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Models for evaluating financial crisis – what went wrong for developed and emerging economies?

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Abstract. *Financial crisis have become a main topic of researchers, especially after the recent global crisis started in 2007. Although the topic is highly relevant for current research, crisis models widely used were not able to predict the big crash. In the present paper we focus on surveying the empirical literature on the subject and try to find out what went wrong with the existing models. In the case study we perform a cluster analysis in order to observe the differences between advanced and emerging economies in what concerns the effects of the financial crisis.*

Keywords: financial crisis, cluster analysis, banking fragility, recessions.

JEL Classification: G01, C38, E6, G21.

1. Introduction

A well-functioning financial system is mandatory for an efficient economy. However, the fragility of financial systems can cause financial crisis and have significant impact in the real economy. The topic of financial crisis is highly relevant in terms of policy, as outlined by Kauko (2014). Crises trigger output losses and social costs, with an average production loss of 20% of annual Gross Domestic Product (GDP). It is very important to have a good understanding of the past crisis events, of the mistakes made and to learn the lessons from the crisis that happened over time because, as time showed us, history could repeat itself.

There are several studies in the specialty literature that deal with the financial crisis. We could classify the studies on financial and banking crisis into three categories: early studies, studies regarding banking panic episodes before World War II and reviews of the recent instability periods in developing economies.

Reinhart and Rogoff (2013) perform a descriptive analysis on the main instability periods. Their study include prior results (Bordo, 2001; Caprio, 2005), thus offering the most complete picture to date of the financial instability (that is from the period 1800 until the recent global financial crisis in 2007). The analysis of crisis from 1880 has been already covered in the study of Bordo (2001), but Reinhart and Rogoff (2013) extend this period with 80 more years, offering the longest period of financial crisis that were covered so far in a study. As main ideas for the early instability episodes (that is before 1900), we mention the first documented crisis for an advanced economy in France, 1802 and the first banking crisis of developing economies: India, 1863, followed by China in the 1860-1870 and Peru, in 1873. However, one notices a scarce documentation of this period.

After the first wave of financial crisis mentioned in the introduction of the paper, the second wave of financial crisis episodes starts with the New York panic in 1907. This crisis started with the suspension of operations from the second largest trust company, Knickerbocker Trust. The panic rapidly spread in the financial system, which caused other severe bank runs. The involvement of J.P. Morgan with his financial force, but also with his strong influence on Wall Street encouraged bankers to save the New York Stock Exchange from total collapse. This crisis situation comes in an already weakened macroeconomic context in the US, mainly caused by a severe credit shortage and deflation of the dollar. The effects of the 1907 panic were significant: commodity prices dropped by 21 percent, unemployment rate rose from 2.8 to 8 percent. The financial regulation was increased and led to the formation of the Federal Reserve System in 1913. However, the financial system was not completely stabilized with the measures taken after the 1907 panic. This is shown by the outbreak of the Great Depression in 1929.

In the present paper we focus on the most important past events of crisis that changed the economic environment. We highlight the causes and effects of the financial crisis and establish some important lessons that were learned. Moreover, we develop a case study to test the differences of reaction between economies in what concerns the great financial crisis that burst in 2007.

The rest of the paper is organized as follows. In the next section we highlight the crisis that emerged after the 1970s and focus on two severe episodes: Tequila crisis and Nordic countries crisis. The reason why we choose these two types of episodes is to see the differences between an emerging country and developed economies in front of a financial crisis. The third part of the paper is aimed to discover the particularities of the global financial crisis in 2007 and what was different versus the previous ones. The last part of the paper is the case study – a cluster analysis performed on a set of 49 economies. We use five macroeconomic indicators that we measure in the post-crisis period for each economy. Based on the evolution of the chosen variables, we perform a cluster analysis and find four groups of countries. The characteristics of the four groups are in line with what we find in the specialty literature and offer valuable insight into the evolution of the economies after the crisis.

2. Financial crisis after World War II – lessons learned from tequila and nordic crisis

After the World War II, there is a period of relative calm – from the late 1940s to the early 1970s. This could be explained by the booming world growth, but also by the repression of the domestic financial markets. Reinhart and Rogoff (2013) offer a brief radiography of the crisis episodes since the early 1970s.

The new wave of financial crisis releaser could be considered the financial and international capital liberalization which spread rapidly all over the world. The break-up of the fixed exchange rate Bretton Woods system and the significant increase in the oil prices brought about new banking crisis in advanced economies. Moreover, at the beginning of the 1980s, the decline in the global commodity prices together with the volatile interest rated in the United States determines several banking and sovereign debt crisis in emerging economies (Latin America and Africa). After the loan crisis in US form 1984, the Scandinavian countries experienced severe banking crisis in the early 1990s which we will detail later in the paper. In 1992, Japan entered into a banking crisis of a decade long triggered by the asset price bubble burst. The break-up of the Soviet bloc in the early 1990 determined several ex-communist countries from Central and East-Europe to enter into economic transition crisis. In the mid 1990s, the famous Tequila and Asian crisis burst, followed by sovereign crisis in Russia and Colombia. Argentina (2001) and Uruguay (2002) were the last countries to record banking crisis for the 1990s decade.

Mishkin (1999) draws important lessons from the Tequila Crises in 1994 and 1995. Four significant lessons are depicted. First of all, attention is drawn to the danger exhibited by fixed exchange rates regime for emerging economies. This is sustained by the consequences that a speculative attack of the exchange rate could have in the economy by influencing the information flows in the financial markets. He argues that the depreciation of the domestic currency occurring in a pegged exchange rate regime is ”a highly non-linear event because it involves a devaluation”.

The increase in indebtness and in interest rates seriously affects the companies and financial institutions balance sheets causing the financial crisis. Mishkin also outlines that for the economies with fragile banking systems and debt contracts of short duration which are substantially denominated in foreign currencies, the pegged exchange rate is a very dangerous approach. Moreover, this kind of regime hides the daily fluctuations of the exchange rate which could have provided important early warning signals for the monetary policymakers.

The second lesson learned from the Tequila crisis is the important role of prudential supervision of the banking system especially in emerging economies. The crucial role of prudential supervision in emerging markets is determined by the fact that banks play an important part in emerging economies, in channelling funds to investments, that is much more than they do in developed markets.

Another reason is that a weak supervision of the banking sector can determine a foreign exchange crisis which could rapidly lead to a financial crisis. The situation faced by the Bank of Mexico in 1994 has been drawn by this weak system of banking supervision. Briefly, the central banks raised the interest rates in order to counteract a speculative attack on the currency. The increased interest rates affect the bank balance sheet, as the duration of banks assets is usually larger than their liabilities. This makes very problematic the mechanism of defence against the speculative attacks on the currency. Several solutions to encourage a strong bank regulation are given, but this does not make the object of the present paper (for more information, see Mishkin – 1999).

The third important lesson learned from the Latin American crisis is the need of phase gradually the financial liberalization in emerging economies. Before the liberalization, banks could have a poor expertise on granting loans to debtors of good creditworthiness so offering them new lending opportunities with a speed up rate could harm the quality of their loan portfolio. Financial liberalization usually leads to a credit boom which in most cases is followed by a banking crisis. This does not mean that the financial liberalization should be stopped. On the contrary this is an important topic for the efficient functioning of the financial markets. However, financial deregulation should be very well managed, even pursue it on a measured rhythm, in order to have a better control on the credit boom process.

The last lesson mentioned by Mishkin (1999) is that the traditional solutions found by the developed countries to overcome the financial crisis could be counterproductive in emerging economies. He argues that the monetary expansionary policy usually applied in developed countries could lead to hyperinflation and devaluation of domestic currency in the case of emerging markets with serious damage caused to balance sheets of households, companies and financial institutions. Thus, this is not a correct policy to be applied for a developing economy in order to recover from a financial crisis. He also argues that ”the lender of last resort role of a central bank must be used far more cautiously in an emerging market country”.

As a general conclusion to be drawn from the Tequila crisis, we remark that in constructing the macroeconomic policies for emerging policies one cannot copy the ones from the developed countries, but the characteristics of financial systems in the designated countries have to be taken into account.

In what follows, we will refer to the lessons learned from Nordic countries. The economies of Denmark, Finland, Norway and Sweden have known a very good period of growth and full employment, that is after the World War II and until the 1990s when the image of the Nordic successful economies was crushed and a severe crisis erupted. The main trigger for the financial crisis was the financial liberalization which set off the lending boom, capital inflows, rose in a rapid pace the asset price, as well as consumption and investment. Soon, the boom phase transformed into a beginning of depression, as bankruptcies erupted, employment was falling, the GDP recorded a negative growth. In the end, the central banks of Finland, Norway and Sweden moved to flexible rates in 1992 in order to avoid the deepening of the depression. The Nordic crisis were triple crisis, as apart from the banking and currency panic episodes, the big public budget deficits emerged as a consequence of the significant shrink of the economic activity.

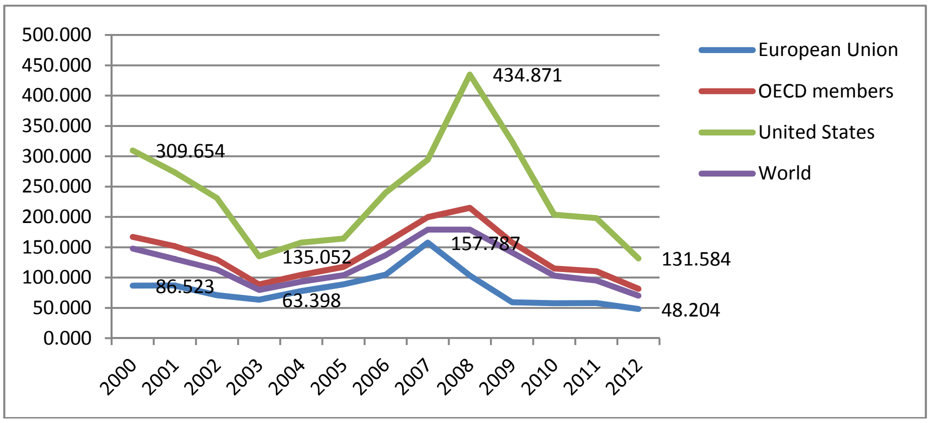
Jonunug (2010) outlines three main categories of the lessons learned from the Nordic crises. First of all, there are the lessons on how to liberalize without creating a financial crisis. Secondly – how to deal with a financial crisis once it is created and thirdly – the effects on long term of the financial integration on designing stabilization policies, on growth and efficiency. In his paper, he draws attention on the dangers of financial ignorance, of “backward-looking policy learning” and of fast changes in the real rate of interest, which may be considered an early warning signal of financial crisis. After a period of very low or negative interest rates, in the bust period, the real interest rate begins a rapid growth, creating negative balance sheet, reducing investments and consumptions. He argues the inefficiency of the procyclical monetary and fiscal policies and suggests that during the bust period, budget deficits should be allowed and all policies should be aimed at enforcing the balance sheets of the private sector.

3. Particularities and effects of the Global Financial Crisis from 2007

The global financial crisis started in 2007 had some main key drivers. We highlight some of them. First of all, there is the rise in the financing costs throughout the financial sector. It all started with the deterioration of the housing market in the US, a rapid increase in default and liquidity risk lead to a sharp risk re-pricing. This determined the onset of the financial crisis, preceded by the turbulences in the global money markets, with the sharp increase in spreads all over the world. Another triggering factor was the negative evolution of the stock prices in many countries. This also determined negative perceptions of risk and higher financing costs and loss in confidence, reduction in lending to companies and households in the euro area. In Figure 1 we have an evolution of stocks traded during the period 2000 – 2012 in four regions: US, World, European Union and OECD countries. The indicator refers to the total value of shares traded during the period and complements the market capitalization ratio (indicator is calculated as % of the GDP).

We can clearly see by the graph depicted that the total value of stocks traded increased with a rather constant pace from 2003 to 2008, when it recorded a historical peak. From 2008 until 2012 the total value of stocks traded went into a decrease path, with a minimum value in 2012, lower than the one recorded in 2003. Besides this, there are also some non-financial factors, like the decline in consumer confidence and increased in uncertainty which lead to a blocking in the investment spending plans. Moreover, the trade flows among economies contracted severely after 2007, and the international linkages acted as a domino effect.

Figure 1. *Evolution of the total value of stocks traded (% OF GDP)*



Source: World Bank Data.

The crisis also drew attention on the international dimension of the economic analysis, considering the integrated international financial systems. The crisis has shown that there is a need to pay more attention to the international transmission of financial and confidence factors and that there is an important link between US and euro area confidence, as the US confidence shocks had a significant impact on the euro area confidence indicators in the short term.

4. Case study

In our case study we develop a cluster analysis in order to characterize the differences between economies in what concerns the effects of the Great Financial Crisis from 2007.

First of all, we define the database. We use the Gross Domestic Product (GDP) recorded in 2013 from the World Bank data and calculate the share of the World GDP for each of the over 200 economies available. We select sample of the most important economies as share of GDP – more precisely we keep the first economies that totalize 95% of the world's GDP. The number of economies in this sample is 81.

The next step is to define the variables that will be included in the cluster analysis. For this, we take into account the effects of the Global Financial Crisis on the economy. We base our choice on the specialty literature (as highlighted above) and on data availability. We establish a set of five indicators, as follows: the annual growth rate of the GDP (considered as average for the years 2008-2012), the rate of the bank nonperforming loans to total gross loans (for 2013), the cash deficit/surplus calculated as percent of GDP (for 2012), inflation for 2011 and money growth for 2012. The detailed descriptions of the indicators are found in Table 1.

Table 1. *Indicators description*

Indicator	Indicator Description	Year
GDP growth (annual %)	Annual percentage growth rate of GDP at market prices based on constant local currency.	Average 2008-2012
Bank nonperforming loans to total gross loans (%)	Bank nonperforming loans to total gross loans are the value of nonperforming loans divided by the total value of the loan portfolio.	2013
Cash surplus/deficit (% of GDP)	Cash surplus or deficit is revenue (including grants) minus expense, minus net acquisition of nonfinancial assets.	2012
Inflation, consumer prices (annual %)	Inflation as measured by the consumer price index reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly.	2011
Money and quasi money growth (annual %)	Average annual growth rate in money and quasi money. Money and quasi money comprise the sum of currency outside banks, demand deposits other than those of the central government, and the time, savings, and foreign currency deposits of resident sectors other than the central government. This definition is frequently called M2.	2012

Source: Data World Bank.

Considering the availability of the indicators mentioned, we keep 50 economies in our database. However, Belarus is always placed as a singular cluster which determines us to exclude the country from analysis and consider the data as an outlier for the designated sample. The results of the clustering analysis are found in Table 2. The clustering method used is the Ward's linkage procedure. Calculations are done using Stata Software. We choose a number of 4 clusters as it best fits the dimension of our sample of 49 economies.

Table 2. *Results of the clustering procedure*

Country Name	Cluster
Austria	1
Belgium	1
Czech Republic	1
Denmark	1
France	1
Iceland	1
Israel	1
Japan	1
Luxembourg	1
Latvia	1
Morocco	1
Netherlands	1
Poland	1
Sweden	1
United States	1
South Africa	1
United Arab Emirates	1

Country Name	Cluster
Australia	2
Brazil	2
Chile	2
Colombia	2
Estonia	2
India	2
Korea, Rep.	2
Kuwait	2
Malaysia	2
Oman	2
Peru	2
Philippines	2
Russian Federation	2
Singapore	2
Thailand	2
Turkey	2

Country Name	Cluster
Bosnia and Herzegovina	3
Egypt, Arab Rep.	3
Croatia	3
Italy	3
Lithuania	3
Moldova	3
Romania	3
Serbia	3
Ukraine	3

Country Name	Cluster
Spain	4
Greece	4
Hungary	4
Ireland	4
Portugal	4
Slovenia	4

Source: Author's calculations.

We can clearly see that the four clusters correspond to four categories of economies, from the point of view of the crisis impact on the macroeconomic indicators. Cluster 4 comprises Greece, Spain and Portugal, economies that have been severely affected by the Global Crisis. In cluster 3 we find Romania, Moldova, Lithuania, Serbia, Ukraine which suggest that this cluster could be a cluster that encompasses the characteristics of the emergent economies. What strikes us in this cluster is the presence of Italy which, after the aftermath of the Crisis, we would have expected to find in the fourth Cluster. Looking at the countries included in the first two clusters, we conclude that this are the countries least affected by the financial crisis. However, looking at these countries, we cannot tell which is the cluster of economies that has been less affected by the crisis. In order to find this, we look at the summary statistics for each cluster. The results are presented in Table 3.

Table 3. *Clusters summary statistics*

Cluster	Frequency	Percent
1	17	34,69
2	16	32,66
3	10	20,41
4	6	12,24
Total	49	100

Cluster 1					
Indicator	GDP avg	NPL	M2	Cash deficit	Inflation
Mean	0,814	3,941	2,052	-3,521	2,843
Max	4,334	8,400	5,184	0,522	5,280
Min	-2,448	0,200	-3,747	-7,994	-0,283
Std. Dev	1,808	2,030	2,753	2,459	1,413

Cluster 2					
Indicator	GDP avg	NPL	M2	Cash deficit	Inflation
Mean	3,661	2,618	9,876	1,634	4,923
Max	6,801	6,000	16,072	27,869	8,858
Min	-0,438	0,700	4,806	-4,526	3,200
Std. Dev	1,871	1,380	3,423	7,683	1,801

Cluster 3					
Indicator	GDP avg	NPL	M2	Cash deficit	Inflation
Mean	0,740	14,940	9,517	-4,492	6,726
Max	4,193	21,600	20,832	-1,607	11,917
Min	-1,848	9,500	2,842	-10,635	2,250
Std. Dev	1,954	3,700	6,158	2,936	3,537

Cluster 4					
Indicator	GDP avg	NPL	M2	Cash deficit	Inflation
Mean	-1,647	18,450	-5,529	-6,619	3,087
Max	-0,947	31,300	-3,456	-2,644	3,957
Min	-4,475	8,200	-7,607	-9,397	1,811
Std. Dev	1,398	8,537	1,514	2848,000	0,779

Source: Author's calculations.

The results confirm our hypothesis. The countries from the second cluster are the least affected by the crisis (this include Australia, Estonia, Korea, Singapore, Thailand, etc.) – that is especially stable economies from the Asia and Middle East. The economies registered a growth of the GDP in the period 2008-2012 and a very low rate for the non-performing loans (2.62%). The growth in the money supply and the surplus of current account are also at very good levels: average growth in the money supply is 9.87% and the average cash surplus in 2012 is 1.63%.

The second cluster is the only group that registers cash surplus, the other three having cash deficit. The second less affected by the crisis group of countries is cluster 1. This includes among others: Western Europe developed economies (Belgium, Austria, France, Denmark, Netherlands, Sweden, Luxembourg), the United States and Japan. This group of countries has an average growth of the GDP significantly lower than those of countries from cluster 2 (0,814%). The non-performing loans (NPL) rate is close to the one in cluster 1 (3.94% in cluster 1 vs. 2.61% in cluster 2), but the growth rate of the money supply is almost 7 basis points lower.

In what concerns the third cluster, this is more affected by the crisis and, as we mentioned before this cluster includes Romania and other emerging economies from Europe. Although there is only a slight difference in GDP growth versus the first cluster (0.74% vs. 0.81% in the first cluster), the NPL rate reaches almost 15% vs. app. 4% for cluster 1. The difference between the average level of the two indicators is significant and denotes the fragility of the banking sector in the emerging economies.

Cluster four includes the economies which were most affected by the Financial Crisis: Spain, Greece, Hungary, Ireland, Portugal, Slovenia. The six economies are clustered in the “most affected” group of countries and this is confirmed by the average level of the five indicators. The group has negative economic growth (-1.64%), contraction of the money supply (-5.52%) and the largest current account deficit (-6.61%) from all groups of countries, while the NPL rate is at a peak of 18.4%.

In the end of our cluster analysis we note that the values of the Inflation indicator are not suggestive for the four clusters. The highest value of inflation (average 6.72%) is recorded for cluster 3 (mainly Europe emerging economies), which is rather a characteristic of the monetary policies of these countries. Surprisingly, the second highest inflation is recorded in cluster 2 (average 4.92%), which is the cluster of the countries which were less affected by the financial crisis. The inflation recorded in cluster 4, the most affected countries, is on average 3.08%, meaning that inflation was not among the macroeconomic indicators which were so affected by the financial crisis.

Conclusions

In this paper we analyzed the financial crisis from multiple points of view. First of all, we have done a historical radiography of the most important panic episodes that influenced the global economy. Secondly, we outline the most important features of the main financial crisis and we conclude that advanced and emerging economies are likewise vulnerable in face of the financial system fragilities. This is also confirmed by the case study developed which shows that both developed and emerging economies have suffered significantly after the recent global financial crisis.

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