credit and discuss the implications of the expansions in credit to the private sector on the main economic indicators. To discuss macroeconomic implications of fast credit growth, Cottarelli et al. (2003) exploit this fundamental in their model based

on a panel estimation from the developing and industrial countries of Central and Eastern Europe and Balkans. As the main determinants of the equilibrium level of credit I employ real GDP per capita (PPP-based), real effective exchange rate, real interest rate, inflation, oil prices and the openness of trade (proxy for the tradable sector) to learn the association of these fundamentals with the credit level. To identify the stationarity conditions of these fundamentals I make use of the unit root tests, both Augmented Dickey-Fuller (ADF) and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) tests. Estimations allow us to say that all the variables are integrated of order one, that is, we get the non-stationary conditions for these aggregates. Then I switch to cointegration tests to investigate the long-run relationships of the variables and identify the long run equation for credit to GDP ratio. Based on Johansen's (1995) approach to cointegration analysis it turns out that the long-run development of credit can not be explained by all the fundamentals that intuitively could be considered as the determinants of credit level. But once inflation and openness variables are excluded from the model I am able to identify the long-run equilibrium of credit. Moreover, I find that there is a one cointegration among the variables, so I decide to set up a VECM (Vector Error Correction Model) to learn the short-run dynamics of credit expansion. VECM framework provides estimates of both the short-run equilibrium value of the credit to the private sector and the dynamic adjustment path to its long-run equilibrium. The coefficients of the error terms in VECM imply that credit converges to its long-run equilibrium.

This research about credit expansions in Azerbaijan also links the rapid credit growth to the financial crisis happened in 2008. There are several studies that discuss this issue with the empirical approaches. For instance, Kaminsky and Reinhart (1996) analyze

the Mexican and Asian case and conclude that credit bubble is an important preceding factor causing banking and currency crises. Schadler et al. (2004) also argue the risk of banking crisis after rapid credit expansions in Central and Eastern Europe. This thesis also reemphasizes the findings of Mendoza and Terrones (2008) who find a large likelihood of financial crises with the credit booms, as my study also shows a significant connection between the credit bubble found in 2008 May-October period and the financial crisis in 2008.

Reiner et al. (2007) discuss the issue of appreciating domestic currency in the countries facing credit booms. This thesis also shows the similar results in the case of Azerbaijan in 2000-2009 years, especially in the period of financial crisis in 2008. This should also be mentioned that CBAR pursues the fixed exchange rate policy in Azerbaijan; hence nominal interest rates do not change as a result of credit booms, just real effective exchange rate slightly decreases (the domestic currency appreciates).

CHAPTER 2: RECENT ECONOMIC OVERVIEW IN AZERBAIJAN

Azerbaijan produced more than half of the world's oil supply at the beginning of the 20th century[1]

Azerbaijan is located in the South Caucasus region, bordering Caspian Sea from the east, between Iran and Russia, with a small European portion in the north of the Caucasus range. Historically, Azerbaijan has been in the interest of the big countries because of its strategic-geographical position. After gaining independence in 1991, Azerbaijan became a member of the International Monetary Fund (IMF), the World Bank, the European Bank for Reconstruction and Development, the Islamic Development Bank and the Asian Development Bank. Country encompasses lots of different natural resources; in particular it is rich in oil-gas sector. Oil and gas serve as a large part in Azerbaijan's industry, it accounts for more than 80% of exports and 50% of GDP. Oil production was about 450 million barrels in 2008. GDP is also growing every year; it was estimated at 10.8% in 2008, including 7% in the oil sector and 15.7% in the non-oil sector. The national currency, Azerbaijani manat)[2] was established in 1992, since then all kind of monetary transactions have been conducted in this currency.

The banking system's portfolio did not face any kind of negative changes during the financial crisis period, in 2008. Despite of unfavorable surroundings, Azerbaijan's banking system demonstrated its ability to withstand the emerging risks. Progress in

[1] From the report of the Chairman of the Central Bank Management Board
[2] On 1 January, 2006 a new manat, AZN was introduced (at a value of 5000 old manat) with the denomination due to inflation. 1 USD = 0.8036 AZN, 1 EUR = 1.0164 AZN

banking sector is essential for Azerbaijan, because an efficient banking system is crucial for the development of non-oil sector of the country and it plays a pivotal role in reducing the country's dependency on the oil. Banking sector includes more than 40 commercial banks, 2 state owned banks, and assets in this sector are estimated at about 4.4 billion USD. Banking sector in Azerbaijan has undergone significant changes and improvements; combined with favorable investment climate, it is posed for further growth and enhancement.

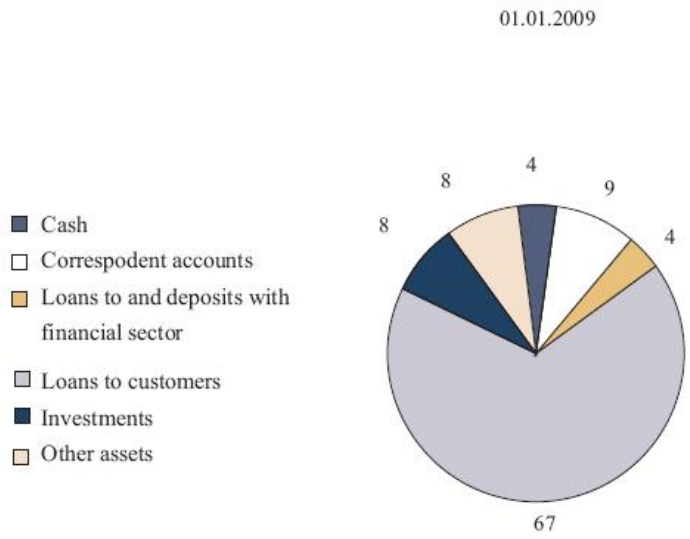

Figure 1: Structure of banking sector's assets, % (Source: Central Bank of Azerbaijan Republic, 2008)

The total bank assets increased by AZN 3547.9 million or 52.7% totaling to AZN 10273.5 million as of January 1, 2009. This is a quite considerable amplification in bank assets for Azerbaijan. As it is seen from above figure, a huge division (67%) of whole assets is the loans given to customers. That indeed shows the significance of credit loans in Azerbaijan's banking sector. Given loans played a substantial role in the increase of

profit for small firms and organizations, as well as for individuals. Therefore, The Central Bank of the Azerbaijan Republic, henceforth CBAR, pursued policy about keeping the banking systems harmless from the negative impact of the misbalance at the international financial market. During the reported period, the banks' loan portfolio increased in scope in addition to continuing to improve in terms of quality.

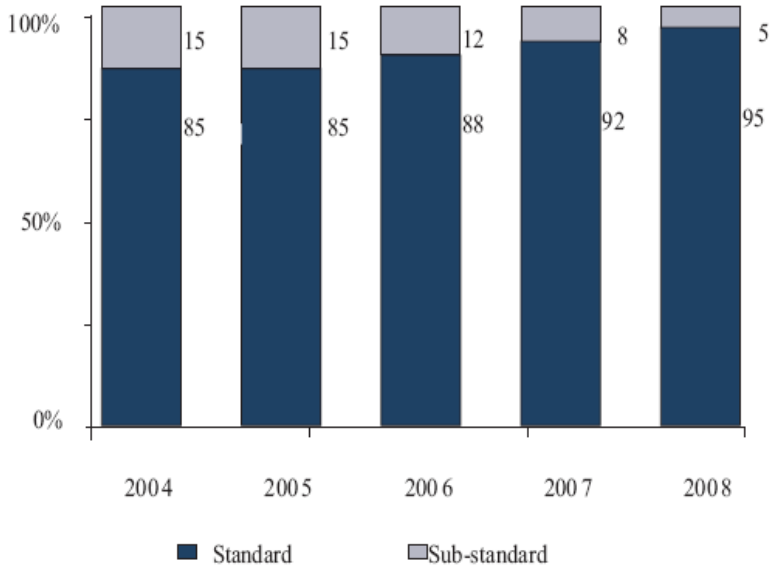

Figure 2: Quality of loan portfolio, % (Source: Central Bank of Azerbaijan Republic, 2008)

Because of the rigid asset classification, quality of loans increased in 2008. The possible loan loss provisioning requirements were increased. As of January 1, 2009 the possible loan loss provisions amounted to 6.2 % of loan portfolio (5.7% as of January 1, 2008).

CHAPTER 3: LITERATURE REVIEW

Knowledge is a treasure – the more you use the more it increases, the less you use the more it diminishes. (A Chinese proverb)

A quite large number of empirical researches and studies have been conducted both to identify credit booms and analyze the effects of credit booms on macroeconomic indicators. Identifying credit expansions and characterizing economic fluctuations through the comparison of emerging and industrial economies were the main interests of these studies. Gourinchas, Valdes and Landerretche (2001), were the first who introduced threshold methods to the analysis of credit booms. Their method also encompasses the introduction of thresholds that are common to all the countries of interest in their study. Moreover, Gourinchas et al. (2001) analyze relationship of boom episodes with the financial crises. They compare the probability of having a banking crisis before and after a boom episode with the probability of experiencing such a crisis during tranquil periods.[3] The authors use basic information from Caprio and Klinguebiel (1997) who construct a large database on banking crisis episodes. According to Caprio and Klinguebiel (1997) a banking crisis occurs when the net worth of the banking sector has been almost completely eliminated.

Another approach to the identification of credit booms is made by Mendoza and Terrones (2008). Their method for determining credit booms is different from the one used by Gourinchas et al. The fundamental that they use to measure a credit boom and

[3] For more information see "Lending Booms: Latin America and the world"

the ways of detecting the booms are quite different in their study. I talk more briefly about this issue in Chapter 3.

Kaufmann and Valderrama (2007) examine the relation between credit and asset prices in the transmission of shocks to the real economy in the Euro area and U.S. In their study they show how credit aggregates and asset prices reinforce each other and the role of credit aggregates in the upsurge of financial disparities. They use a non-linear vector autoregression to model the asymmetric transmission of shocks through credit and asset markets. After estimating the model for both regions they show whether there are differences in the role of asset prices and credit loans in the transmission mechanism between an economy characterized by a bank-based and a market based financial system respectively. They find that monetary policy may not necessarily achieve monetary stability and that in Euro zone credit growth may provide as an indicator for future liquidity prospects because it contains information about future inflation forecast.

There are also some articles that contribute to definitions of credit aggregates that serve as a background for better understanding of credit and its expansions. Collins, Thorp and White (1999) investigate the role of credit in the transmission mechanisms.[4] This article supports its findings by empirical evidences in New Zealand provided by Reserve Bank of this country.

Cotarelli et al. (2003) write about bank credit growth to the private sector in the case of Central and the Eastern Europe and the Balkans. They run a regression using the panel data method to learn the effect of macroeconomic indicators on bank credit to the

[4] One of the most important transmission mechanisms indicated here is the one associated with balance sheet effects, and especially the effects that monetary policy may have on bank lending.

private sector and study macroeconomic implications of fast bank credit growth. Authors find that bank credit to the private sector rises faster than GDP throughout the region. Backe et al. (2006) also uses panel data for estimation of long-run relationship for CEE countries.

Relationship of a credit boom with a banking crisis has been a major topic of recent studies. Some authors draw their conclusion based on a structural relationship between rapid credit growth and a crisis in the banking sector. For instance, Ottens et al. (2005) find the results showing that credit bubble is indeed a key indicator for a banking crisis in Asian and Latin American emerging markets between 1980 and 2003. In their study they discussed conceptual background of credit boom, and how it causes a banking crisis. Ottens et al. come to these results first by defining threshold values for credit growth.[5] In addition, several econometric studies have also found the relation between a huge credit expansion and banking sector fragility. Borio and Lowe (2002), Eichengreen and Arteta (2000), Kaminsky and Reinhart (1999) investigated that credit booms increase the possibility of banking crises.

[5] They find threshold values for credit expansion by signaling model (where they use country-specific Hodrick-Prescott filter) , if credit growth exceeds the threshold, then it is said that credit boom has emerged. (See Ottens et al. Credit booms in emerging market economies)

CHAPTER 4: CREDIT BOOM

Remember that credit is money.
(Benjamin Franklin)

In this chapter, the key reasons and consequences of credit booms are discussed and empirical methods for finding credit boom levels are overviewed.

4.1 MAIN REASONS OF CREDIT BOOMS

Credit growth consists of three major components: financial deepening, normal cyclical upturns and excessive cyclical movements (which reflect credit booms). During an economic upturn credit aggregate increases more quickly than GDP does and this process is defined as financial deepening in literature. Goldsmith (1969) discusses the levels of financial intermediation and development of an economy and how they move together, but the drawback of his paper is that he does not mention the direction of causality, whether economic development leads to more financial deepening or financial deepening encourages economic development. Some other empirical studies show that financial development does cause financial development and it affects financial development through the increase in productivity.[6] Credit expansion can be associated with normal cyclical upturns where because of some reasons they increase. But when these cyclical amplifications cross over some certain level, then it is said that a credit

[6] In these studies economic growth is regressed on the ratio of credit to the private sector: See King and Levine (1993) and Beck et al. 2000)

boom (excessive cyclical upturn) is emerged. I discuss the ways of finding these certain levels for credit booms later in Chapter 6.

There are several reasons for fast credit growth. One of the important factors that lead to credit booms is the financial accelerator, where shocks to asset prices and relative good prices get increased through balance sheet effects. There are some studies written about the financial accelerator, how they emerge, where financial imperfections (that basically result from information asymmetries and institutional shortcomings) are presented as the sources of these accelerators.[7]

Excessive competition among banks can also cause a credit boom. Strong competition makes them decrease their profit margins and banks start to increase the amount of credit loans in order to prevent this negative effect on their profitability. This can be considered as a factor leading to a huge credit expansion and a credit boom. There are also some positive shocks (related to technology, etc.) that make the expansion in the private sector's credit demand increase in the case of high pro-cyclicality of the output elasticity of credit demand. Credit booms may be caused by several other reasons like excessively optimistic expectations relating to economic prospects (Kiss et al., 2006), herding behavior of banks (Kindleberger, 2000), agency problems that cause some banks (those may be affected by other banks) to apply some lending policies (Peterson and Rajan, 1995), explicit or implicit government "bail-out" guarantees (Corsetti, Pesenti and Roubini, 1999).

[7] You can find more information from Bernanke, Gertler and Gichrist (1999) and Kiyotaki and Moore (1997)

4.2 EMPIRICAL INDENTIFICATION OF CREDIT BOOMS

Many empirical researches have been conducted on the identification of the credit boom: how the credit boom is measured, how to find the certain point levels that distinguish credit booms from the ordinary credit expansions. Particularly, in emerging market countries it is quite challenging, because credit levels have grown from very low levels.

Some authors identify a credit boom by using the HP filter. The credit boom is determined as credit expansion goes beyond a certain threshold around the trend. Gourinchas et al. (2001) and Mendoza and Terrones (2008) discuss this issue and they find an absolute and a relative deviation from the trend as the main determinants of the thresholds. I discuss it in more detailed form in the next chapter. Moreover, Nakornthab et al. (2003) also presented such an analysis for Thailand, but the time series methods that he uses do not lead to economically meaningful results due to the possible structural breaks caused by the transition in the 1990-s in Thailand.

Another approach to determine credit boom level is the explanation of the equilibrium level of credit to GDP ratio by some fundamental macroeconomic variables. Lots of papers use VECM, panel data, pooled OLS and other econometric tools in order to explain credit to GDP ratio and identify credit boom level. Some authors preferred to use one-country VECM model. For instance, Hofmann (2001) finds equilibrium level of credit to GDP ratio in developed countries separately, whereas Brzoza-Brzezina (2005) determines excessive credit expansion in each new and old EU states employing in-sample estimation.

CHAPTER 5: DATA ANALYSIS AND THEORETICAL FRAMEWORK

It is the theory that decides what can be observed.
(Albert Einstein)

In this chapter, first I describe data analysis and then I find credit booms in Azerbaijan during 2000-2009 years according to the boom levels that are accepted to distinguish credit expansions from the credit booms in theory.

5.1 DATA ANALYSIS OF THE DETERMINANTS OF EQUILIBRIUM LEVEL OF CREDIT[8]

In this thesis, I make use of the monthly data covering the period January 2000 – December 2009 that is obtained from the database of CBAR. I use the monthly observations of credit to GDP ratio (both in real terms), real GDP per capita (PPP based), inflation, prices of Brent crude oil, real effective exchange rate (REER) and openness of the economy as a proxy for the tradable sector in Azerbaijan. All the fundamentals are estimated in AZN. GDP per capita, REER, oil prices and openness of the economy are taken in their logarithmic forms due to their large variance. REER is taken as AZN/USD.

In this thesis, I employ credit to GDP ratio as a fundamental that captures financial deepening which is the primary cause for credit booms. Whenever credit/GDP ratio increases then financial deepening process is getting enhanced and credit expansion is approaching to its highest point. Many studies use credit/GDP ratio as a main measure

[8] By the term of equilibrium only steady state is considered, i.e. long-term equilibrium. In credit boom the credit market is also in equilibrium, demand equals to supply.

of credit level while setting up econometric models. Since this variable shows financial deepening, it is more appropriate to exploit this fundamental in learning macroeconomic implications of credit bubbles.

I use PPP-based GDP per capita, which is the commonly used variable for determining credit equilibrium, to learn the effect of development. Actually, it is less reasonable to think about a direct relationship between credit and development. Intuitively, the effect of economic growth on expected income and profit is considered first. There are some convincing arguments about a positive correlation between credit demand, supply and growth. For example, during the sustainable economic growth, banks are more willing to lend, but they start to decrease amount of credit loans when an economic recession emerges. This is a robust argument for a positive relationship between credit supply and economic growth. In some studies, real GDP is used as the main variable, where they measure the impact of real GDP on credit/GDP ratio (See Calza et al., 2003 and Hofmann, 2001). But in some researches one of the primary fundamentals that are expected to have a large effect on credit level is PPP-based GDP (For general overview see Table 11 in Appendix).

The second variable that I use in this study is real interest rate. It is more appropriate to use real interest rate than nominal interest rate because the former is adjusted for inflationary expectations. It is logical to think that excessively low real interest rates are likely to cause a credit boom. In the case of low real interest rates, the

duration of credit loans decreases and the shorter duration, in turn, will have a negative effect on the total credit loans.[9]

The third variable is inflation that is primarily based on its direct effect on credit constraints. I get inflation from consumer price index (CPI) that is given on monthly cumulative basis of which the difference between two months' CPI expresses monthly inflation. As in the case of real interest rates, high inflation rates also have an impact on the amount of credit loans given in the country. But some papers say that credit boom can emerge without major changes in inflation (See Mendoza and Terrones, 2008). At the same time vast of studies discuss equilibrium level of credit by estimating inflation level (for instance, Cottarelli et al. 2003), so it makes sense to examine the impact of inflation on credit to GDP ratio in my paper.

Furthermore, I want to examine the effect of oil prices on credit to GDP ratio in Azerbaijan. We can find several studies where authors, such as Hofmann (2001) and Backe et al. (2005) use property prices as an explanatory variable for finding real credit growth. They conclude that amplification in property prices affects credit demand through the wealth effect. But intuitively, in an oil-rich country like Azerbaijan, inclusion of oil prices seems more appropriate, as oil captures a huge part of the country's export.

I also include the openness of the economy, which I define as the ratio of exports and imports to GDP, as a potential proxy for the weight of the tradable sector. The economic intuition behind this is that an open economy is vulnerable to the rapid credit

[9] This effect can be also showed by a mortgage loan. (See Kiss et al. 2006)

growth, and it is quite reasonable to include the openness of the economy as a proxy in this model.

Moreover, as a macroeconomic indicator, real effective exchange rate (REER) should also be considered to determine the equilibrium level of credit. Some authors emphasize the role of exchange rates in learning the macroeconomic implications of credit to GDP ratio. According to Duenwald et al. (2005) one of the common factors behind the sharp credit acceleration is the sizable foreign exchange inflows.[10] Besides, Mendoza and Terrones (2008) who made an important contribution by studying the behavior of macroeconomic aggregates during credit boom periods also found a relationship between fast credit growth (sometimes credit boom) and exchange rates. According to them, most of the credit booms in emerging and industrial countries happened under fixed exchange regime. The reason why I use REER is because CBAR uses "hard peg" policy in Azerbaijan; hence, including nominal effective exchange rate (NEER) does not make sense here. Also, by using REER in this model I can include Azerbaijan's international competitiveness which is affected not only by exchange rates, but also domestic and foreign price movements. For example, let's suppose that NEER of the domestic currency does not change, then the relative competitiveness of the country's goods increases when the inflation rate of its trading partner is higher than that of the country. Hence, the NEER is adjusted for the effects of inflation and after adjustment we call it the REER. So, because REER incorporates inflation rate differences, I prefer to use it.

[10] For more information see Duenwald et al. (2005), "Too m uch of a good thing? Credit Booms in Transition economies: The case of Bulgaria, Romania and Ukraine)

5.2 THEORETICAL FRAMEWORK

In order to determine credit boom levels we refer to the theories of Gourinchas et al. (2001) and Mendoza and Terrones (2008). Their methods to find a credit boom level differs from each other at some points. As a measure of credit, Mendoza and Terrones (2008) use credit per capita, while Gourinchas et al. (2001) use credit to GDP ratio. Mendoza and Terrones (2008) use the following arguments in favor of their method that credit to GDP ratio is not the proper and appropriate measure because it eliminates the possibility of having trends for credit and output separately, it can increase even in the case when credit and GDP are decreasing as GDP falls more rapidly and finally it can be misleading because of improper price adjustments when a high inflation emerges.

Detrending procedure and definition of thresholds are also different in these theories. Mendoza and Terrones use a standard HP filter, but Gourinchas et al. (2001) employ an expanding HP trend that extends the sample over which the trend is computed by one year as each successive year in the sample added. In order to identify a credit boom the latter author applies a boom threshold which is invariant across countries, changes in country's cyclical variability of credit the boom threshold that they employ in their study. In contrast, Mendoza and Terrones (2008) define thresholds as multiples of the country-specific standard deviation of credit over the business cycle that causes some changes in the threshold level of credit ($\delta\sigma(l)$).[11]

A number of studies have been carried out to learn short and long-run relationships of credit overexpansion with other macro aggregates. The most used way to do that is to employ VAR (Vector Autoregression) or VECM (Vector Error Correction

[11] See Mendoza and Terrones and also Gourinchas, Valdes and Landerretche

Model). For example, Hofmann (2001) analyses the determinants of credit to the private non-bank sector by invoking VAR since he does not find a cointegraton among his variables, hence his study shows that the long-run development of credit can not be explained by standard credit demand factors. Schadler et al. (2004) employs VECM to learn the impact of some macro aggregates on the demand for credit in Euro area. Her cointegration tests suggest long-run equations that indicate potential credit booms in Euro area.

In my thesis, I am interested in long-run and short-run dynamics of credit, its macroeconomic implications, as well as its identification and determination. Hence, in the next chapter I try to investigate whether there was a credit boom in Azerbaijan and if yes, in which period. And I focus on finding long-run equilibrium of credit by using cointegration tests, then I employ VECM model to learn short-run dynamics of credit and other macro fundamentals. I find cointegrating relationships among variables; hence I decide to set up a VECM model.

CHAPTER 6: EMPIRICAL ANALYSIS AND RESULTS

If the facts don't fit the theory, change the facts.
*(*Albert Einstein)

In this chapter, first I invoke cointegration tests and then describe VECM (Vector Error Correction Model) procedure in order to find short-run and long-run relationships between credit to GDP ratio and other fundamentals.

6.1 FINDING THE CREDIT BOOM LEVEL

In this paper, I use the methods employed by Mendoza and Terrones (2008). I use credit per capita to define credit boom levels, because as I stated above, credit to GDP ratio does not allow for the possibility that credit and output could have different trends, which is important if countries are undergoing a process of financial deepening, or if for other reasons the trend of GDP and that of credit are progressing at different rates. I detrend the data of credit per capita using a standard application of the HP filter. I denote the deviation from the long-run trend in the logarithm of real credit per capita in Azerbaijan, date t as l_t and the corresponding deviation of this cyclical component as $\sigma(l_t)$. The long run trend is estimated using the HP filter with the smoothing parameter (lambda) set at 14400, because it is typical for monthly data. Azerbaijan is said to have an experience of a credit boom, when we identify one or more contiguous dates for which the credit boom condition l_t is greater or equal than $\delta\sigma(l_t)$ holds, where δ is the bubble threshold factor. Hence, during a credit boom the deviations from trend in credit exceed the typical expansion of credit over the business cycle by a factor of δ or more. I use a baseline value of $\delta = 1.75$ as in the model of Mendoza and Terrones (2008). So I estimate

that $\delta\sigma(^{l}{}_{t}) = 0.131$ for the logarithm of real credit per capita in Azerbaijan. Thus, in any month between January 2000 and December 2009 if l(t) > 0.131, then credit bubble is detected in that month for the real credit per capita.

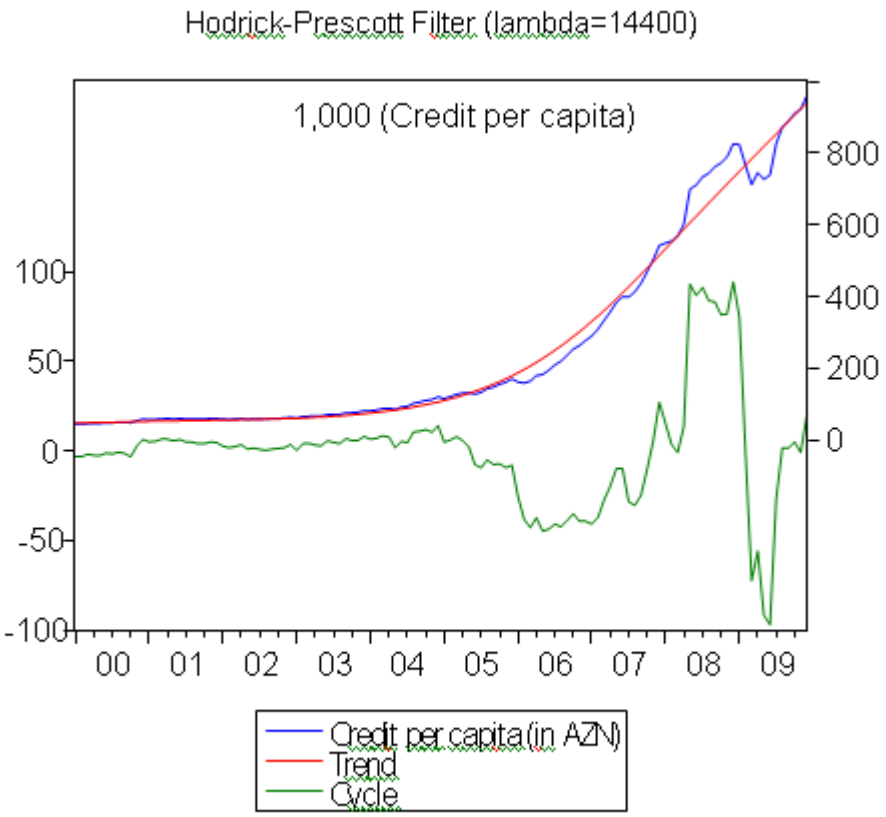

Figure 3: HP filter for Credit per capita (in AZN)

Credit boom is examined during 2008 May-2008 October. As it is seen from the above figure, the deviations in credit from the trend go beyond the levels of typical credit growth over the business cycles. So, credit booms are observed in the country on these dates. The financial crisis (2008) can be considered as a reason for this credit bubble. I

discuss the connections of financial and currency crises with the credit bubbles in the last chapter.

6.2 UNIT ROOT TESTS

In this subsection I discuss the statistical characteristics of the time series used in this study. As the degree of integration of the variables is one of the main issues in time series regression because of the well-known problem of spurious regression, I employ the unit root tests in order to define the degree of integration among the variables used in the model. Then, if the variables are integrated of the same order other than zero, cointegration tests are needed to be applied here.

For unit root tests, first I use Augmented Dickey-Fuller (ADF) test in order to check whether the variables are stationary or not. I also employ the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test and compare the results of ADF test with that of the KPSS. ADF is the test with the null hypothesis that the DGP (Data Generating Process, the variables included in the model) is non-stationary, that is, there is a unit root problem against an alternative of a trend stationarity. But KPSS is the test with the null hypothesis of trend stationarity (DGP is stationary) against an alternative of a unit root. There are some contradictory results between ADF and KPSS tests. It might be an explanation that ADF and KPSS tests have low power and they may result in a failure to distinguish between stationary and non-stationary conditions of the variables, because of so-called "structural break" (also called level shift) problem in the data. Hence, I decide to use also the unit root test with structural break proposed by Lanne, Lutkepohl and Saikkonen (2002) in order to see the results by preventing a structural break problem. All the fundamentals (except inflation and real interest rate) are seasonally adjusted before

starting the unit root tests due to the strong seasonality problem. Inflation and real interest rate do not show any seasonality patterns, so they are not seasonally adjusted. I also transform some variables into logarithmic form in order to decrease their variance (all the variables except inflation and real interest rate).

Both ADF and KPSS tests show that all the model variables are integrated of order one except KPSS test for the oil prices and real interest rate which implies about the stationarity of these variables. All the unit root test results for level and first difference time series variables are reported in Table 8 (See the Appendix).

6.3 COINTEGRATION TESTS

In order to do a cointegration test, first the VAR is estimated with an appropriate lag. Then, cointegration test is used where the rank of cointegration determines the number of long-run equilibrium equations in the model. The basic VAR model of order p has the following form:

$$y_t = A_1 y_{t-1} + \cdots + A_p y_{t-p} + u_t,$$ [12]

Where A_i's are (K x K) coefficient matrices and $u_t = (u_{1t}, \cdots, u_{Kt})$ is an unobservable error term. If there is a common stochastic trend between the variables used in the model, then they are said to be cointegrated. VAR model is not an appropriate model choice when there is a cointegration among the model fundamentals. Instead, VECM model is commonly used in this case. The model setup of VECM is the following:

[12] The formulas are taken from Lutkepohl et al. (2004), "Applied Time Series Econometrics"

$$\Delta y_t = \Pi y_{t-1} + \Gamma_1 \Delta y_{t-1} + \cdots + \Gamma_{p-1} \Delta y_{t-p+1} + u_t$$

VECM is basically obtained from the VAR formula. By subtracting y_{t-1} from both sides of VAR and then rearranging terms, we get the above VECM formula. Here:

$$\Pi = -(I_K - A_1 - \cdots - A_p) \text{ for i = 1,…, p-1.}$$

In this thesis, I use the fundamentals (the ones which I have indicated in Data Analysis subsection) that in general affect the credit level (credit to GDP ratio). Hence, I apply Johansen (1995) cointegration test to all those variables (See Table 9 in Appendix). But I find highly insignificant results for some fundamentals, mainly for the inflation and the openness of trade (the proxy for the tradable sector). The long-run equilibrium equation for the credit to GDP ratio that I obtain from the estimation of Johansen (1995) cointegration test is the following:

Table 1: Long-run equilibrium equation that for the credit to GDP ratio

CGR_t = - 1.575 $\log(GDP_t)$ + 3.55 $\log(REER_t)$ + 6.55 $\log(P_t)$ + 11.67 $INFL_t$ - 11.64 $RIR_t + ec_t$ (1.918) (3.59) (2.00) (15.43) (16.58)
Estimation period: 2000 M3, 2009 M12 T = 118 (observations)

Note: Standard errors are given in parentheses under the coefficients.

As it is seen from the above table, except *oil prices* (P_t), all the variables are statistically insignificant. That is why I decide not to go further with all those fundamentals and estimate VECM model. But instead I decide to exclude the proxy variable (*openness of trade*) and inflation from the model. Actually, *inflation* and *real interest rate* are highly correlated to each other. Consider the formula $(1+r_t) = (1+i_t)/(1+\pi_t)$, where r_t, i_t and π_t stand for real interest rate, nominal interest rate and inflation respectively. This implies that in the short run at least, when the nominal interest rate does not move much, inflation and the real interest rate are likely to be highly correlated. Indeed, my data also shows a high correlation (-0.92) between these fundamentals; whenever inflation increases, real interest rate goes down (See Figure 3 and 7 in Appendix). Second, since Azerbaijan has a fixed exchange rate, the REER basically captures the inflation differential vis-à-vis the rest of the world. I drop the openness variable, because it turns out that there is a considerably high correlation (0.8) between oil and tradable sector in Azerbaijan (See Figure 6 and 8 in Appendix). Oil is an important trading commodity and it captures approximately 80 % of the tradable sector in Azerbaijan.[13] Since openness variable is defined as the potential proxy for the weighted tradable sector, it becomes pointless to use this variable as a determinant of credit level in my model, because it leads to economically meaningless and statistically insignificant results. So, I begin estimating the cointegration tests again. According to Table 2 (See Appendix), both Trace and Maximum Eigen Value tests show that there is only one cointegration in the model against the 5% critical value.

[13] Source of information is the Central Bank of Azerbaijan Republic.

Table 2: Cointegration Analysis

Vectors	**Coefficients and standard deviations (in parentheses) of the Cointegration equation**
cgr_t Credit to GDP ratio (in real terms)	1 (-)
$\log(gdp_t)$ Logarithmic form of GDP per capita	2.43 (1.40)
$\log(REER_t)$ Logarithmic form of the real effective exchange rate	-6.6 (3.3)
$\log(p_t)$ Logarithmic form of Brent crude oil prices	-7.03 (2.12)
RIR_t Real interest rate	27.01 (9.83)

Our model framework allows us only one long-run equation since there is just one cointegrating relationship among the fundamentals. The results in the long-run equation are as expected and do not contradict economic theories (although GDP per capita is statistically insignificant here). Here only credit to GDP ratio and real interest rate appear in level form, the other fundamentals are estimated in their logarithmic form. Therefore, to estimate the effect of the variables, I use the log-level formula: $\Delta y = (B_1/100)\,\%\,\Delta x$ and I divide the coefficients of the fundamentals that are in logarithmic form by 100 in order to calculate all the impacts in percentages.

According to the table above, 10% increase in *GDP per capita*, induces credit to GDP ratio to decrease by 0.25%. This does not seem to be plausible, because in all the related studies it is theoretically justified that there should be a positive relationship

between the credit/GDP ratio and GDP per capita. I explain this issue more in the last chapter.

We also find a positive relationship between the credit level and *real effective exchange rate*. 10% depreciation in exchange rate causes 0.7% increase in the credit level. Unfortunately again practice does not meet theory. Because in many researches it is theoretically justified that one of the possible consequences of credit booms is the appreciation of domestic currency (that reflects in depreciation of REER, AZN/USD). Mendoza and Terrones (2008) imply that an expansion of real credit is associated with an appreciation of the domestic currency. But in the following parts in the short-run dynamic of credit level I find that credit and real effective exchange rate is negative correlated, that is, credit expansion induces real exchange rate to appreciate.

Moreover, we find that *oil prices* also have a positive impact on the credit to GDP ratio. 10% amplification in oil prices implies 0.7% increase in the credit level. It is also intuitive for an oil-rich country like Azerbaijan.

Finally, we obtain from our estimation that, 10% raise in the *real interest rate* results in 2.7% credit level decrease in the long run. According to our model, real interest rate has the highest impact on the credit level among those other variables. Intuitively, it is a consistent result, because when real interest rates on credit lending increase people do not buy a credit loan, instead they deposit their money in banks, thus level of credits decrease.

Table 3: Long-run equilibrium equation that for the credit to GDP ratio

$CGR_t = -2.43\ \log(GDP_t) + 6.6\ \log(REER_t) + 7.03 \log(P_t) - 27.01\ RIR_t + ec_t$
(1.40) (3.30) (2.12) (9.83)
Estimation period: 2000 M3, 2009 M12 T = 118 (observations)

6.4 VECTOR ERROR CORRECTION MODEL

Error correction model is the best choice to get the short-run dynamics of the credit level in our model. After getting the cointegration rank number from Table 2, I set up the model where I also include seasonal dummies and trend in order to capture seasonal and trend effects of the fundamentals. To estimate the model I make use of two-stage procedure which allows for model reduction by imposing zero restrictions on explanatory variables in each equation unless I get significant t-values of those fundamentals.[14]

In addition to the identification of the cointegrating vector, determining the causal relationship among the variables is also essential analysis in VECM. It can be tested that some of the cointegrating relations do not enter a particular equation and thus that the corresponding left-hand side variable is weakly exogenous for the cointegration parameters, then the corresponding element of the loading matrix α will be zero.[15] The weak exogeneity test of the null of corresponding $\alpha = 0$, is below:

[14] This sequential elimination method is based on AIC (Akaike Information Criterion). See Bruggeman et al. (2001).
[15] See Luthkepohl et al. (2004), "Applied Time Series Econometrics".

Table 4: Weak Exogeneity Test[16]

Vector	**LR Test**	**Prob**
cgr_t	6.61	0.01**
$\log(gdp_t)$	0.165	0.68
$\log(REER_t)$	21.161	0.000003**
$\log(p_t)$	1.3	0.25
RIR_t	2.1	0.14

So, we observe a strong relation between real effective exchange rate and credit level in short-run, as well. The null of weak exogeneity of GDP per capita, oil prices and real interest rate are not rejected and the corresponding elements of the loading matrix α should be zero for these variables in VECM model. But, I assume that these fundamentals are not weak exogenous in order to learn their short-run dynamics because I am also interested in the impact of credit level on GDP per capita, real effective exchange rate and real interest rate in the short-run. The short-run equilibrium equations of these variables are given in Table 9.

[16] ** denote rejection of null at the 5% significance level.

Table 5: Error Correction Equations for Credit Level and Oil Prices

$$\Delta CGR_t = -0.012\,(CGR_{t-1} + 7.501 GDP_{t-1} - 9.051 P_{t-1} + 9.897 REER_{t-1} + 29.427 RIR_{t-1}) -$$

(-3.880) (1.201) (-3.743) (-2.301) (2.726)

$$-0.443\Delta CGR_{t-1} - 1.233\Delta REER_{t-1} + \chi S_t + u_t$$ [17]

(-5.316) (-2.255)

$$\Delta P_t = 0.05\,(CGR_{t-1} + 7.501 GDP_{t-1} - 9.051 P_{t-1} - 9.897 REER_{t-1} + 29.427 RIR_{t-1}) +$$

(2.048) (1.201) (-3.743) (-2.301) (2.726)

$$+0.199\ \Delta P_{t-1} + \chi S_t + u_t$$

(2.340)

Note: T-statistics are given in parentheses under the coefficients.

As we see from the above equation for credit to GDP ratio, credit level is affected by the lags of real GDP per capita, oil prices, real effective exchange rate and real interest rate, as well. In the first equation of Table 8, the minus sign of significant error-correction terms imply that credit level adjusts to its long-run equilibrium.

But the second error correction equation does not make economic sense because the oil prices are determined out of the economic system of Azerbaijan. Hence, macroeconomic indicators in Azerbaijan can not change the oil prices that are affected by many different factors in the world. Moreover, oil price does not adjust to its equilibrium in the long-run.

[17] S_t and u_t stand for seasonal dummies and error terms respectively.

Table 6: Error Correction Equations for GDP per capita, REER and RIR

$$\Delta GDP_t = \underset{}{0.001}(CGR_{t-1} + \underset{(1.201)}{7.501}GDP_{t-1} - \underset{(-3.743)}{9.051}P_{t-1} - \underset{(-2.301)}{9.897}REER_{t-1} + \underset{(2.726)}{29.427}RIR_{t-1}) +$$

$$+\underset{(5.559)}{0.145}\Delta\, CGR_{t-1} + \lambda S_t + u_t$$

$$\Delta REER_t = \underset{(-5.324)}{-0.002}(CGR_{t-1} + \underset{(1.201)}{7.501}GDP_{t-1} - \underset{(-3.743)}{9.051}P_{t-1} - \underset{(-2.301)}{9.897}REER_{t-1} + \underset{(2.726)}{29.427}RIR_{t-1}) +$$

$$+\underset{(2.348)}{0.199}\Delta P_{t-1} + \lambda S_t + u_t$$

$$\Delta RIR_t = \underset{(-1.513)}{-0.001}(CGR_{t-1} + \underset{(1.201)}{7.501}GDP_{t-1} - \underset{(-3.743)}{9.051}P_{t-1} - \underset{(-2.301)}{9.897}REER_{t-1} + \underset{(2.726}{29.427}RIR_{t-1})$$

$$\underset{(-3.420)}{-0.054}\Delta CGR_{t-1} - \underset{(-2.615)}{0.128}\Delta GDP_{t-1} + \lambda S_t + u_t$$

Note: T-statistics are given in parentheses under the coefficients.

Table 6 says that there is a considerable interaction among macro aggregates in the short run. For instance, from the second equation it can be seen that if ΔP_{t-1} increases by 1 percent, then $\Delta REER_t$ amplifies by 0.2 percent. It means that oil prices had significant effect on real exchange rate (since its t-statistics is significant), amplification of oil prices depreciates the exchange rate in Azerbaijan. Third equation explains that credit level in the previous month has an important effect on real interest rate, 1% rise in

the change of credit level last month decreases the change of real interest rate (the difference in real interest rate between this and previous month) by 5.4%. It is a plausible result as in general, excessively high credit expansions are likely to cause a contraction in real interest rates. Short-run dynamics of the fundamentals shown in Table 9 implies that all the variables except GDP per capita adjust to their long-run equilibrium because of their positive α-coefficients.

6.5 MODEL CHECKING

In this subsection I use some econometric tools for checking the VECM model. I test for residual correlation and normality of errors in the model.

Table 7: Diagnostic tests for residual autocorrelation

Test	No. of lags	T-statistics	p-value
Portmanteau	3	60.53	0.14
	6	137.53	0.35
LM	3	28.38	0.29
	6	23.60	0.54

There is no serial correlation among residuals since the null hypothesis of no serial correlation are not rejected for both tests (p-values are greater than 0.05). I also check the normality of residuals by employing normality test. The test has null hypothesis indicating that error terms in the model have skewness and kurtosis corresponding to normal distribution. Null hypothesis is rejected by the test. It might be the case that there is a presence of outliers in the model.

CHAPTER 7: CONCLUSION AND DISCUSSION

A conclusion is simply the place where
someone got tired of thinking (English proverb)

In this chapter, I discuss macroeconomic implications of rapid credit growth by comparing the results of recent studies with the results that I get in my research. I also talk about the relations of credit booms with the banking and currency crises.

According to my study, credit booms have considerable macroeconomic implications reflecting fluctuations and dynamics of other macro aggregates. My results are robust on findings of other researches that have been conducted to investigate long-run and short-run equilibrium of credit and other macroeconomic indicators so far. Considering the period that I focus on in my paper (2000-2009 years) and economic upturns/downturns that happened during that period, the results that I find can be economically interpreted and have meaningful explanations. For example, I find that in the short-run, real effective exchange rate decreases (the domestic currency appreciates) while credit booms emerge. This is also supported by empirical evidences of Mendoza and Terrones (2008) who construct a model to determine a credit boom according to the data of some emerging and industrial countries in the world. The increase in real exchange rates during the credit bubbles can be explained through the effect of capital inflows. In the period of model, there are huge capital inflows to Azerbaijan regarding to the country's economic policy. Capital inflows in high credit growth period keep the exchange rates appreciated and imports cheap. In contrast, during the sudden stops of

capital inflows, there is an increasing pressure on real effective exchange rates which makes it depreciate.

I also investigated a countercyclical relationship between real interest rates and credit. It is an intuitive result since in the case of significantly low real interest rates it is very appropriate to loan more credit, hence credit level is expanded in these conditions. When interest rates go up, loans become more expensive and loan demand is reduced. The correlation between real interest rates and credit loan is a popular topic of recent studies. One of them, Taylor and Schularick (2009) also confirm the negative relation between these two fundamentals by implying that an overexpansion of credit reduces real interest rates and induces a greater production and purchase of long-duration capital goods and land. Indeed, in this period Azerbaijan economy faces a considerably significant purchase of houses and lands by long-term credit loans, hence this fact also shows the credibility of my model result.

One of the important and effective macroeconomic indicators of Azerbaijan economy is the price of petrol/oil. Since the beginning time of oil exporting, the fluctuations in oil prices have played an important role in the economy of the country and have caused to sizeable changes in other big macroeconomic aggregates. Credit is one of those aggregates being affected by the changes in oil prices. In this study according to the model estimation, increase in oil prices has positive impacts on the volume of credit loans in Azerbaijan (both in the short-run and in the long-run). It can be explained due to increase in capital inflows and inflation after the upward shift in oil prices. Increase in inflation leads to a decrease in real interest rates (at least in the short-run) and this decline in real interest rates causes a big amplification in credit levels.

GDP per capita (usually PPP based) is also considered as a primary determinant of credit level and has been discussed in a number of studies. Some authors, for example, Hofmann (2001) finds a positive and procyclical relationship between real credit and real GDP. But apparently, in Azerbaijan we find a negative relationship. This might be due to a sharp increase of credit level and sudden fall of real GDP per capita during the financial crisis (2008) in Azerbaijan (See Figure 2 and 4 in Appendix). The high correlation (0.9) with the oil prices should also be taken into account. Also, there is a quite weak regulation of credit policy in Azerbaijan. While giving credit loans to the private sector, financial conditions of individuals (or firms, companies) are not taken into consideration properly. .

The relation of rapid credit growth and financial (or currency crises) should also be accounted for while talking about credit booms. Do credit booms really imply banking and currency crises? In many cases (though not in the all) we can conclude a strong relationship between these concepts. Mendoza and Terrones (2008) find that especially in emerging economies, about 68 percent of the credit booms are associated with currency crises and 55 percent with banking crises. In contrast, Gourinchas et al. (2001) find low probability (10-21 percent) of a banking crisis after a lending boom. This probability found by Tornell and Westermann (2002) is even lower (6-9 percent), which is just slightly greater than during tranquil periods of credit growth (4-4.5 percent). In this thesis, I find a strong direct relationship between financial crisis (2008) and credit booms, since the fluctuations that macroeconomic aggregates (the primary determinants of credit booms employed in this model) display during credit boom and financial crisis in

Azerbaijan are almost the same, hence credit boom emerged during the crisis period in Azerbaijan.

Policymakers suggest the following methods to prevent a risk of a credit boom developing. First, improving examination of the banking system, this means better monitoring of credit borrowing. Second, increasing surveillance of corporate borrowing could be considered as a primary method to avoid the risks of credit booms. Considering the strong connection of credit booms with the rapid growth in corporate leverage, supervision of firms' accounting should be realized in order to prevent an increase in corporate borrowing. Moreover, tightening macroeconomic policy (increasing real interest rates) can also play a significant role in preventing credit booms. Since a credit booms is usually accompanied by an unsustainable growth in credit demand, it seems very helpful to pursue a tightening monetary policy in restraining this unsustainable credit growth. It should also be mentioned that high rates of credit growth make it difficult for banks and supervisors alike to ensure that appropriate risk management models and procedures are in place. Liquidity support by the central banks may temporarily enable commercial banks to roll over problem loans, but ultimately the underlying quality of assets will depend on the state of the real economy. Therefore, it is important to develop contingent plans for restructuring and recapitalization of the banking systems.

Finally, one of the general methods that are presented in a number of studies is to improve institutional frameworks in the countries that face credit boom risks. Statistically, credit booms have emerged in industrial countries less frequently than in the countries with emerging economies. Hence, improving macroeconomic policies,

upgrading financial sector regulations, fostering better risk management and advancing the information given to borrowers about exchange and interest rate risks affecting their debt-servicing costs must be primary functions of policymakers of countries (especially with the emerging economies) that have a fear of high credit boom risk.

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APPENDIX

Table 8: Unit root tests

Variable	Test	Deterministic terms	Lags	Test value	5% critical value
Credit to GDP ratio	ADF KPSS	c, t c, t	1 9	-1.15 0.29	-3.44 0.14
∆Credit to GDP ratio	ADF KPSS	c c	11 11	-15.6 0.39	-2.8 0.46
Inflation	ADF KPSS	c c	1 9	-1.97 0.53	-2.88 0.46
∆Inflation	ADF KPSS	n c	0 6	-6.28 0.13	-1.94 0.46
Log(oil prices)	ADF KPSS	c, t c, t	1 9	-2.59 0.11	-3.44 0.14
∆ Log(oil prices)	ADF KPSS	c c	0 5	-8.85 0.06	-2.88 0.46
Log(GDP per capita)	ADF KPSS	c, t c, t	2 9	-2.25 0.21	-3.44 0.14
∆ Log(GDP per capita)	ADF KPSS	c c	1 9	-11.9 0.18	-2.88 0.46
Log(REER)	ADF KPSS	c, t c, t	0 9	-1.04 0.31	-3.44 0.14
∆ Log(REER)	ADF KPSS	c c	0 7	-8.4 0.46	-2.8 0.49
Log(trade openness)	ADF KPSS	c, t c, t	2 7	-3.3 0.04	-3.44 0.14
∆ Log(trade openness)	ADF KPSS	c, c	1 9	-15.76 0.46	-2.88 0.5
Real interest rate	ADF KPSS	c c	0 9	-1.63 0.6	-2.88 0.46
∆ Real interest rate	ADF KPSS	ADF KPSS	0 6	-9.37 0.14	-1.94 0.46

All the fundamentals above, except the inflation are seasonally adjusted due to their strong seasonal patterns. Here, *c* , *t* and *n* stand for constant, trend and none (neither constant, nor trend), respectively. Lag numbers standing next to the KPSS tests are actually bandwidth numbers of the KPSS tests. KPSS test could not reject the null hypothesis of stationarity of the oil prices. So, I invoke to the UR test with structural break (level shift) and get significant results supporting non-stationarity of the oil price fundamental. The t-statistic is 0.74 against 5% critical value which equals to - 2.88.

Table 9: Johansen (1995) Cointegration Test

Hypothesis	Trace Statistics	5% critical value	Prob**
1. Trace test (constant and no trend in the cointegration space)			
H0: r = 0	98.45	69.81	0.0001
H0: r = 1	41.64	47.85	0.16
2. Maximum Eigen Value Test (constant and no trend in the cointegration space)			
H0: r = 0	56.80	33.87	0.000
H0: r = 1	21.28	27.58	0.25
1. Trace test (constant and trend in the cointegration space)			
H0: r = 0	120.37	88.80	0.0001
H0: r = 1	63.32	63.87	0.05
2. Maximum Eigen Value Test (constant and trend in the cointegration space)			
H0: r = 0	57.04	38.33	0.0001
H0: r = 1	26.87	32.11	0.19

Table 10: Cointegration Analysis

Vectors	**Coefficients and standard deviations (in parantheses)**	
	Cointegration (1)	**Cointegration (2)**
cgr_t Credit to GDP ratio (in real terms)	1 (-)	- (-)
$\log(proxy_t)$ Logarithmic form of the openness of trade which is a proxy for the trade sector)	- (-)	1 (-)
$\log(gdp_t)$ Logarithmic form of GDP per capita	1.575 (1.918)	1.63 (0.96)
$\log(REER_t)$ Logarithmic form of the real effective exchange rate	-3.55 (3.59)	-0.157 (1.810)
$\log(p_t)$ Logarithmic form of Brent crude oil prices	-6.55 (2.00)	-3.72 (1.00)
$\inf_t$ (inflation)	-11.67 (15.43)	-5.79 (7.77)
RIR_t Real interest rate	11.64 (16.58)	5.09 (8.35)

Table 11: Literature Survey

Authors, title	Target group	Methodology	Variables
Backe et al. (ECB) 2006:"Credit Growth in Central and Eastern Europe	11 Central and Eastern European countries	Pooled and Fixed Ols	Private Credit/GDP: PPP-based GDP,government credit,short and long nominal interest rate,inflation, house prices
Brzoza-Brzezina (ECB)2005: "Is Lending in Central and Eastern Europe developing fast?	POR, IRL, GRE, HUN, CZE, POL	VECM for individual countries and panel estimation	Private Credit/GDP, total credit for Eurozone members
Calza et al. (ECB) 2003: „Aggregate loans to the euro are private sector"	Eurozone	VECM on aggregate Eurozone data	Private Credit/GDP: real GDP, interest rate, inflation
Cotarelli et al. (IMF) 2003: „Early birds,late risers,and sleeping beauties:bank credit growth to the private sector..."	15 Central European and Balkan countries, out of sample estimation	Random effect panel estimation of 24 developed and non-transition emerging countries	Private Credit/GDP: Public Debt/GDP, PPP-based GDP, inflation
Duenwald et al. (IMF) 2005: „Too much of a good thing? Credit booms in transition economies	BLG, ROM, UKR	Panel estimation, fixed effect GLS	Private Credit/GDP: links with trade balance
Hofmann (BIS) 2001: „The determinants of private credit in industrialized countries..."	16 developed countries	VECM for individual countries	Private Credit/GDP: real GDP, short real interest rate, property price index
Schadler et al. (IMF) 2004: „Credit booms, demand booms and Euro adoption"	New EU members, based on out of sample estimation	VECM on aggregate Eurozone data	Private Credit/GDP: PPP-based GDP, long real interest rate

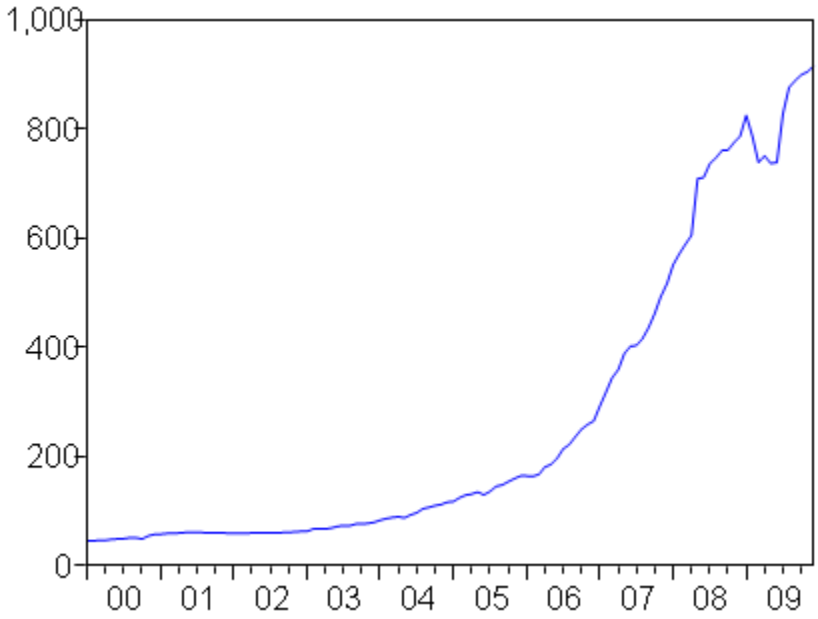

Figure 4: Credit per capita

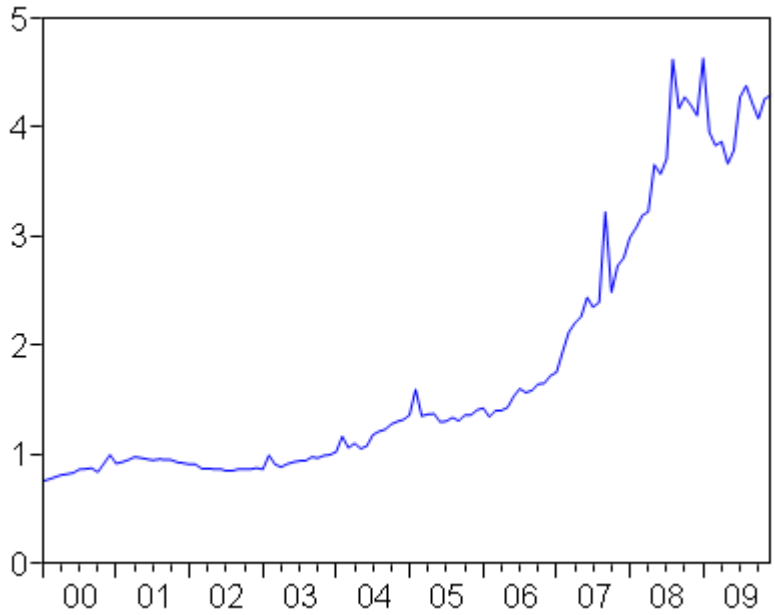

Figure 5: Credit to GDP ratio

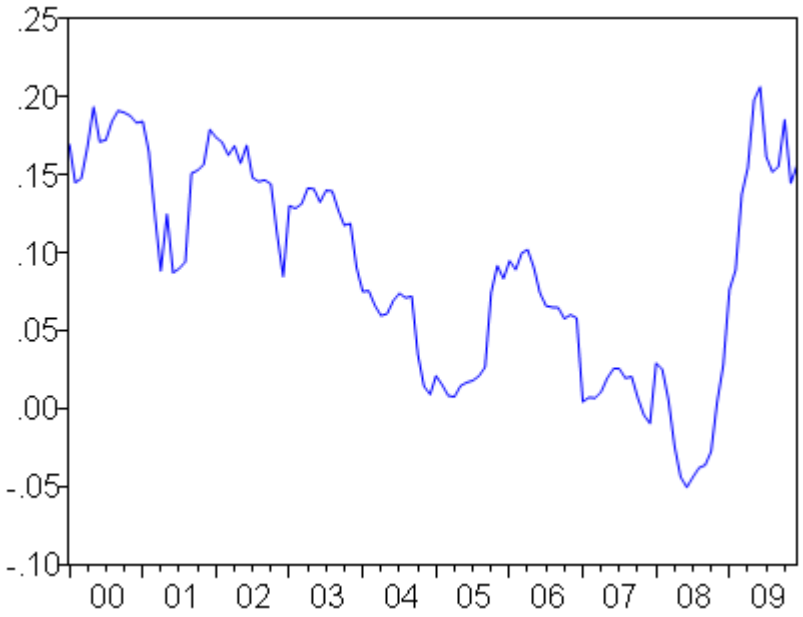

Figure 6: Real interest rate

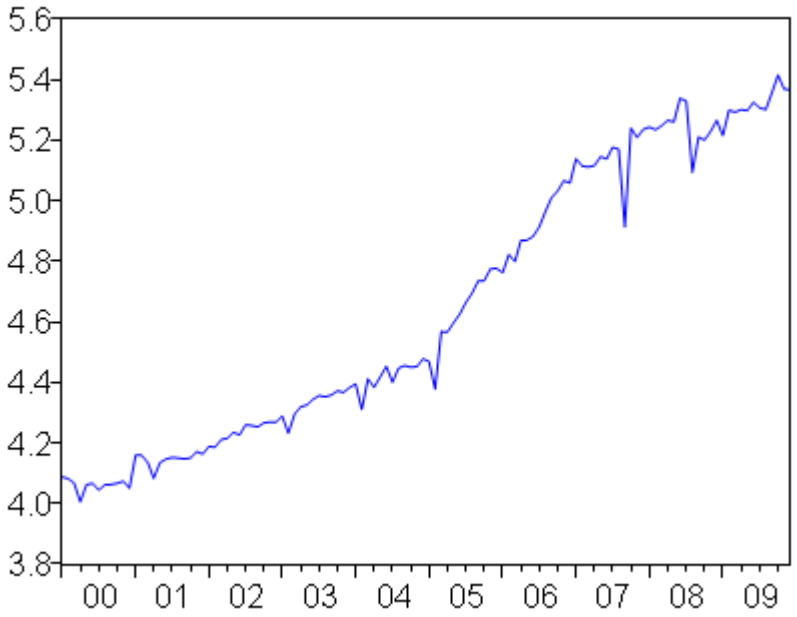

Figure 7: GDP per capita

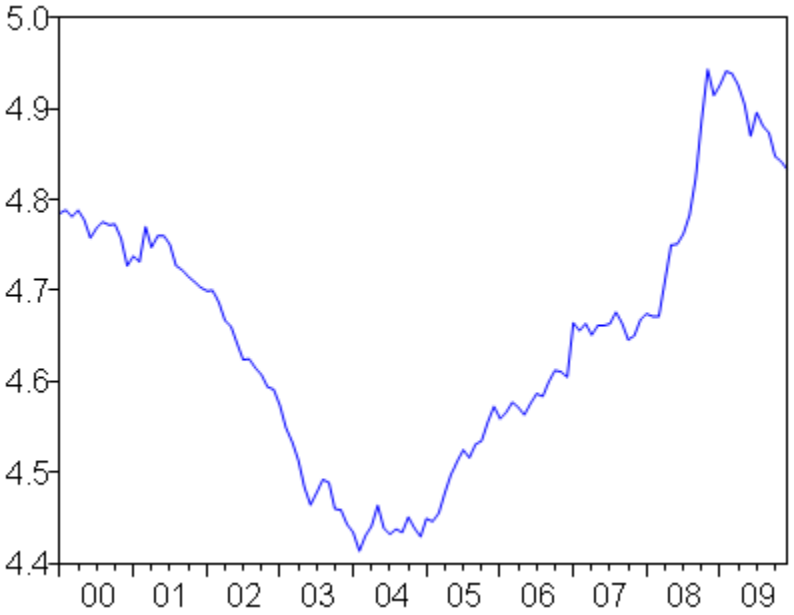

Figure 8: Real effective exchange rate

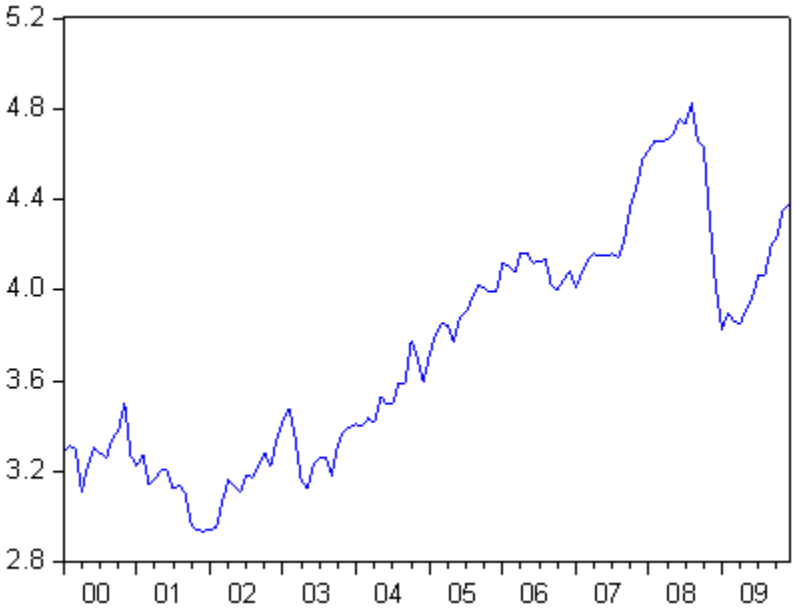

Figure 9: Oil prices (monthly average)

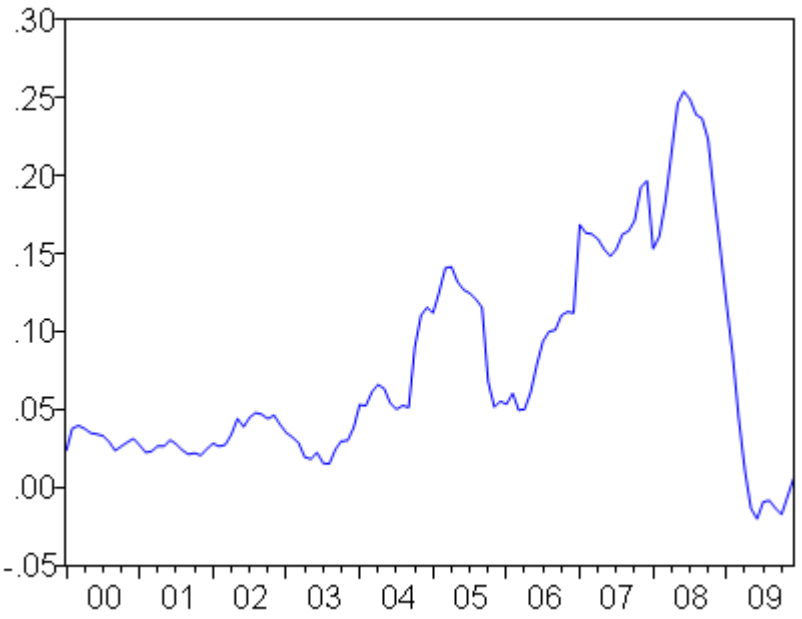

Figure 10: Inflation

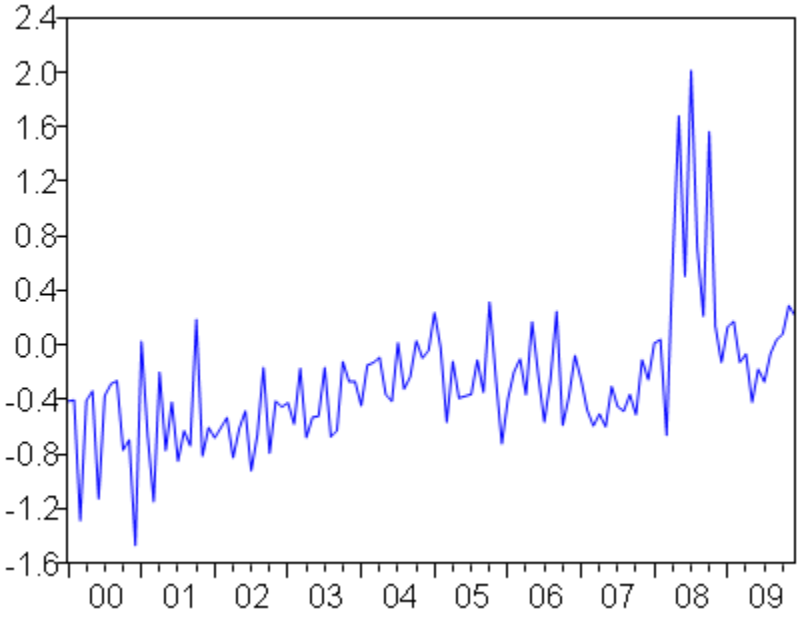

Figure 11: Openness of trade