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MASTER'S THESIS

The Effects of Crisis Management Measures on the Economy: Evidence from Past Crises

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Declaration of Authorship

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

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Prague, July 31, 2024 Jonáš Čekal

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Abstract

This thesis deals with the effectiveness of crisis management measures used by national authorities to tackle a systemic banking crisis. Quarterly panel dataset of 69 countries over the time span 1970 to 2023 was created and 54 crisis periods identified. The estimation employs two-way fixed effects model in difference-in-differences design to examine the effect of individual policies on the economy as represented by real GDP, house prices and credit provision. We find a significant positive effect of nationalizations and deposit freezes on the growths of real GDP and nominal house prices. The evidence on the remaining measures is either mixed or does not suggest any clear link to macroeconomic variables. Implementation of the policy expenses and other improvements in data quality would be needed to obtain more precise results.

JEL Classification	G01, G21, G28, E65
Keywords	State financial support, Bailout, Economic growth, Financial stability, Systemic banking crisis
Title	The Effects of Crisis Management Measures on the Economy: Evidence from Past Crises

Abstrakt

Tato diplomová práce se zabývá účinností nástrojů řešení bankovních krizí využívaných národními orgány. Byl vytvořen datový soubor s čtvrtletní frekvencí pozorování obsahující data z období mezi lety 1970 a 2023, v jehož rámci bylo identifikováno 54 krizových období. K odhadu vlivu použitých opatření na reálné HDP, nominální ceny nemovitostí a poskytnuté úvěry byla použita zobecněná konstrukce metody rozdílů v rozdílech zkoumaná pomocí modelu časových a individuálních fixních efektů. Byl objeven statisticky významný kladný efekt znárodnění a zmrazení vkladů na růst reálného HDP a nominálních cen nemovitostí. V případě ostatních opatření nabízejí regrese buďto protichůdné výsledky, anebo nenaznačují žádný vliv na makroekonomické indikátory. K dosažení přesnějších výsledků by bylo zapotřebí implementovat vynaložené náklady na jednotlivá opatření a dále zlepšit kvalitu a podrobnost dat.

Klasifikace	G01, G21, G28, E65
Klíčová slova	Státní podpora, Bailout, Ekonomický růst, Finanční stabilita, Bankovní krize
Název práce	Dopady nástrojů řešení krizí na ekonomiku: evidence z minulých krizí

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Master's Thesis Proposal

Author:	Bc. Jonáš Čekal
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Defense Planned:	June 2024

Proposed Topic:
The Effects of Crisis Management Measures on the Economy: Evidence from Past Crises

Motivation:
With U.S. government guaranteeing uninsured deposits of collapsed Silicon Valley Bank and Signature Bank and Swiss government orchestrating rescue and takeover of Credit Suisse bank, the role of government in resolving banks' troubles is once again a topical theme. In recent decades, we have witnessed a large number of systemic banking crises, as well as many crisis management measures (CMMs) taken by the authorities to tackle them. As these tools often consume a significant amount of taxpayers' money, it is relevant to ask whether they have been effective in achieving their objective of preserving soundness of the real economy and financial markets or contributing to their recovery.

Several studies of the effect of different CMMs on the real economy have been conducted in recent history. These include tools like bank holidays, deposit freezes, liquidity support, liabilities guarantees, nationalizations, or recapitalizations. Detragiache and Ho (2010) examined 40 banking crises in different countries across the world and found out that measures with relatively greater fiscal burden are associated with worse economic performance after the crisis and delayed recovery. On the contrary, Barucci et al. (2019) showed that the state financial support across the EU countries between 2008 and 2016 positively impacted their GDP and gross fixed capital formation. In terms of specific measures, these effects were driven by guarantees and recapitalizations. Overall, the majority of studies conducted before the global financial crisis indicate either no, or even negative effect of bailout policies on the recovery of the real economy. After the crisis, researchers often focused on studying how recapitalization programs affected balance sheets of banks and how effectively they boosted credit supply. For instance, Brei et al. (2013) suggest that a critical threshold of the amount of additional capital provided exists, which must be exceeded in order to translate this funding into greater lending. Giannetti and Simonov (2013) confirmed this finding, adding that too small capital injections even encourage the evergreening of nonperforming loans.

Hypotheses:
1. Hypothesis #1: Crisis management measures differ in their impact on the real economy and credit recovery after the crisis.
2. Hypothesis #2: Crisis management measures associated with higher fiscal costs contribute to a faster recovery of the economic performance and credit after the crisis, reducing its duration and economic costs

3. Hypothesis #3: The developed countries are able to reduce the economic costs and duration of the crisis more effectively

Methodology:

As a core source of data, I intend to use the latest systemic banking crises database by Laeven and Valencia (2020). This widely used research paper was originally published in 2008 and has been updated several times since then. Now it provides information on 151 systemic banking crisis which appeared between 1970 and 2017 all around the world. Specifically, the data on timing, policy responses taken to resolve the crisis and fiscal and output costs related are identified. For almost half of the total number of crises, additional information regarding the CMMs is attached. I will rely on these statistics to create a panel dataset of dummy variables indicating the presence of a specific measure. If the information is not detailed enough, an additional search will be made using national resources and published documents. I will also attempt to extend the information about the CMMs applied for some of those countries for which this information was not available in the Laeven and Valencia (2020) database. Then, I will examine the effect of various measures on the economy and credit as represented by the GDP and credit to private sector. I will also control for other macroeconomic and country-specific variables.

With cross-country panel data at hand, the use a fixed effects estimation method seems appropriate. The two-way fixed effects regression allows to control for country- and time-specific trends. Apart from Barucci et al. (2019) in the already mentioned study, this approach was also followed by Laeven and Valencia (2012) when examining the effectiveness of government guarantees on bank liabilities in a sample of 42 systemic banking crisis.

There are some issues associated with this kind of analysis as described in the existing literature. Sample selection bias might arise when analysing only countries which were hit by a crisis. Laeven and Valencia (2013) solve this problem by including other countries in their sample that did not experience any crisis during the examined period. Furthermore, studies also point to possible endogeneity bias caused by the simultaneity of government interventions and real economic activity. Authors often provide additional regression with instrumental variables to address this issue and to provide a robustness test. Honohan and Klingebiel (2003) used political and institutional instruments such as corruption and law and order tradition, while Detragiache and Ho (2010) included an indicator of a country's political system. I plan to do the same.

Expected Contribution:

The existing literature is not conclusive about the exact effects of specific CMMs on the economy. My research will use a broader set of past crises by combining the samples from previous related studies and additional information from available sources. I will thus be able to better distinguish the effects of various CMMs as well as to compare the policies across countries with different levels of development. The results of my analyses might be used to provide better information about how to tackle possible future crises more effectively as they will hopefully evaluate and rank different measures in terms of their impact on the economy, credit, and the length and the total costs of crises

Outline:

1. Introduction: motivation for the research
2. Crisis management measures: description and use in previous crises
3. Literature review: summary of existing literature on related topics
4. Data: sources of data, description of variables

5. Methodology: use of methods, specifications of models for estimation
6. Results: presentation of results, discussion, comparison
7. Conclusion: summary of findings, their usefulness and possible future extension of study

Core Bibliography:

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1 Introduction

In 2023, with U.S. government guaranteeing uninsured deposits of collapsed Silicon Valley Bank and Signature Bank and Swiss government orchestrating rescue and takeover of Credit Suisse bank, the role of government in resolving banks' troubles became once again a topical theme. During recent decades, we have witnessed a large number of systemic banking crises, as well as many crisis management measures taken by the authorities to tackle them. As these tools often consume a significant amount of taxpayers' money, it is relevant to ask whether they have been effective in achieving their objective of preserving soundness of the real economy and financial markets or contributing to their recovery.

Over the years, seven main policies have crystallized. The most common measures are the liquidity support alongside recapitalizations. Often, the authorities also use guarantees, nationalizations and asset purchases, whereas bank holidays and deposit freezes occur only rarely. Several studies of the effects of these measures on the economy or bank performance and risk have been conducted with mixed evidence and results provided. The objective of this thesis is to analyze the effectiveness of crisis policies using updated and more detailed dataset and different methods. We apply difference-in-differences approach to examine a broad panel dataset of 69 countries all around the world over the time span 1970 to 2023 with quarterly frequency. The main contribution lies in the identification of the timing of individual measures across the 54 systemic banking crisis periods covered. That enables to attribute movements in macroeconomic variables to these policies while controlling for country- and time-specific fixed effects and for evolution of macroeconomy in control group of countries. Analyzing the growth of real GDP and nominal house prices, we find nationalizations and deposit freezes to be significantly effective measures in economic recovery. However, our second hypothesis of more expensive measures contributing to faster growth is rejected.

In this thesis, we start with description of systemic risk, systemic banking crisis and the individual measures adopted by countries to tackle it. We proceed with literature review summarizing existing research on this question. Then, description of the data collection process and data summary are provided before moving on to methodological part of the thesis. Finally, the results of our models are presented, limitations discussed, and hypothesis tested.

2 Systemic Banking Crisis and the Crisis Management Measures

In recent decades, we have witnessed a large number of systemic banking crises, as well as many crisis management measures taken by the authorities to tackle them. This chapter provides a description of systemic risk as it is the source of the crises which we analyze in our thesis. Afterwards, the systemic banking crises are defined as we set the playing field for our research. Finally, we delve into specific crisis management measures. A variety of them have been used during past crises in order to protect or recover the real economy and financial markets.

2.1 Systemic risk

A systemic banking crisis arises from amplification and transmission of systemic risk in the economy. This risk was underestimated before the latest global financial crisis of around 2008 and hence the following years brought about a thorough research on this topic. Systemic risk has two dimensions: cross-sectional and time. The former dimension relates to shock propagation. The balance sheets in the financial system are interconnected and because of these settlement and interbank linkages, the problems of one specific institution pose a huge risk for the whole system. The other type of cross-sectional dimension is the common exposures and a subsequent threat of a shock hitting a huge segment of market. An example might be the real estate market which crushed at the beginning of the global financial crisis.

The time dimension of systemic risk relates to its procyclicality. Over the good times of economic cycle, the agents increase risk which is cumulated up to the point of peak. At that time the systemic risk can be highest although it looks lowest. During bust, risk aversion of agents once again amplifies the direction of economic cycle, this time the other way around.

Both dimensions of systemic risk must be dealt with by specific policies. In good times, when the systemic risk accumulates, preventive policies should be built by the authorities to prepare for future distress. In contrast, materialization of systemic risk happens in bad times and in these cases the crisis management policies should enter the scene (Caruana, 2010).

The authorities further identify so-called systemically important banks. They aim to impose stricter requirements on large banks as these represent the greatest threat for the financial system. The related theory of "too big to fail" identifies huge financial institutions which carry out such a large number of transactions that their failure would possibly destroy the whole system and economy. Other criterion of systematically important banks is the so-called "too interconnected to fail" which detects reciprocal balance sheet exposures between different banks and hence huge risk of contagion in case of distress. Finally, "too many to fail" phenomenon describes similar balance sheet characteristics of a large group of institutions. These similarities once again increase the risk of spread of the shock to the whole system (Foglia & Angelini, 2021).

The systematically important banks are often bailed out by the authorities in case of distress. However, this creates a problem of moral hazard in the financial sector. Managers are prone to take excessive risks if they know that their bank would be saved in any case. This risk is somewhat reduced by stricter regulatory requirements for large banks which should help them survive economic downturns.

2.2 Systemic banking crisis

The World Bank (2023) provides a definition of systemic banking crisis which occurs in case of serious solvency and liquidity problems of many banks in a country at the same time. One of the reasons might be a failure of an important bank and a successive spread of this shock to the whole financial system due to interconnectedness. Alternatively, there might be some common shock which affects all the banks jointly.

The trigger is typically a situation of a number of defaults in corporate or financial sector resulting in difficulties of repaying contracts on time. Then, the share of non-performing loans increases sharply and capital in banking system might be exhausted. Rising real interest rates or depressed asset prices often join as well. Alternatively, the runs on banks might be the starting points of systemic banking crises. In these cases, panic is present on the financial market as the depositors do not want to end up last in the queue and not get their money out.

Systemic banking crises can cause deep recessions and can rapidly spread to other countries due to globalization. As for the causes of such crises, World Bank (2023) mentions a combination of several factors including unsustainable public debt, large current account deficit, excessive credit boom and capital inflows or balance sheet fragilities. Furthermore, currency and maturity mismatches and off-balance sheet items turned out to be a great threat.

In 2008, Valencia & Laeven (2008) published a new systemic banking crisis database with total of 124 crises identified over the period 1970 to 2007. This widely used research paper has been updated twice since then and the current version provides information on 151 systemic banking crises which appeared between 1970 and 2017 all around the world (Laeven & Valencia, 2013a, 2020).

In the database of Laeven & Valencia (2020), the authors define a banking crisis as an event that meets two conditions. At first, the banking system must exhibit significant signs of financial distress. These might be losses, bank liquidations, or bank runs. The second criterium relates to significant banking policy intervention measures which must be implemented in response to these significant losses. Laeven & Valencia (2020) consider the implemented measures to be significant if at least three of the six mostly used measures have been introduced. We provide a description of those in the following subchapters. The first year when both these conditions are met is considered as the year when the banking crisis became systemic, based on the author's reasoning. Alternatively, in exceptional cases, even only the first condition was sufficient to date the crisis if losses and liquidations were severe, such as at least 20 % share of non-performing loans or fiscal restructuring costs exceeding 5 % of GDP. Although there exist some other approaches to crisis dating, Laeven & Valencia (2020) claim that their method is very objective and applicable for countries of all different income levels. Moreover, results of alternative research are very similar to those of Laeven & Valencia (2020).

Based on the author's database, the systemic banking crises are often occurring multinationally at the same time, causing large waves. In the 1980s and 1990s, these crises were mostly low- and middle-income country phenomenon. The 2000s represented a silence before the storm as very few episodes were detected. The storm finally came in 2008 and hit mostly the high-income countries.

Furthermore, a systemic banking crisis might be accompanied by a sovereign debt crisis or a currency crisis. There are spillovers present between public and banking sector in both ways as banks hold exposures of the sovereigns and sovereigns bail out banks. Hence, problems of banks and sovereigns are connected and reinforce each other. In case of a currency crisis, the mechanism is similar. Banks might hold open foreign exchange positions, making them vulnerable to depreciation of domestic currency. Depositors, on the other hand, turn attention to foreign assets if the trust in domestic financial sector is broken. Laeven & Valencia (2020) detected 11 triple crises over their examined period 1970–2017. Out of the twin crises, the systemic banking crisis is accompanied by currency crisis at most with 31 such examples. On the other

hand, its concurrence with just sovereign debt crisis is quite rare. Only 3 such cases were discovered over the mentioned period. Interestingly, it is common for systemic banking crisis to happen at the same time or precede sovereign debt and currency crises.

Based on the specific policies used to mitigate the consequences of systemic banking crisis, the total fiscal costs of crises vary across countries. The median value is 6.7 % of GDP for high-income countries and 10 % for low- and middle-income countries. Laeven & Valencia (2020) also measured recoveries of government outlays, such as proceeds from sales of financial assets which were acquired to help the banks. These were especially successful in high-income countries as they halved the median value of fiscal costs. On the contrary, the less developed countries were not able to reduce these costs any significantly.

As for the systemic banking crisis duration, over a half of these episodes in high-income countries showed up to be persistent as they lasted 5 or more years. In contrast, the majority of crises in less developed countries were a matter of 1–4 years. One of the explanations might be a complexity of financial systems in the most developed countries. Nevertheless, the latest global financial crisis creates a bias in these statistics as it was very severe and hit mostly high-income countries.

Finally, the output losses also tend to be larger for developed countries and the decline in the level of output more persistent. Developing countries often manage to increase their exports just after the crises and benefit from a boost of external demand.

2.3 Crisis management measures

The crisis management measures as we define them in our thesis involve several financial sector policy interventions which were introduced as a response to distress on financial market. Their ultimate objective is preserving soundness of the real economy and financial markets or contributing to their recovery.

This subchapter provides an overview of these individual measures which are often used concurrently. In our thesis, we concentrate on examining their effectiveness during or after a systemic banking crisis. However, we might see different interventions implemented also outside the scope of a crisis with the aim of preventing one. For instance, in 2023 we could witness the U.S. government guaranteeing uninsured deposits of collapsed Silicon Valley Bank and Signature Bank, and the Swiss government orchestrating rescue and takeover of Credit Suisse bank.

2.3.1 Liquidity support

The liquidity support is the mostly used measure during a systemic banking crisis for all countries regardless of their level of development. The central banks typically provide lender-of-last-resort support through advances with or without collateral, discounts of eligible paper or repos of the institution's assets. By these actions, the authority shows the public that it acts firmly and is ready to limit the disturbance. Often, the criteria of systematically important banks have to be relaxed and rather all financial institutions receive the aid. Also, the collateral issue varies a lot as valuable assets might be missing in times of distress. The liquidity support represents a crisis containment policy as it hopefully resolves the risk of bank runs, but it just provides time to prepare crisis resolution policies which only are able to solve the distress in the long-run (He, 2002).

At least 5 % of total deposits and foreign liabilities is considered an extensive liquidity support by Laeven & Valencia (2020) to account for an identification of a systemic banking crisis. The median peak of this ratio reaches 20.2 % over the set of detected systemic banking crises and the middle- and low-income countries tend to use liquidity support on a much larger scale and more persistently. The reason for the difference might be a broader array of instruments used by developed countries and also the length of period of use.

2.3.2 Recapitalization

Next to liquidity support, bank recapitalization is the second widely used CMM during a banking crisis. It consists of government capital injection, often in a combination of common and preferred equity. As the fiscal costs of banking crises are driven largely by these recapitalizations, the sovereign typically requires prohibition of dividend payments and also a seat in the bank board. Additionally, this policy aims at crisis resolution, but trade-off between the speed and durability of recovery and fiscal costs is present (Valencia & Laeven, 2008).

Due to its large fiscal burden and introduction of moral hazard, recapitalizations are very unpopular. On the other hand, undercapitalized banks represent a huge problem for the financial sector as they either increase zombie lending, or at least seriously limit lending, hence limiting growth. In a fear of closure, they might also intentionally underestimate the share of non-performing loans (Homar, 2016).

2.3.3 Guarantees on bank liabilities

The guarantees on bank liabilities represent another containment policy to deal with liquidity pressures at the early stages of a crisis. They are able to limit the upfront fiscal costs as compared to direct liquidity support. However, the public faith in sovereign's financial health is crucial for their effectiveness. We distinguish explicit and implicit guarantees, both types giving rise to moral hazard problem, but the implicit ones even miss clearly defined boundaries. Furthermore, the specific guarantees differ in the range of liabilities which they cover. These might be just deposits, for instance, which corresponds rather to increase in deposit insurance coverage (Schich, 2009). The term blanket guarantee relates to explicit guarantee on a substantial fraction of bank liabilities (Laeven & Valencia, 2012).

Based on Laeven & Valencia (2020), the important feature of guarantees is their long period of operation and only gradual removal. For example, in Mexico, the blanket guarantees were left in place from 1993 to 2003. Overall, guarantees are much more common among high-income countries, possibly because of larger credibility of its governments.

2.3.4 Nationalization

The nationalizations represent the extreme case of recapitalization when the systemically important bank is taken over by the government. Valencia & Laeven (2008) reported the use of this measure in 57 % of total crisis episodes. However, the nationalization is rather a phenomenon of developing countries which find it difficult to search a new private owner of failed bank.

2.3.5 Asset purchases

National authorities might also implement the purchase of assets from banks, which belongs to crisis resolution policies. Often, an asset management company was set up by the government to take over and manage the distressed assets. This was a case of around 60 % of crises (Valencia & Laeven, 2008).

2.3.6 Bank holidays

The liquidity pressures sometimes represented such threat that the countries decided to close the banks. This measure was used to buy time until the development of a strategy to deal with the crisis. Laeven & Valencia (2020) detected 6 bank holidays in their database which lasted between 4 and 21 days.

2.3.7 Deposit freezes

All 6 reported bank holidays were succeeded by a deposit freeze. This measure enabled to suspend conversion of deposits into cash and restrict foreign payments. Overall, the deposit freeze was only used during 8 systemic banking crises which are part of the database of Laeven & Valencia (2020). In contrast to bank holidays, the deposit freeze might be of long duration of even several years.

3 Literature Review

The existing literature concerning the crisis management measures is quite rich. In this review, we aim to provide an insight into some of the important papers which inspired this thesis. Researchers have several possibilities how to examine the effectiveness of the CMMs. They can try to measure the effects on the economy as the ultimate objective of each measure is preserving soundness of the real economy and financial markets or contributing to their recovery. Furthermore, as these tools often consume a significant amount of taxpayers' money, the question of their effectiveness is relevant for society and the answers vital for their use in future crisis. In another studies, their authors concentrate on the direct effects of measures on bank balance sheets and the changes in bank performance. Last but not least, the policies aiming at crisis resolving involve a huge amount of risk which they bring into the market. The elaboration on different risks was also a topic of many research papers.

We start the literature review with most relevant references for our thesis. These include studies on the effects of CMMs on the economy. We further divide macro-oriented approach from micro-oriented one, because the latter is not applicable for the wide range of past crises which we examine. In the second part of the chapter, we mention some influential works on the topics of effects of CMMs on the bank performance and risk. These papers are more distant to our research, but they definitely provide an interesting insight into other aspects of crisis interventions.

3.1 Effects of crisis management measures on the economy

With a large number of systemic banking crises over the last decades and many different measures taken by the national authorities to tackle them, the question of effectiveness of the tools attracted many researchers. Overall, the majority of studies conducted before the global financial crisis indicate either no, or even negative effect of bailout policies on the recovery of the real economy. After the crisis, researchers often focused on studying how recapitalization programs affected balance sheets of banks and how effectively they boosted credit supply. We might distinguish macroeconomic and microeconomic analysis of CMMs. The subject of investigation of the former is the level of individual countries and in our study, we follow this

approach. On the contrary, the latter branch of research focuses on bank- and firm-level data.

3.1.1 Macroeconomic analysis

Honohan & Klingebiel (2003) examined 40 crises in different countries across the world which occurred in the last two decades of the 20th century. They concentrated on explaining the overall magnitude of fiscal costs by the specific crisis management measure applied to suppress the decline. The results indicate that each policy is associated with increased fiscal costs and that forbearance, repeated recapitalization and liquidity support are the costliest measures, pushing up the predicted fiscal cost by 6–7 % of GDP. Finally, the researchers studied the impact of CMMs on subsequent economic growth recovery, finding out that only liquidity support had a significant effect which even led to prolonging the crisis.

Similar analysis was performed by Hoggarth et al. (2002) with larger focus on differences between developed and developing countries. In their paper, the authors show that crises in the developed countries are typically of longer duration and hence their output losses sometimes outweigh losses of emerging markets. They further claim that the reason might be faster and sharper reaction of developing countries to crisis as these countries often face much larger share of bad loans and are more dependent on state-owned banks. On the contrary, developed countries might react more slowly and gradually. Their banking system is also more immune and only severe crises hit the economy which might bias these statistics.

These conclusions are not supported by Claessens et al. (2005) who concentrated on the impact of quality of a country's institutional environment on reducing output losses and fastening recovery. They included an index for quality of institutions, corruption and judicial efficiency into their regressions and found out that countries with worse score in the latter two variables experienced a significantly prolonged recovery from crisis. The authors also confirm the findings of previous studies that CMMs are not effective in reducing losses in output.

In their research paper, Cecchetti et al. (2009) regressed the length and the depth of 40 systemic banking crises on many different CMMs which were pursued by the individual countries. Overall, the results indicate that using any of such measures is associated with both increased duration of crisis and GDP decline. Whereas bank nationalizations accounted for 7 quarters longer recovery and 5 % sharper decline in GDP, the liquidity support and government intervention prolonged the crisis by 5 quarters. Other policy responses followed the same trends but remained statistically

insignificant. Furthermore, the relation of systemic banking crises to currency and sovereign debt crises was also examined by Cecchetti et al. (2009). A currency crisis accompanying a banking crisis has a negative effect on the trough in output, decreasing it by 6 %. The crisis also lasts 5 quarters longer. On the other hand, a concurrent sovereign debt crisis dampens the decline in GDP by 7 % and shortens the duration of crisis by 2 years.

Detragiache & Ho (2010) used data from 40 banking crises and found out that measures with relatively greater fiscal burden are associated with worse economic performance after the crisis and delayed recovery. As a possible explanation the researchers mention moral hazard hindering efforts to restructure the financial sector effectively. Hence, no evidence of tradeoff between limiting the economic costs of crisis and protecting fiscal resources was found. This study was using cross-sectional data, as were also the mentioned works of Honohan & Klingebiel (2003), Hoggarth et al. (2002), Claessens et al. (2005) and Cecchetti et al. (2009).

The paper written by Grande et al. (2011) delved into many different aspects of public guarantees on bank bonds. The researchers suggest that a positive correlation between the intensity of the recourse to guaranteed bonds and lending growth existed in 2009. Hence, this measure helped preventing a credit crunch and resuming bank funding.

Time vector analysis of past crises was included in the research of Laeven & Valencia (2012) who used their own created dataset of systemic banking crises to examine a narrower topic of the effectiveness of government guarantees on bank liabilities. As argued by the authors, blanket guarantees should eliminate incentives of deposit withdrawals because they increase public confidence in the banking system. Then, the provision of liquidity support from the monetary authorities to the banking system was expected to decrease and hence it was chosen as a proxy variable to measure the effect of guarantees on public confidence. In a sample of 42 crises, Laeven & Valencia (2012) indeed found negative effect of imposing a blanket guarantee on the liquidity support which declined by 6 %. Nevertheless, the authors also included a dummy variable for bank restructuring policies, including bank recapitalizations or nationalizations. These measures have proven to be much more beneficial in restoring public trust as they are likely to be seen as permanent solutions. Finally, in additional models, foreign creditors are detected to withdraw their deposit with increased speed after the imposition of guarantee. As an explanation, the authors suggest fears of non-residents that their claims would be subordinated to those of domestic creditors. Although moderate effectiveness of CMMs in limiting liquidity pressures was found

in the research of Laeven & Valencia (2012), the implications for growth and lending were not explored in their work.

An analysis of panel data covering the EU countries from 1999 to 2016 was conducted by Barucci et al. (2019). They showed that the state financial support across the member countries between 2008 and 2016 positively impacted their GDP and gross fixed capital formation (investment). Specifically, a 1 % increase in cumulative state support to financial institutions as a fraction of their total assets led to a 0.05 % rise in the growth rate of GDP and 0.1 % increase in the growth rate of investment. The researchers continued by examining the transmission channels of the state aid to the real economy. Hence, to their models, they further added the growth rates of the stock of securities issued by non-financial companies, of the stock of loans granted to non-financial companies and of the country stock index. As a result, the state support had a significant positive effect on the growth rate of securities and stock index with a 1 % increase in aid translated into 1.2 % increase in the former and 0.4 % growth in the latter measure. However, out of the three transmission channels, only the securities were detected to have a statistically significant effect on the growth rate of the GDP and investment, which was in both cases positive. In terms of specific CMMs, the effects on the real economy were driven by guarantees and recapitalizations. The GDP growth was accelerated by 0.3 % and growth in investment by 0.7 % when increasing the amount of money spent on recapitalizations by 1 %. The effect of guarantees was around 5 times weaker in case of both indicators.

3.1.2 Microeconomic analysis

In another branch of research, the authors try to provide microeconomic evidence on the real effects of bank bailouts. Giannetti & Simonov (2013) studied the Japanese banking crisis of the late 1990s and obtained panel data for over 3000 non-financial companies and 239 banks. They found out that two wide Japanese recapitalization programs led to sizeable increase in the supply of bank loans to firms and subsequently to positive abnormal returns and increased investments of these firms. However, this effect was fueled only by those banks which ended up able to meet capital requirements after the capital injections. Moreover, these banks provided 2.35 % less credit to zombie firms after recapitalization as compared to an 0.18 % increased lending to unprofitable businesses by banks which remained undercapitalized. Based on their results, Giannetti & Simonov (2013) conclude that the range and power of recapitalizations are crucial determinants of their effectiveness and that too small capital injections even encourage the evergreening of nonperforming loans.

Brei et al. (2013) confirmed this finding and suggested that a critical threshold of the amount of additional capital provided exists, which must be exceeded in order to translate this funding into greater lending. They arrived at this result by analyzing data on 108 banks from advanced economies over the period from 1995 to 2010.

Firm-level and industry-level data were used by (Laeven & Valencia, 2013b) to examine effects of policies adopted during the latest global financial crisis. They tested whether these measures influenced the real growth of value added of firms and sectors which are dependent on external financing. Because the policies have no direct impact on value of firms, this effect would be driven by the channel of additional supply of credit achieved by imposition of specific measures. The results indicate a significant positive effect of bank recapitalization policy and real growth in value added of financially dependent firms. On the other hand, guarantees, asset purchases and liquidity support proved to be individual insignificant. Nevertheless, all measures together remained jointly significant.

3.2 Effects of crisis management measures on bank performance and risk

Several studies focused on the effects of CMMs on the behavior of banks and on the risks associated with an adoption of such measure. For instance, Hryckiewicz (2014) examined 92 banks in 23 countries which were either protected by guarantees or directly bailed out during a systemic banking crisis. She detected a strong increase of risk in the banking sector arising from loosening of governance mechanisms after the crisis, lack of restructuring process in the distressed banks and inefficient management.

Kryg (2020) elaborated on this research as she used data on nearly 1000 banks, both intervened and non-intervened ones. Based on her results, she argues that only nationalizations have a positive effect on all studied measures of bank performance. On the contrary, government-assisted merger and “bad” bank approach were successful in huge improvement of a specific measure. Hence, Kryg (2020) recommends a case-by-case implementation of an intervention based on the desired result by each specific bank.

The US Capital Purchase Program of 2008 and 2009 was the focus Taliaferro (2009), who found that this new equity was mostly used to improve the capital ratios of banks. Only 13 % of the support was used for lending purposes, which is much less than in the preceding years.

In her master's thesis, (Sivá, 2023) analyzed EU and US banks during the latest global financial crisis of around 2008. The government bailouts across the countries of the EU led to higher loans ratio. However, this effect was especially strong in the periphery states (Greece, Ireland and others), where, together with increasing share of non-performing loans, it led to excessive risk-taking and moral hazard problems. The results suggest that EU core countries' (Germany, France and others) and US banks rather used the bail outs to increase their capital adequacy ratio.

In the already mentioned article, Grande et al. (2011) measured the impact of bond guarantees on the riskiness of banks. If this risk were to reduce, the authors would also expect a decline in the credit risk premiums required by investors on banks' securities. And that is what happened as the introduction of debt guarantee reduced the bank credit default swap premia (a proxy for credit risk premia) by 0.25 % and this effect turned out to be quite persistent. To compare with impact of other rescue measures, capital injections had a similar effect as debt guarantees, whereas asset purchases and guarantees even led to increase in bank credit default swap premia. Finally, Grande et al. (2011) pointed at some weak points of guarantee schemes of 2008. Distortions to competition raised from differences in creditworthiness of individual countries when weak banks with strong sovereign were advantaged and vice versa. Furthermore, weak sovereigns were not able to reduce cost of borrowing effectively. Supranational authorities might be a solution, the authors claim.

4 Data

In this chapter, the choice of dependent and independent variables for econometric analysis is defended. We also state the data sources and provide description of additional data adjustments if any. At the end, the final dataset is analyzed with summary statistics and comprehensive overview of the past crises and policy measures taken. Illustrative examples of crisis periods complement the last part of the chapter.

4.1 Dependent variables

In order to study the effects of crisis management measures on the economy, the collection of several macroeconomy indicators is necessary. The fact of availability of the crises description data with exact policy timing encouraged us to conduct research with quarterly granularity. That enables to detect optimal intertemporal effects consistently across the dataset as annual data basis would represent too wide period. On the other hand, such a frequency creates issues with data availability for many different countries across several past decades.

The earliest crises with sufficient information date from the 1980s. Hence, quarterly macro indicators were collected from 1970 when data for at least some countries were available. With the choice of difference-in-differences approach these measurements enable to widen the control group of countries and time periods where no crises and no measures were present.

The gross domestic product is one of the indicators chosen as the dependent variable in some of our model specifications. One would expect that after a common drop in production at the onset of the crisis, the crisis management measures adopted aim at restoring the production growth and lead to higher GDP. The source of the data is the International Financial Statistics of the International Monetary Fund (IFS IMF) where the figures are provided in real terms, domestic currency and are seasonally adjusted (IMF, 2024b).

In most of the previous studies, the researchers included real GDP growth rate in their model specifications. For instance, Barucci et al. (2019) explained this variable using yearly panel data. Our quarterly panel creates more possibilities, but also several issues. At first, the problem of seasonality is already addressed by the data source as the IMF provides seasonally adjusted data on GDP. With quarterly data on GDP, we

are also able to measure the GDP growth either related to the to the last quarter (one quarter backwards), or to the same quarter last year (four quarters backwards). However, the latter approach should be accompanied by a sufficient lag in explaining variables due to the earlier base used for creating the dependent variable.

It is further useful to measure the effect of crisis policies on the economy through the credit provision. If the measures adopted by authorities are effective, the relief of banks' balance sheets should allow them to provide more credit. Then, this credit translates into speedier economic recovery (Laeven & Valencia, 2013b). The Bank for International Settlements (BIS) provides the quarterly data on credit from banks in various specifications (BIS, 2024). For the purpose of our analysis, we chose credit from domestic banks to private non-financial sector at market value as a percentage of GDP and adjusted for breaks. The year-on-year and quarter-on-quarter differences in credit were calculated as well.

Finally, the house prices are connected to the macroeconomy to a large extent. At the time of crisis, they usually experience a fall which leads to spillover effects to other parts of economy as property often serves as a collateral. During recession, fewer households and other entities are willing or able to buy real estate (Cecchetti et al., 2009). To provide alternative model specification and to ensure the robustness of results, we collected data on real and nominal house price indices from the Organization for Economic Co-operation and Development (OECD) database (OECD, 2024). Both variables are seasonally adjusted and their growth rates were created using MS Excel.

4.2 Independent variables

In our model specifications, we needed to consider different variables which could possibly explain moves in macroeconomic indicators. In the following subchapters, at first, we explain the procedure of collecting the data on exact timing of banking crises and policy measures taken to tackle them. Then, we turn our attention to other explaining variables which should control for the remaining factors influencing the macroeconomy.

4.2.1 CMM dummy variables

To analyze effectiveness of specific crisis management measures, we decided to construct a set of dummy variables. Using different sources presented below, 8 variables were created manually, quarter by quarter, country by country. If the

literature indicated a clear use of a given policy in a country at a specific quarter, the value of the particular dummy variable was set to 1. In all other cases, the measurement was marked with 0 indicating that policy was not in force in a country at the given time.

As a core source of data, we used the Laeven & Valencia (2020) systemic banking crisis database presented in the literature review chapter. Besides detecting the 151 crisis periods in the majority of countries in the world, the authors also prepared a table with more detailed information on 68 of those crises. Some crises of this selection are accompanied with a continuous text providing an insight into the situation just before a specific depression. What is the most useful are the exact banking crisis start dates with an accuracy of months, as well as binary information on whether a specific measure was or was not used to tackle a given crisis.

At first, systemic banking crisis dummy was created to capture all quarters during which a country experienced a crisis. Then, we turned our attention to dummy variables for specific measures.

In case of deposit freezes and bank holidays, their exact date of introduction and duration in months is captured by Laeven & Valencia (2020). That is also the case for the most of the significant bank liabilities guarantees with the exception of the recent financial crisis. On the other hand, nationalizations, recapitalizations and asset purchases and transfers are mostly mentioned without any clarifying information. Additional sources had to be used in order to track the exact timings of such measures.

Although the dates of nationalization approval and beginning were found for all cases, the course of the entire process is either not known, or difficult to collect. Hence, the value of the corresponding dummy variable was set to 1 from approval or beginning of nationalization process until the end of the systemic banking crisis period as indicated in Laeven & Valencia (2020) database. Such procedure was further used in case of recapitalizations and asset purchases and transfers when data were not sufficiently granular.

Finally, the liquidity support represents the most problematic measure in our chosen empirical approach. It is a very common policy which has been in force during every crisis period we have covered. Here, the question is rather how much than if any. Countries differ a lot in the peak liquidity support in % of deposits as Laeven & Valencia (2020) illustrated in the supplementary text of the database, which was shortly reproduced in the second chapter of our text. For the purpose of our research, we decided only to analyze the effect of the use of a specific measure regardless of the

magnitude of such intervention in terms of money. Hence, because the liquidity support is considered to be an automatically present measure during all the analyzed crisis periods in our dataset, its effectiveness cannot be explored due to missing control group in our research design. However, the financial scope of measures represents a possible extension path of this thesis in future dissertation.

Next to the core systemic banking crisis database of Laeven & Valencia (2020), the work of Metrick & Schmelzing (2021) appeared to be a useful complementary source of data. These authors constructed a huge database covering a wide range of banking crisis policy interventions which were adopted across 143 countries over the centuries since the Roman Empire. Most of them are included in the timeline with an accuracy of months which was used to track nationalizations, recapitalizations and asset purchases and transfers in many cases of distress.

Sometimes, additional supporting sources were studied in case of still uncomplete information. For instance, Sato (2005) provided detailed information on policies adopted to tackle Indonesian banking crisis which began in 1997. Specifically, bank nationalizations occurred in five rounds between November 1997 and March 1999 and recapitalization of reconstructed banks lasted until the end of 2000. Similarly, the timing of Korean nationalization program was taken from Hunter (2001).

Overall, in the database of Laeven & Valencia (2020), the data on exact timing of specific measures are not much granular in case of the most recent crises. Hence, the State Aid Scoreboard 2018 by European Commission (2019) was used to track policies adopted across European countries to tackle the crises which emerged with global financial crisis of 2008. This edition provides comprehensive information on the approved and used state aid to banks in absolute amounts in billion eur. For each country and year, the amounts of recapitalizations, impaired asset measures and guarantees are specified. In our dataset, we marked all four quarters in a given year with 1 as treatment effect in force in our dummy variables if any significant aid was indicated by the scoreboard and was related to a systemic banking crisis.

The timing of nationalizations and some other measures still had to be taken from other available sources. For example, in case of Ireland, the timing of nationalizations of 2 banks was taken from Baudino et al. (2020). Engbith (2020) provided the description of Italian guarantee scheme which was in force from the end of 2008 through the whole 2009.

The effect of the policy adopted possibly translates into the economy with some delay. Using R software functions, 3 lagged variables were created for each of the

policy dummies. Specifically, we shifted the values of dummy variables by 4, 8 and 12 quarters, respectively. In that way, we are able to capture the effect of policy delayed by one to three years.

4.2.2 Control variables

Our dummy variables of special interest need to be accompanied by other control variables in some model specifications to capture other possible determinants of dependent variables. The following paragraphs list the indicators we collected, out of which some were used in our model specifications.

The data on lending rate were taken from IMF IFS database. This rate meets the financing needs of the private sector from the short-term and medium-term perspective (IMF, 2024c). Some interest rate reflecting monetary policy of a given country at given time was included in all studies, namely Barucci et al. (2019) and others.

Rates of inflation and unemployment are other macroeconomic indicators with possible relations to our examined variables. The source of the data is the World Economic Outlook database of the IMF (IMF, 2024d). For instance, Hryckiewicz (2014) controlled for inflation in her models.

The next widely used database was the Global Debt Database of the IMF (IMF, 2024d). The indebtedness across different sectors represents an important factor influencing the whole economy. One of the extracted variables is the central government debt defined as the total stock of debt liabilities issued by the central government as a share of GDP. This variable might be replaced by the similar general government debt which was downloaded as well to compare data availability. The difference lies in inclusion of local governments and others in the latter variable.

In the private sector, the same database provides data on private debt securities accounting for the total stock of loans and debt securities issued by households and nonfinancial corporations as a share of GDP. Additionally, these statistics were extracted for households and nonfinancial corporations separately.

The debt data were further expanded by the interest payments on government debt as % of revenue. These include long-term bonds, loans and other debt instruments and payments to both domestic and foreign residents are accounted for. The source of the data is the World Development Indicators database of the World Bank (World Bank, 2024). A variable linked to debt was included in models of Barucci et al. (2019).

The World Bank database was also used to collect data on total reserves expressed in terms of the number of months of imports of goods and services they could pay for. Holdings of monetary gold and foreign exchange and reserves held by the IMF are among the items which are accounted for (World Bank, 2024).

The OECD provides data on the business confidence index which captures expectations of economic agents regarding the near future business performance. This index is one of the early warning indicators of turning points in economic activity as it predicts output growth (OECD, 2018). The expected default frequency for nonfinancial corporations, sovereigns and banks is another variable linked to the health of the economy. The data are provided by Ong et al. (2023).

The data on lending rate, business confidence index and expected default frequency are provided quarterly. However, most of the variables are available only in annual frequency. Given that these are included only in some of the model specifications and that they are mostly static and continuous, the linear interpolation was chosen to fill the missing values. This enables not to lose quality data of crisis-related and dependent variables and possibly draw better conclusions from the analysis.

4.3 Dataset description

Having all the data prepared, it is important to look at their individual and mutual statistics. We start with correlation to determine whether distinct variables move in the same direction.

The credit to non-financial sector is strongly positively correlated with the private debt securities and subsequently for households and corporations debt. The correlation values range from 0.75 to 0.84. Strong positive correlation coefficient of 0.93 was further detected for liquidity support and recapitalization dummy variables, both of which having also similar relationship with systemic banking crisis dummy variable. However, the dummy variables for specific crisis management measures will also be used with lags to account for their delayed effect on the economy, which significantly reduces their correlation with crisis dummy. Apart from these issues, only variables described as mutual alternatives exceed the correlation value of 0.70. Those are nominal and real house prices and general and central government debt. Nevertheless, the lending rate is quite strongly correlated with both interest payments (0.70) and inflation (0.64).

The aforementioned variables with strong relationships should not be included in the same model specifications as they would add no additional explanatory power

to the model and their coefficients would not be meaningful. The multicollinearity testing is discussed in the results chapter. The variance inflation factor test is used to address this issue.

The Table 4.1 provides us with the summary statistics of our dataset. As the linear interpolation was performed only to some of the control variables and always strictly between 2 exact measurements, our panel data remained unbalanced. For only a couple of the most developed countries, the data for the huge time span 1970-2023 are available. Less data were we able to download in case of the emerging economies which then pull the panel into large unbalance.

Both GDP and nominal house prices quarter-on-quarter and year-on-year growths are expressed as a rate in contrast to other variables of share which are rather presented in percentage points. That is the case for the inflation, unemployment, lending rate, debt statistics, interest payments and the expected default frequency. The quarter-on-quarter and year-on-year credit differences are expressed as a difference of two values in percentages.

In contrast, the business confidence index is measured as an amplitude adjusted index with a long-term average set to 100. The total reserves indicator is expressed in months. Finally, all the dummy variables indicating the presence of a crisis, specific measure, or belonging to the emerging countries, are reported as binary variables.

For each of the collected variables, the Table 4.1 below provides the mean and median values, standard deviation and the extreme values of minimum and maximum. It was created using the stargazer package in R (Hlavac, 2022).

The Table A.0.9 provides all the systemic banking crises in our dataset with the country and quarter of its beginning.

Table 4.1: Summary statistics

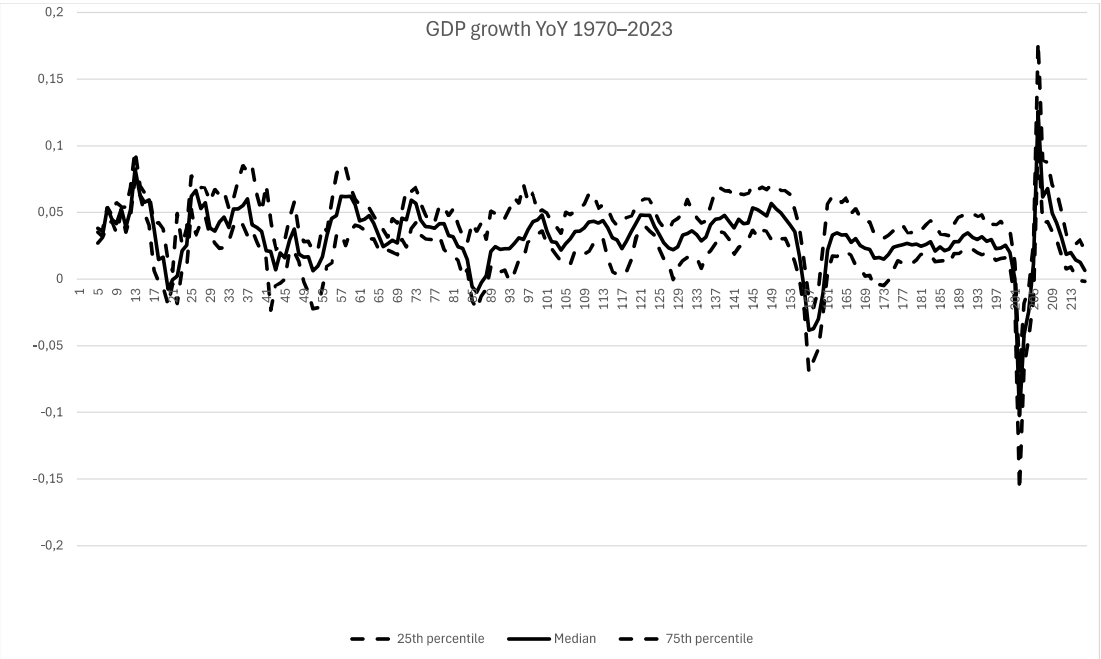
Statistic	N	Mean	Median	St. Dev.	Min	Max
GDP.growth.QoQ	7,637	0.007	0.008	0.021	-0.225	0.226
GDP.growth.YoY	7,439	0.030	0.030	0.042	-0.219	0.262
Credit.differ.QoQ	7,973	0.248	0.200	1.773	-18.600	15.800
Credit.differ.YoY	7,844	1.023	0.900	4.902	-54.600	35.200
House.price.nom.growth.QoQ	6,283	0.016	0.013	0.026	-0.216	0.355
House.price.nom.growth.YoY	6,145	0.066	0.055	0.101	-0.425	1.823
House.price.real.growth.QoQ	6,283	0.004	0.004	0.025	-0.211	0.244
House.price.real.growth.YoY	6,145	0.019	0.018	0.079	-0.407	0.766
Systemic.banking.crisis	14,904	0.044	0	0.205	0	1
Liquidity.support	14,904	0.043	0	0.202	0	1
Recapitalization	14,904	0.036	0	0.186	0	1
Guarantee	14,904	0.048	0	0.213	0	1
Nationalization	14,904	0.022	0	0.148	0	1
Asset.purchase	14,904	0.021	0	0.142	0	1
Bank.holidays	14,904	0.0005	0	0.022	0	1
Deposit.freezes	14,904	0.004	0	0.062	0	1
Inflation	10,153	16.761	3.500	115.155	-4.100	4,734.900
Unemployment	9,096	8.229	7.100	5.305	0.000	37.300
Lending.rate	5,895	15.052	10.140	51.492	0.500	2,578.560
Central.Gov.Debt	10,547	46.388	39.040	33.177	0.821	266.139
Private.Debt.Sec	11,043	102.780	90.387	67.979	1.304	406.844
General.Gov.Debt	7,726	54.444	47.742	35.259	3.765	271.467
House.Debt.Sec	7,426	43.771	39.291	29.195	0.183	137.939
NFC.Debt.Sec	7,426	77.863	70.119	46.839	2.543	339.325
Total.reserves	9,816	4.461	3.702	3.884	0.010	36.645
Interest.payments	8,333	9.123	6.892	8.738	0.001	114.437
BCI	6,335	99.975	100.126	2.082	83.484	109.788
EDF.NFC	4,325	3.771	2.924	2.904	0.037	23.529

5 Key trends and developments

In the following paragraphs, we provide graphical analysis of our data to illustrate the trends and patterns prevailing in the examined variables. We also provide statistics regarding our sample of crisis and the measures used. Finally, we show an example of the behavior of collected variables during a typical crisis.

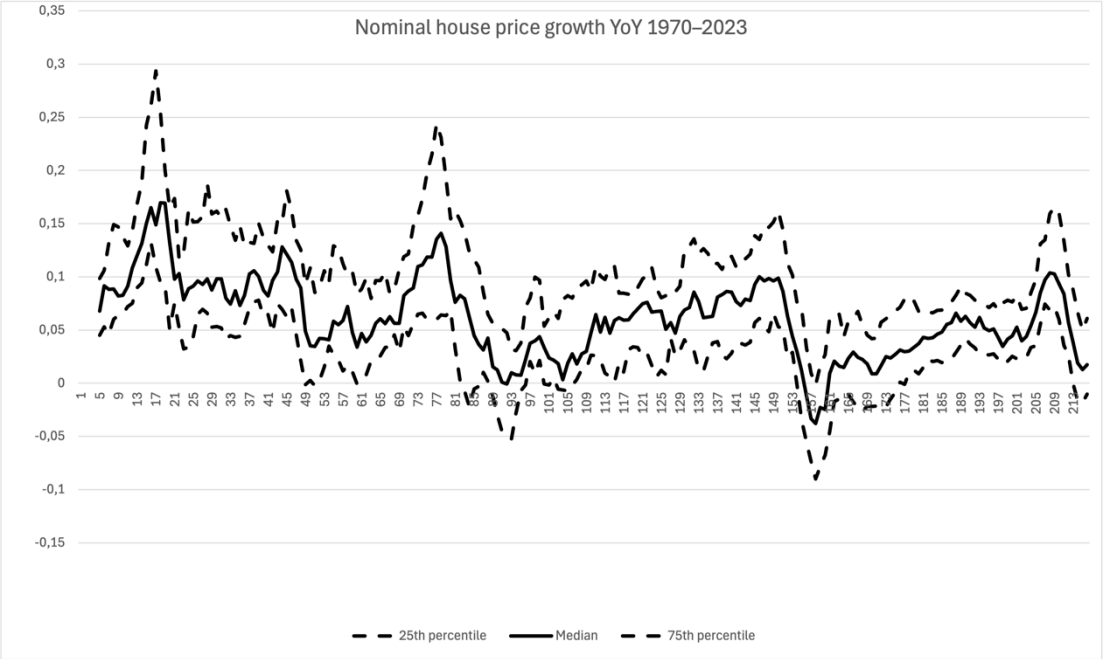
We start with the illustration of the evolution of our dependent variables across all the countries and the whole time span in our dataset. Several waves of drops in year-on-year GDP growth can be identified from picturing the data in Figure 5.1. The largest ones were captured during the first half of 2020 when the Covid-19 pandemic hit the countries around the world. However, more interesting drops for our analysis represent those around the global financial crisis which started in 2008.

Figure 5.1: Year-on-year GDP growth, 1970–2023



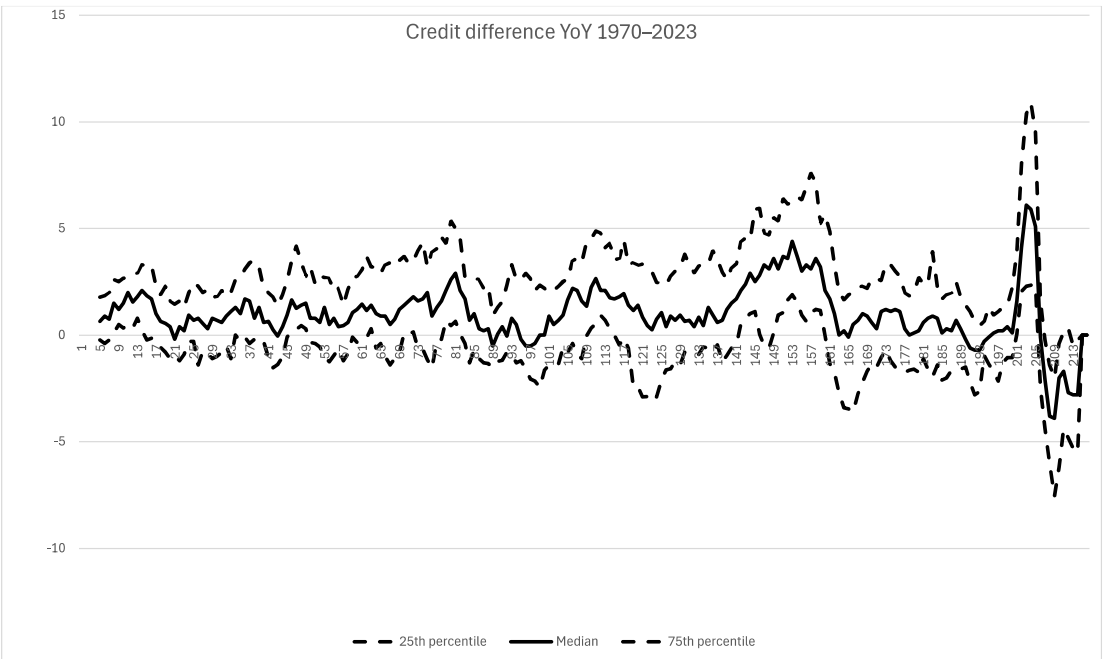
The nominal house prices across the countries in our sample followed a similar pattern around the global financial crisis of 2008. An increase right before the crisis started and then sharp decline after the crisis outbreak. After reaching the trough, most of the countries gradually grew until 2022 when another drop in house prices growth was detected. During the timespan before the crisis of 2008, less common patterns can be detected and the variable moves with large variance. The year-on-year nominal house price growth from 1970 to 2023 is presented in Figure 5.2.

Figure 5.2: Year-on-year nominal house price growth, 1970–2023



Finally, the credit difference is more stable on average with rather large outliers as the Figure 5.3 suggests. Similarly to the nominal house prices, an increase in credit provision is visible during the last years before the global financial crisis of 2008. Then, a fall and a relative stable decade follows. During 2020, the credit difference increases sharply again, only to shrink in 2021.

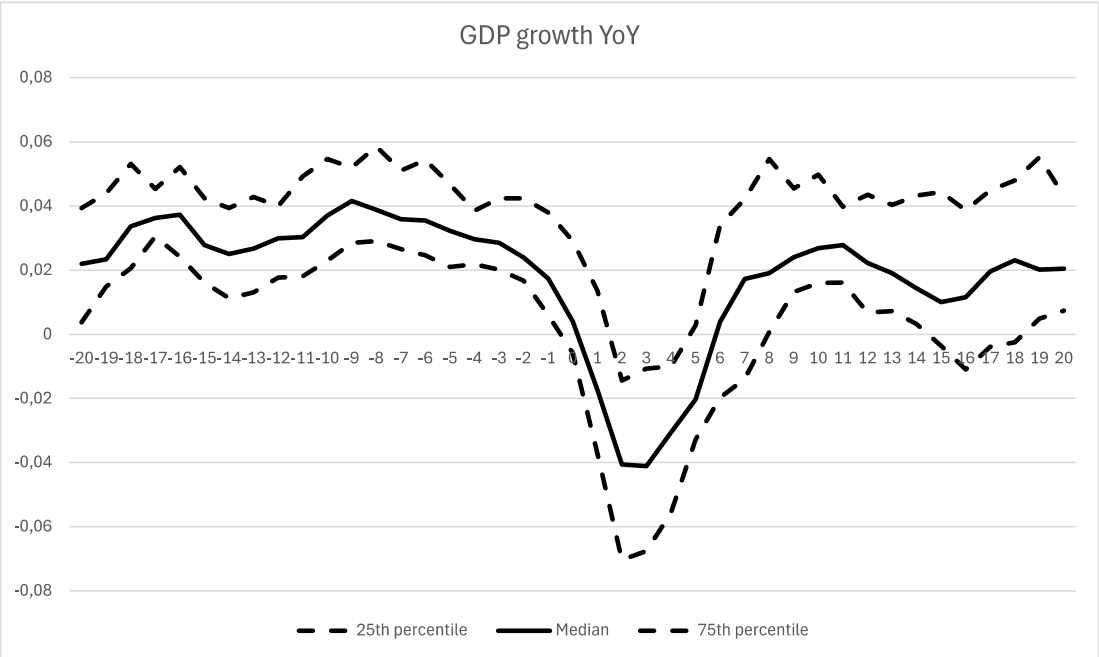
Figure 5.3: Year-on-year credit difference, 1970–2023



To help us understand and explain our regression results, we created an additional panel dataset composed only of the crisis periods from our complete dataset. The time vector did not follow the timeline of years and quarters anymore, but it marked the first quarter of each crisis as a time 0. All the variables were extracted for each crisis up to 20 quarters back from the beginning of a crisis and 20 quarters ahead after this crisis outbreak. With this additional dataset ready, we are able to detect common patterns of all crises.

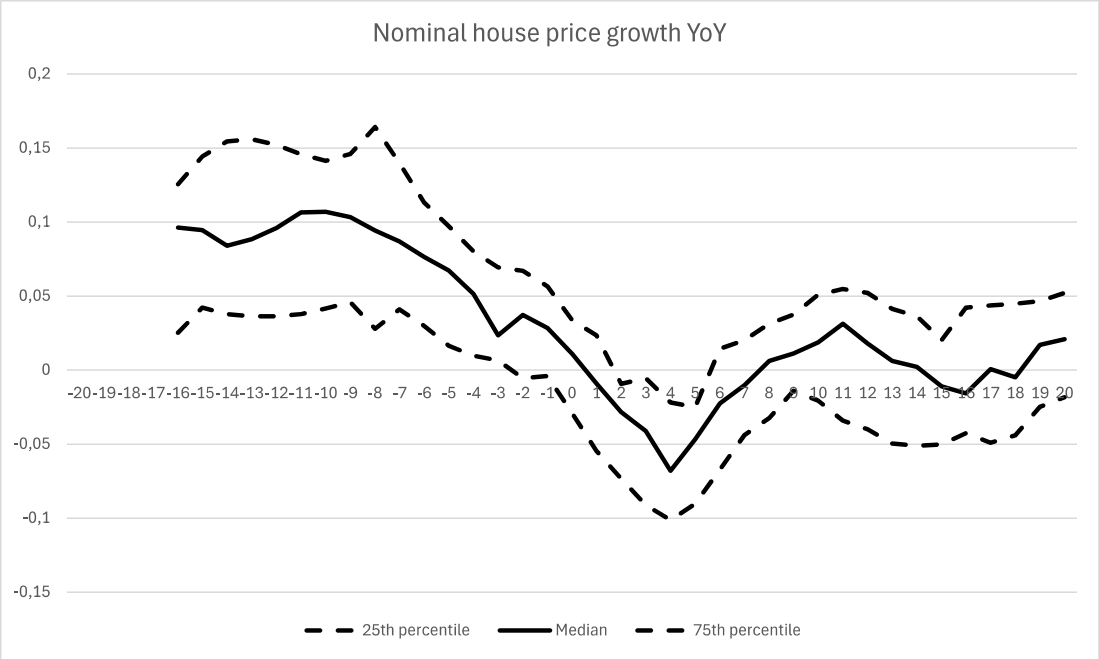
The GDP growth follows a constant increase path until a couple of quarters before the beginning of a crisis as set by Laeven & Valencia (2020). A sharp decrease follows, pushing the growth variables into negative values. The Figure 5.4 below indicates that the year-on-year growth reaches back the pre-crisis track after three years. This post-crisis period is, however, a bit less stable and of larger variance.

Figure 5.4: Year-on-year GDP growth around the crisis period



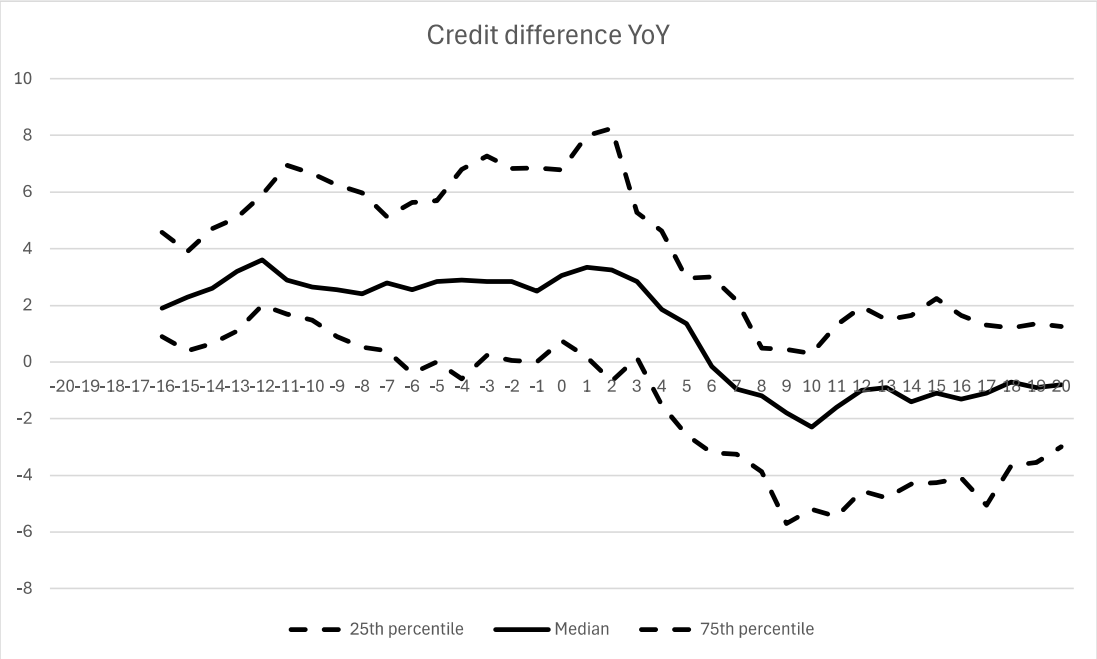
Looking at the Figure 5.5, the nominal house price growth indicator seems to follow a slightly different pattern. The decreasing trend is visible much earlier before a crisis outbreak, around two to three years. The annual growth follows the decreasing trend until the fifth quarter of a crisis. More than a year of sharp increase follows before stabilizing close to 0 values. As compared to the GDP, the pre-crisis path is never recovered.

Figure 5.5: Year-on-year nominal house price growth around the crisis period



Finally, the behavior of credit provision is completely different as one can deduct from the Figure 5.6. The stable path is substituted by a decrease nearly a year after the crisis beginning. After reaching the trough, no immediate increase follows as in the cases of the GDP and house prices. On the contrary, the variable remains slightly below zero with only slight gradual increase if any. As found out in the following regression results chapter, the analysis of credit truly generates completely different results from the analysis of the remaining dependent variables.

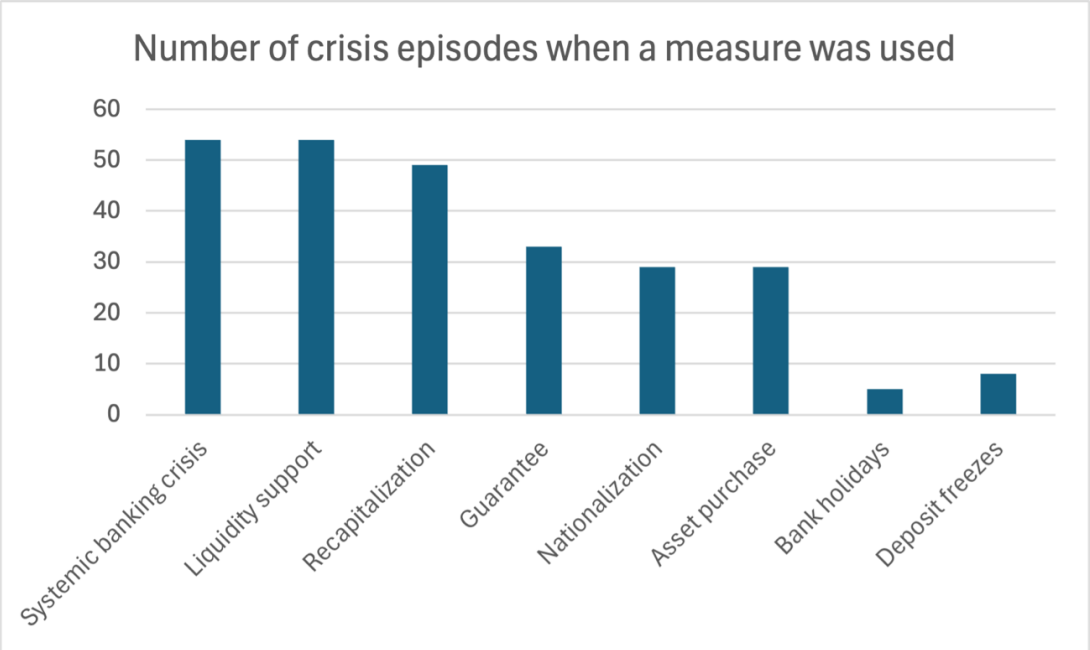
Figure 5.6: Year-on-year credit difference around the crisis period



We follow with statistics of measures used in different systemic banking crises included in our dataset. In total, we identified 54 crisis periods in 45 different countries. Argentina experienced 4 such periods, whereas 3 crises hit Ukraine. Colombia, Latvia, Russia and Sweden all went through two systemic banking crises periods.

The liquidity support was the only measure which was used during all 54 crisis periods. Only in 5 crisis the authorities did not recapitalize their institutions. The bank liabilities guarantees are the third mostly used measure with their usage during 33 recessions. During 29 crises, banks were nationalized, and asset purchase programs were implemented. The situation escalated into bank holidays during 5 systemic banking crises. Twice in Argentina and once in Cyprus, Ecuador and Greece. Finally, deposits freezes were adopted during 8 periods of distress. Twice in Argentina and once in Brazil, Cyprus, Ecuador, Greece, Latvia and Ukraine. The statistics is provided graphically in Figure 5.7.

Figure 5.7: Number of crisis episodes during which a specific measure was used



To illustrate the evolution of the year-on-year GDP growth 20 quarters before and after a crisis on four real examples, we provide the following figures. We chose the systemic banking crises of Germany, United Kingdom, Ukraine and Hungary, as each of these countries used a different set of measures to tackle them. The lines for each of the policy indicate whether it was in force during a specific quarter.

We can see GDP growth drop starting at the point of the crisis beginning with Germany, Ukraine and Hungary hitting the through only during the first year of the crisis. Afterwards, the variable quicky returned to its pre-crisis values and behavior in the case Germany where it remained in the negative values of growth only for a year and a half. That is illustrated in Figure 5.8. The United Kingdom in Figure 5.9 follows a very similar pattern to Germany, only the timing of drops and increases is shifted due to an earlier detection of a systemic banking crisis period. Laeven & Valencia (2020) placed the beginning of the United Kingdom's crisis in the third quarter of 2007, whereas for Germany and Hungary the crisis started a year after. The drops for all three countries are synchronized, then.

The Figure 5.10 suggests that Hungary as a developing country does not differ much from the cases of Germany and the United Kingdom. In contrast, Ukraine saw a drop of double magnitude to that of remaining three countries and remained in negative GDP growth for a longer period of two years as the Figure 5.11 indicates.

Figure 5.8: Year-on-year GDP growth around the 2008 crisis, Germany

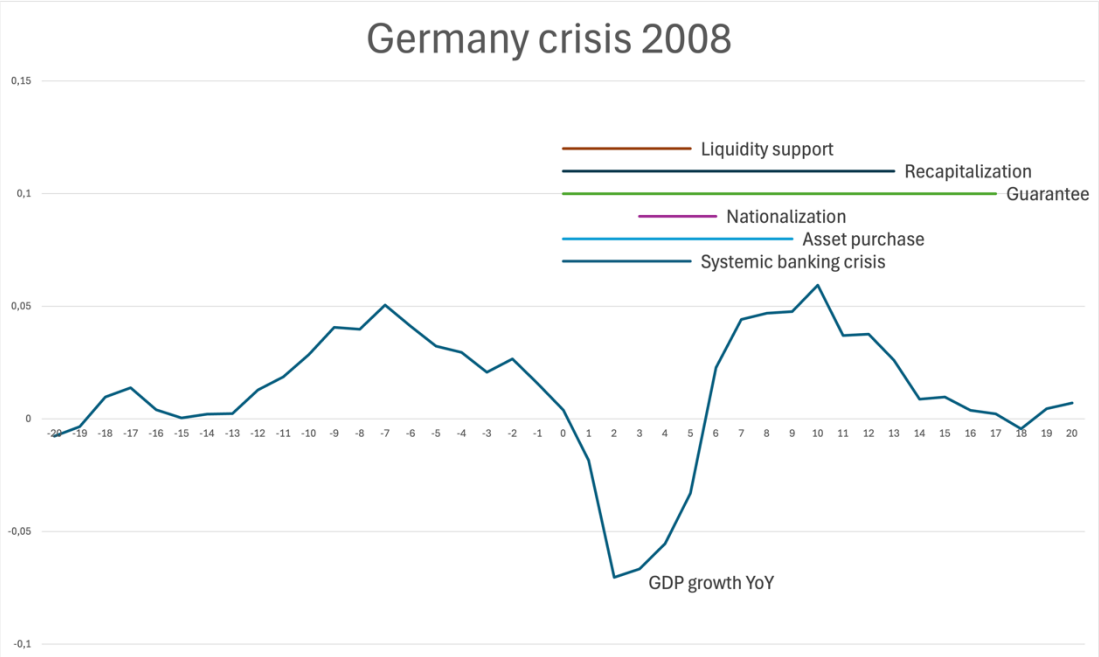


Figure 5.9 Year-on-year GDP growth around the 2008 crisis, United Kingdom

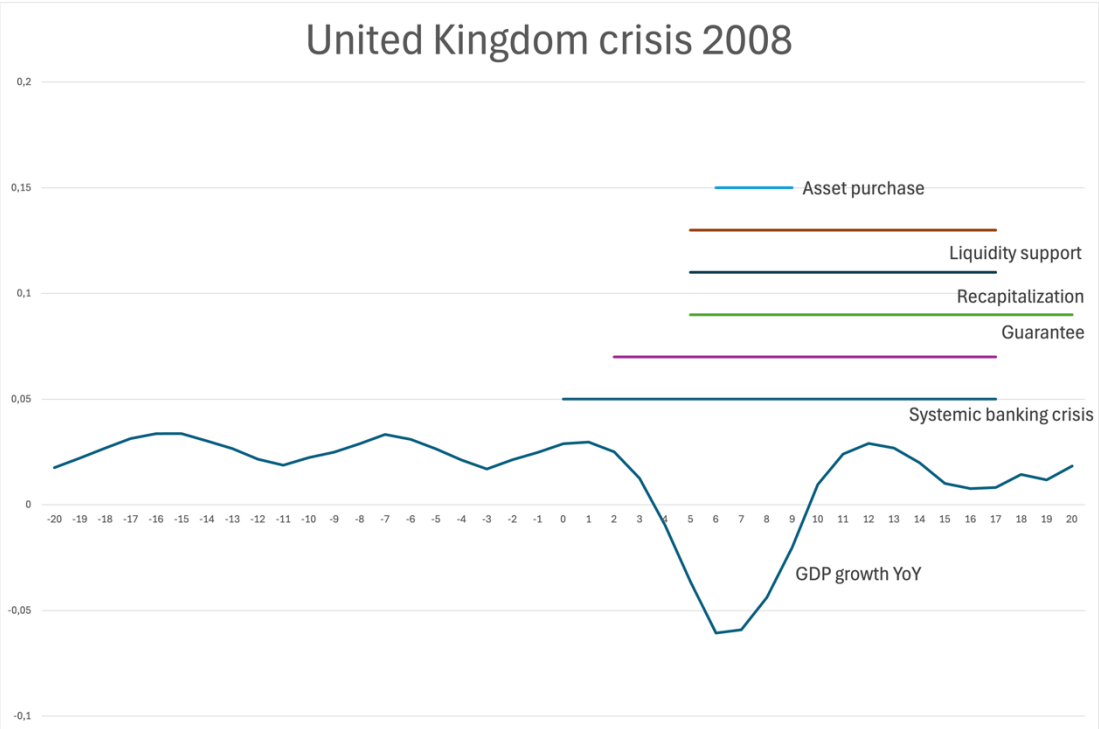


Figure 5.10: Year-on-year GDP growth around the 2008 crisis, Hungary

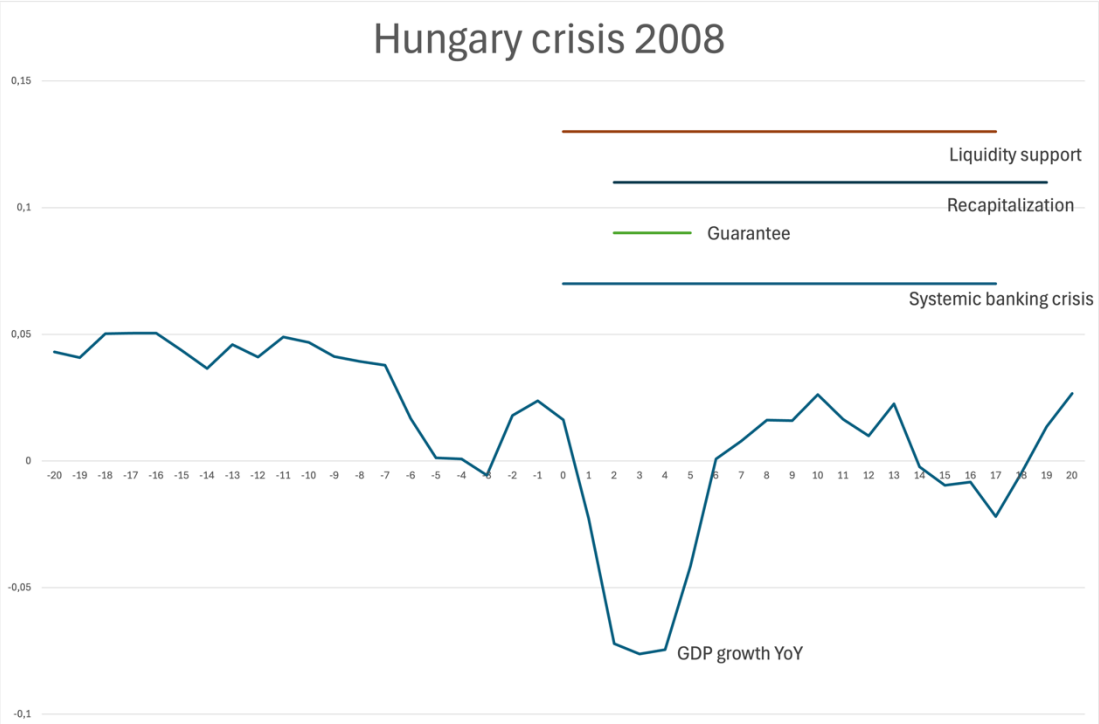


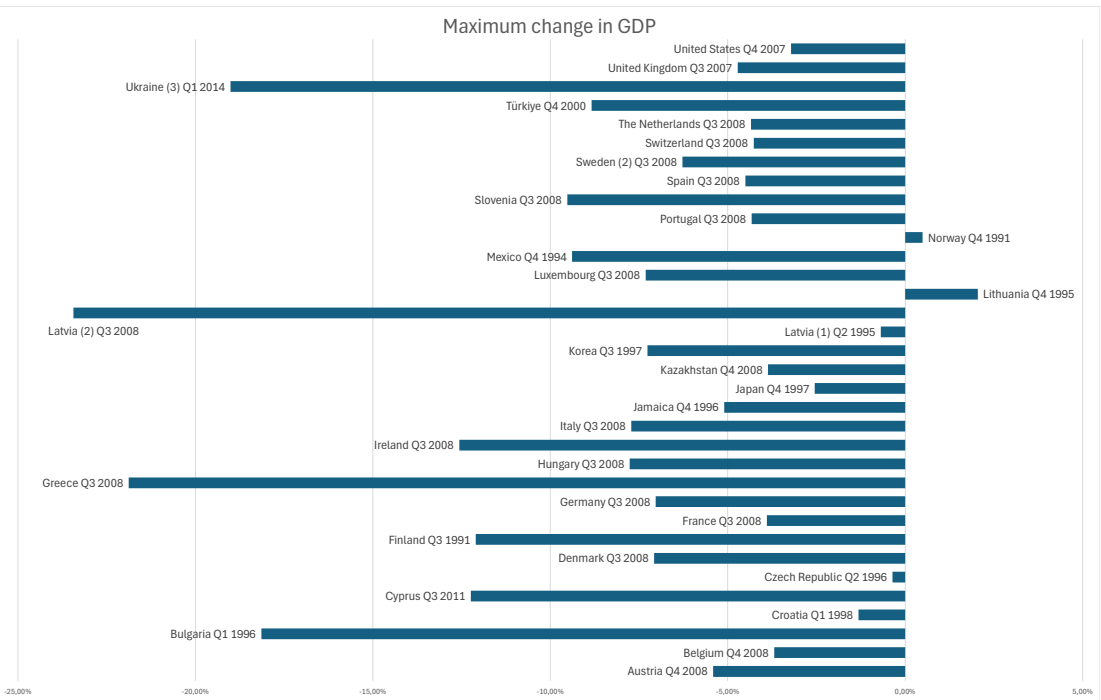
Figure 5.11: Year-on-year GDP growth around the 2014 crisis, Ukraine

We also examined a maximum change of real GDP for every crisis period in our sample. Specifically, we took a maximum value of GDP during 8 quarters before the crisis beginning. Then, a minimum value of the variable during 12 quarters after

the crisis starting point was obtained and the corresponding difference calculated. We report the decrease or growth of real GDP in percentages.

In the Figure 5.12, we can see the maximum change of real GDP across countries for which data were available. The labels denote the country of a given crisis and the quarter in which this crisis started. The largest drop was experienced by Latvia in its second crisis which began in 2008. The change between the largest pre-crisis and the lowest in-crisis value of GDP was nearly 25 %. Greece, Ukraine and Bulgaria also saw a huge decrees of around 20 %. On the other hand, the crises in Norway and Lithuania did not have a negative effect on real GDP.

Figure 5.12: Maximum change in real GDP during crisis



6 Methodology

With the panel data ready, we can use a suitable regression method to estimate the effects of our independent variables on the economy. To evaluate specific policies in our study, we selected the difference-in-differences approach. This method is widely used to compare outcomes between a treated group, where the policy was implemented during a specific period, and a control group, where no interventions occurred.

In current research, the difference-in-differences design is typically analysed using a two-way fixed effects model (Wing et al., 2018). Our difference-in-differences model is a specialized type of fixed effects estimation method. The two-way fixed effects regression accounts for state- and time-specific trends. By incorporating state-specific fixed effects, we ensure that we analyse only the impact of variables that change over time. In contrast, time-specific fixed effects eliminate potential biases from other estimates due to common time trends across states. The difference-in-differences model is created by adding dummy variables, which indicate (with a 1) when a treatment is active in a particular state at a particular time.

Assumptions for fixed effects include unobserved effects in the model specification, a random sample, no perfect multicollinearity among the independent variables, strict exogeneity, homoskedasticity, and no serial correlation. For each model, we will conduct the Breusch-Pagan test to detect possible heteroskedasticity and the Breusch-Godfrey test to detect serial correlation. The Breusch-Pagan LM test will check for contemporaneous correlation or cross-sectional dependence, while the augmented Dickey-Fuller test will verify the stationarity assumption of the data. Additionally, we will use the variance inflation factor test to detect multicollinearity. For the difference-in-differences design to function effectively, we need to incorporate the common trends assumption. Since we consider only state- and time-specific fixed effects, the time series of our outcome across states should differ only by a fixed amount in each period. In our models, we include additional independent variables to account for variations not explained by the treatment dummy. This approach allows us to plot the dependent variable across states over time and visually ensure that the time series are roughly parallel lines (Wing et al., 2018).

In the following paragraphs, we explain in detail our model specifications which are used to analyse our data. The first specification includes only the independent variable of particular interest, the crisis management measure dummy, together with systemic banking crisis dummy which controls for common effects across all the crises. The former variable is lagged by 4, 8 or 12 quarters to capture and compare the effects of policies with different possible delays. The exact specification of our two-way fixed effects model is provided below.

$$GDP\ growth\ YoY_{it} = \beta_1 Systemic\ banking\ crisis\ dummy_{it} + \beta_2 Crisis\ management\ measure\ dummy_{it+4} + a_i + b_t + u_{it}$$

The set of dependent variables includes real GDP growth, nominal house prices growth and the difference in credit to private non-financial sector. Each of these variables is used either as year-on-year, or as quarter-on-quarter measure in distinct regressions. The index i denotes a specific country, while t captures the timing of observation, a specific quarter of a specific year. The systemic banking crisis dummy and a specific crisis management measure dummy are the only independent variables included in this basic specification. β_2 is our coefficient of interest as it indicates the effect of specific policy on the economy. a_i and b_t capture the state-specific and time-specific fixed effects, respectively. Finally, the error term is represented by u_{it}.

After running these simple regressions, we extend the model by including all the control independent variables described in the previous chapter. Additionally, the two variables are added which were described as dependent but are not used that way in a specific model. To solve for the possible issue of simultaneity or to capture a delay in which macroeconomic indicators influence each other, the control explaining variables are lagged by one quarter. The following equation summarizes the changes made.

$$GDP\ growth\ YoY_{it} = \alpha_1 Systemic\ banking\ crisis\ dummy_{it} + \alpha_2 Crisis\ management\ measure\ dummy_{it+4} + \beta_k X^k_{it+1} + a_i + b_t + u_{it}$$

X_{it}^{k} stands for all the control variables included to capture their effects on the dependent variable. A set of their coefficients is represented by β_k. This time, the coefficient α_2 shows the estimated effect of the crisis management measure with a specific lag. As with the basic models, different versions of this specification are provided which vary in the choice of dependent variable.

Similar methodology and its description was used as in our bachelor's thesis where we examined the effectiveness of the Czech subsidy program to promote electric vehicles sales (Čekal, 2022). The way in which we report the results follows the pattern used in Arakelyan et al. (2023) where a model specification is also repeated for a number of policies, creating a diagonal table of coefficients.

7 Results and Discussion

We continue the research by providing the results of our regressions. For each of the dependent variables, after presenting the basic models we turn to regressions with control variables included.

The design of basic models was discussed in the methodology chapter. It is useful to begin by examining the patterns in which our variables of interest move with indicators of the economy. This will help us gain an approximate knowledge about the behavior of policy dummies and the results will be compared to those of the complex models. Additionally, for all the different model specifications, the outcomes of assumptions testing are provided.

7.1 Effect of policies on GDP

The Maddala-Wu unit-root test results in p-value way below 0.01 for both our GDP-related variables, namely quarter-on-quarter and year-on-year growth of real GDP. Hence, the assumption of stationarity is fulfilled for our basic models and there is no need to provide robustness check with different method. Similarly, the common trends assumption was checked by plotting the data for both dependent variables. The visual inspection did not detect any serious violation. The variance inflation factor results in low value as we only include two explaining variables with low mutual correlation.

The studentized Breusch-Pagan test results in value close to the 0.05 threshold for most of the model specifications. Hence, some of our models suffer from heteroscedasticity. Completely all models fail the Breusch-Godfrey and Breusch-Pagan LM tests which indicates serial correlation and cross-sectional dependence, respectively. These results oblige us to use heteroskedasticity and serial and contemporaneous correlation robust standard errors in all the following model specifications. The errors are directly reported in parentheses in the results tables.

In the three tables below, we attach representative results for each lag of the policy dummy. In the case of one year lag, the quarter-on-quarter real GDP growth was chosen and the results reported in the Table 7.1, the remaining two- and three-years lags are included in year-on-year GDP growth regressions reported in the Table 7.2 and Table 7.3. The rest of the models can be found in the appendix under Table A.0.1, Table A.0.2 and Table A.0.3. We find expected negative effect of systemic banking

crisis dummy on GDP growth. The crisis periods reduce the quarterly GDP growth by 0.7 % and annual GDP growth by nearly 3 %. This effect is highly statistically significant at 0.01 level in all cases. On the contrary, the majority of adopted policies lead to higher GDP growth as the coefficients of the dummies indicate. The significance of the effects varies a lot, though.

The nationalization turned out to be the only measure with significant positive effect on GDP growth across all the models with 3 possible lags. Countries which decided to nationalize banks during a systemic banking crisis experienced faster quarterly GDP growth of 0.3 to 0.4 % in the following period. In case of year-on-year GDP growth, this effect culminated in the interval of 1 and 1.1 %.

With a lag of 8 and 12 months, the deposit freezes significantly impacted GDP growth, leading to more than 0.6 % larger quarterly ratio. The annual growth accelerated by 2.2 % and 2.8 % in the case of 8 months lag and 12 months lag, respectively. The dummy on bank holidays gained very significant effect on both GDP growth indicators in the case of three years lag. Moreover, this effect was of large magnitude with 1.1 % increased quarterly growth and 4.1 % increased annual growth.

The recapitalizations and liquidity support only appeared significant at some of the model specifications with rather smaller effects. Guarantees and asset purchases did not influence GDP growth as the results suggest.

As expected, the goodness of fit measure indicates that our models are largely underspecified. We only aim to show the direct effects of the incriminated variables and later compare these preliminary results with complete regressions which account for many other determinants.

Table 7.1: Basic models – GDP growth QoQ, lag 4

	Dependent variable:						
	GDP.growth.QoQ						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Systemic.banking.crisis	-0.008***	-0.008***	-0.007***	-0.008***	-0.007***	-0.007***	-0.007***
	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Lag4.Liquidity.support	0.002*						
	(0.001)						
Lag4.Recapitalization		0.002***					
		(0.001)					
Lag4.Guarantee			0.0004				
			(0.001)				
Lag4.Nationalization				0.004***			
				(0.001)			
Lag4.Asset.purchase					0.0005		
					(0.001)		
Lag4.Bank.holidays						-0.004	
						(0.004)	
Lag4.Deposit.freezes							0.003
							(0.002)
Observations	7,622	7,622	7,622	7,622	7,622	7,622	7,622
R^2	0.009	0.009	0.008	0.010	0.008	0.008	0.008
Adjusted R^2	-0.029	-0.029	-0.029	-0.028	-0.029	-0.029	-0.029
F Statistic (df = 2; 7343)	32.841***	33.290***	30.476***	36.946***	30.436***	30.401***	31.012***
Note:							*p<0.1; **p<0.05; ***p<0.01

Table 7.2: Basic models – GDP growth YoY, lag 8

	Dependent variable:						
	GDP.growth.YoY						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Systemic.banking.crisis	-0.029***	-0.029***	-0.028***	-0.029***	-0.028***	-0.028***	-0.028***
	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Lag8.Liquidity.support	0.003						
	(0.003)						
Lag8.Recapitalization		0.006*					
		(0.003)					
Lag8.Guarantee			0.003				
			(0.002)				
Lag8.Nationalization				0.010***			
				(0.003)			
Lag8.Asset.purchase					0.001		
					(0.004)		
Lag8.Bank.holidays						0.019	
						(0.013)	
Lag8.Deposit.freezes							0.022***
							(0.007)
Observations	7,419	7,419	7,419	7,419	7,419	7,419	7,419
R^2	0.039	0.040	0.039	0.042	0.039	0.039	0.041
Adjusted R^2	0.002	0.003	0.002	0.005	0.002	0.002	0.004
F Statistic (df = 2; 7144)	145.526***	149.233***	145.730***	155.909***	143.227***	143.795***	152.320***
Note:							*p<0.1; **p<0.05; ***p<0.01

Table 7.3: Basic models – GDP growth YoY, lag 12

	Dependent variable:						
	GDP.growth.YoY						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Systemic.banking.crisis	-0.028***	-0.028***	-0.028***	-0.028***	-0.028***	-0.028***	-0.028***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Lag12.Liquidity.support	0.005						
	(0.004)						
Lag12.Recapitalization		0.005*					
		(0.003)					
Lag12.Guarantee			0.001				
			(0.002)				
Lag12.Nationalization				0.011**			
				(0.004)			
Lag12.Asset.purchase					0.001		
					(0.004)		
Lag12.Bank.holidays						0.041***	
						(0.012)	
Lag12.Deposit.freezes							0.028***
							(0.007)
Observations	7,399	7,399	7,399	7,399	7,399	7,399	7,399
R^2	0.040	0.040	0.039	0.043	0.039	0.040	0.043
Adjusted R^2	0.003	0.004	0.002	0.006	0.002	0.003	0.007
F Statistic (df = 2; 7128)	147.801***	149.031***	143.420***	158.670***	142.853***	147.932***	159.258***
Note:							*p<0.1; **p<0.05; ***p<0.01

After exploring the pure relationship of GDP and different measures, we proceed with complete regressions results. As the Maddala-Wu unit-root test reveals, none of our remaining variables contain a unit root process and the assumption of stationarity is fulfilled. The variance inflation factor test is further used to detect multicollinearity. We need to exclude debts of general government, households and non-financial corporation from our analysis. This outcome was expected after the previous mutual correlation exploration. After this exclusion, the largest factor value of around 4,5 remains by the interest payments. Following the recommendation of various sources, we keep those variables in the model which score below 5.

Furthermore, due to the limited data availability for lending rate and its large correlation with interest payments and inflation, we decided to omit this variable from our models as well. The expected default frequency then remains a variable with the lowest number of observations by far. In order to include more countries and track wider time span, this variable will not be analyzed either. On the other hand, the nominal house price growth and credit difference are included.

Nearly all studentized Breusch-Pagan, Breusch-Godfrey and Breusch-Pagan LM tests result in rejecting the null hypothesis. Hence, our models suffer from

heteroskedasticity, serial correlation and cross-sectional dependence. To provide reliable results, we include rather robust standard errors in parenthesis.

The goodness of fit measure improved a lot as compared to the basic regressions. Hence, we are able to explain the variation in our dependent variable much better. This time, we provide results of year-on-year GDP growth analysis together with two shorter lags of policy dummy in the Table 7.4 and Table 7.5, whereas the analysis of quarter-on-quarter growth is represented by model with three years lag in the Table 7.6. The rest of the results can be found in the appendix in the Table A.0.4, Table A.0.5 and Table A.0.6.

To a large extent, the complete regression results confirm our findings of significant positive effect of bank nationalizations on the real GDP growth represented by both examined forms. Year-on-year, the GDP grows around 1 % more in countries where this measure was adopted to fight the crisis if the effect of the policy is lagged by 4 or 12 quarters. Quarter-on-quarter growth is increased by 0.3 % using the same lags. 2-years delay produces insignificant coefficients of nationalizations dummy.

As opposed to basic regressions, the bank holidays turn out to have larger impact on GDP growth in short term. If a country closed banks in a specific quarter during systemic banking crisis episode, its year-on-year GDP growth one year later was 1.7 % larger as compared to other countries and periods. Moreover, one and two years after the adoption of this measure, such country grows faster also quarterly with around 0.5 % lead over the control group of countries.

A coefficient of guarantee, liquidity support and recapitalizations appeared positive and significant only circumstantially with no support from other regressions. The asset purchase and deposit freezes gained such relationship in none of the regressions.

As in the case of basic regressions, the dummy controlling for the effect of systemic banking crises appeared highly significant in all model specifications. The crisis reduces year-on-year GDP growth by around 2 % and the quarter-on-quarter by 0.5 %.

Regarding the control variables, most of them appear insignificant or with negligible effect on GDP growth. Only the business confidence index significantly impacted our dependent variables across all the regressions with positive coefficient. The nominal house prices growth was associated with increased GDP growth in most cases.

Table 7.4: Complete models – GDP growth YoY, lag 4

	Dependent variable:						
	GDP.growth.YoY						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Systemic.banking.crisis	-0.020***	-0.019***	-0.018***	-0.022***	-0.018***	-0.018***	-0.018***
	(0.005)	(0.005)	(0.005)	(0.006)	(0.005)	(0.004)	(0.004)
Lag4.Liquidity.support	0.005						
	(0.003)						
Lag4.Recapitalization		0.005					
		(0.003)					
Lag4.Guarantee			0.002				
			(0.002)				
Lag4.Nationalization				0.011**			
				(0.004)			
Lag4.Asset.purchase					-0.001		
					(0.004)		
Lag4.Bank.holidays						0.017***	
						(0.005)	
Lag4.Deposit.freezes							0.004
							(0.008)
House.price.nom.growth.YoY.	0.056***	0.056***	0.055***	0.054***	0.055***	0.055***	0.055***
	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)
Credit.differ.YoY.	-0.001***	-0.001***	-0.001***	-0.001**	-0.001***	-0.001***	-0.001***
	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)
Inflation.	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***
	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)
Unemployment.	-0.0002	-0.0003	-0.0002	-0.0002	-0.0002	-0.0002	-0.0002
	(0.0005)	(0.0004)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0004)
Central.Gov.Debt.	-0.0001	-0.0001	-0.0001	-0.0001	-0.0001	-0.0001	-0.0001
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Private.Debt.Sec.	-0.0001*	-0.0001*	-0.0001*	-0.0001*	-0.0001*	-0.0001*	-0.0001*
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Total.reserves.	-0.0002	-0.0002	-0.0002	-0.0003	-0.0002	-0.0002	-0.0002
	(0.0005)	(0.0005)	(0.0005)	(0.0004)	(0.0005)	(0.0005)	(0.0005)
Interest.payments.	-0.0004	-0.0004	-0.0004	-0.0004	-0.0004	-0.0004	-0.0004
	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)
BCI.	0.006***	0.006***	0.006***	0.006***	0.006***	0.006***	0.006***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Observations	2,903	2,903	2,903	2,903	2,903	2,903	2,903
R^2	0.288	0.288	0.287	0.292	0.287	0.287	0.287
Adjusted R^2	0.233	0.234	0.232	0.238	0.232	0.232	0.232
F Statistic (df = 11; 2696)	99.050***	99.347***	98.623***	101.056***	98.428***	98.509***	98.451***

Note: *p<0.1; **p<0.05; ***p<0.01

Table 7.5: Complete models – GDP growth YoY, lag 8

	Dependent variable:						
	GDP.growth.YoY						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Systemic.banking.crisis	-0.018***	-0.018***	-0.018***	-0.019***	-0.018***	-0.018***	-0.018***
	(0.005)	(0.004)	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)
Lag8.Liquidity.support	0.002						
	(0.003)						
Lag8.Recapitalization		0.002					
		(0.003)					
Lag8.Guarantee			0.005***				
			(0.002)				
Lag8.Nationalization				0.003			
				(0.003)			
Lag8.Asset.purchase					0.001		
					(0.003)		
Lag8.Bank.holidays						0.012*	
						(0.006)	
Lag8.Deposit.freezes							0.001
							(0.009)
House.price.nom.growth.YoY.	0.055***	0.055***	0.054***	0.054***	0.055***	0.055***	0.055***
	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)
Credit.differ.YoY.	-0.001**	-0.001**	-0.001***	-0.001**	-0.001***	-0.001***	-0.001***
	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)
Inflation.	-0.001***	-0.001***	-0.002***	-0.001***	-0.001***	-0.001***	-0.001***
	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)
Unemployment.	-0.0002	-0.0002	-0.0003	-0.0002	-0.0002	-0.0002	-0.0002
	(0.0005)	(0.0004)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)
Central.Gov.Debt.	-0.0001	-0.0001	-0.0001	-0.0001	-0.0001	-0.0001	-0.0001
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Private.Debt.Sec.	-0.0001*	-0.0001*	-0.0001**	-0.0001*	-0.0001*	-0.0001*	-0.0001*
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Total.reserves.	-0.0002	-0.0002	-0.0003	-0.0002	-0.0002	-0.0002	-0.0002
	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)
Interest.payments.	-0.0004	-0.0004	-0.0004	-0.0004	-0.0004	-0.0004	-0.0004
	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)
BCI.	0.006***	0.006***	0.006***	0.006***	0.006***	0.006***	0.006***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Observations	2,903	2,903	2,903	2,903	2,903	2,903	2,903
R^2	0.287	0.287	0.290	0.287	0.287	0.287	0.286
Adjusted R^2	0.232	0.232	0.236	0.233	0.232	0.232	0.232
F Statistic (df = 11; 2696)	98.591***	98.509***	100.019***	98.756***	98.434***	98.457***	98.414***
Note:							*p<0.1; **p<0.05; ***p<0.01

Table 7.6: Complete models – GDP growth QoQ, lag 12

	Dependent variable:						
	GDP.growth.QoQ						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Systemic.banking.crisis	-0.005***	-0.005***	-0.005***	-0.005***	-0.005***	-0.005***	-0.005***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Lag12.Liquidity.support	0.001						
	(0.001)						
Lag12.Recapitalization		0.0002					
		(0.001)					
Lag12.Guarantee			0.001				
			(0.001)				
Lag12.Nationalization				0.003***			
				(0.001)			
Lag12.Asset.purchase					0.0004		
					(0.001)		
Lag12.Bank.holidays						-0.003	
						(0.002)	
Lag12.Deposit.freezes							-0.006
							(0.005)
House.price.nom.growth.QoQ.	0.019	0.019	0.019	0.016	0.019	0.019	0.020
	(0.016)	(0.017)	(0.016)	(0.016)	(0.017)	(0.016)	(0.017)
Credit.differ.QoQ.	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)
Inflation.	-0.0002	-0.0002	-0.0002	-0.0002	-0.0002	-0.0002	-0.0002
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Unemployment.	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Central.Gov.Debt.	0.00001	0.00001	0.00000	-0.00000	0.00001	0.00001	0.00002
	(0.00003)	(0.00004)	(0.00004)	(0.00003)	(0.00003)	(0.00003)	(0.00003)
Private.Debt.Sec.	-0.00003	-0.00003	-0.00003	-0.00003	-0.00003	-0.00003	-0.00003
	(0.00002)	(0.00002)	(0.00002)	(0.00002)	(0.00002)	(0.00002)	(0.00002)
Total.reserves.	0.0001	0.0001	0.0001	0.00002	0.0001	0.0001	0.0001
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Interest.payments.	-0.00005	-0.00004	-0.00004	-0.0001	-0.00004	-0.00004	-0.0001
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
BCI.	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***
	(0.0002)	(0.0003)	(0.0003)	(0.0002)	(0.0003)	(0.0003)	(0.0002)
Observations	2,933	2,933	2,933	2,933	2,933	2,933	2,933
R^2	0.044	0.043	0.043	0.045	0.043	0.043	0.044
Adjusted R^2	-0.029	-0.029	-0.029	-0.027	-0.029	-0.029	-0.028
F Statistic (df = 11; 2726)	11.318***	11.218***	11.260***	11.666***	11.224***	11.222***	11.394***
Note:							*p<0.1; **p<0.05; ***p<0.01

7.2 Effect of policies on house prices

Our analysis of policy effectiveness continues with house prices examination. Even though this indicator was collected in both nominal and real terms, we decided to only

report the results of the regressions with the former variable specification included. Nevertheless, the resulting coefficients were similar.

We were able to confirm the assumption of stationarity of both year-on-year and quarter-on-quarter nominal house price growth series. The common trends assumption was subject to a successful visual check. The variance inflation factor results in low values given the low number of variables included and their low mutual correlation.

Although most of our models fulfill the homoskedasticity assumption, they fail the serial correlation and cross-sectional dependence tests. Hence, in the brackets, robust standard errors are reported and significance of estimates adjusted.

This time, the basic regressions did not provide any clear relationships across models analyzing both dependent variables and all three lags as the results in the Table 7.7, Table 7.8 and Table 7.9 indicate. At least the 4 and 8 quarters lagged nationalization dummy appeared with positive and significant coefficient in models analyzing the quarter-on-quarter nominal house price growth. The projected increase in house prices growth exceeded 0.5 %.

The three-years lagged effect of deposit freezes is of large magnitude with more than 3 % sharper house price growth in countries where this measure was used. Other policies ended up with either insignificant, or even significant negative effect on house prices. The models are again hugely underspecified, though.

Finally, the presence of systemic banking crisis reduces house price growth significantly at 0.01 level. The countries in such distress experience nearly 1.5 % lower growth quarterly and 5 % in case of annual quarterly growth.

Table 7.7: Basic models – Nominal house price growth QoQ, lag 4

	Dependent variable:						
	House.price.nom.growth.QoQ						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Systemic.banking.crisis	-0.012***	-0.012***	-0.013***	-0.015***	-0.012***	-0.014***	-0.014***
	(0.003)	(0.002)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)
Lag4.Liquidity.support	-0.002						
	(0.002)						
Lag4.Recapitalization		-0.003					
		(0.003)					
Lag4.Guarantee			-0.001				
			(0.002)				
Lag4.Nationalization				0.005*			
				(0.003)			
Lag4.Asset.purchase					-0.006**		
					(0.003)		
Lag4.Bank.holidays						-0.018***	
						(0.003)	
Lag4.Deposit.freezes							-0.012**
							(0.006)
Observations	6,229	6,229	6,229	6,229	6,229	6,229	6,229
R^2	0.012	0.013	0.012	0.013	0.014	0.012	0.013
Adjusted R^2	-0.030	-0.030	-0.030	-0.030	-0.029	-0.030	-0.030
F Statistic (df = 2; 5970)	37.668***	38.883***	37.413***	39.537***	41.524***	37.210***	38.636***
Note:							*p<0.1; **p<0.05; ***p<0.01

Table 7.8: Basic models – Nominal house price growth QoQ, lag 8

	Dependent variable:						
	House.price.nom.growth.QoQ						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Systemic.banking.crisis	-0.013***	-0.013***	-0.013***	-0.015***	-0.013***	-0.014***	-0.014***
	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)
Lag8.Liquidity.support	-0.002						
	(0.002)						
Lag8.Recapitalization		-0.001					
		(0.002)					
Lag8.Guarantee			-0.002				
			(0.002)				
Lag8.Nationalization				0.006**			
				(0.003)			
Lag8.Asset.purchase					-0.001		
					(0.002)		
Lag8.Bank.holidays						-0.010***	
						(0.003)	
Lag8.Deposit.freezes							0.013
							(0.008)
Observations	6,154	6,154	6,154	6,154	6,154	6,154	6,154
R^2	0.013	0.012	0.013	0.014	0.012	0.012	0.013
Adjusted R^2	-0.030	-0.030	-0.030	-0.029	-0.030	-0.030	-0.030
F Statistic (df = 2; 5899)	37.443***	37.053***	37.921***	41.530***	37.106***	36.946***	38.649***
Note:							*p<0.1; **p<0.05; ***p<0.01

Table 7.9: Basic models – Nominal house price growth YoY, lag 12

	Dependent variable:						
	House.price.nom.growth.YoY						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Systemic.banking.crisis	-0.053***	-0.054***	-0.053***	-0.055***	-0.053***	-0.054***	-0.054***
	(0.008)	(0.009)	(0.008)	(0.009)	(0.008)	(0.008)	(0.009)
Lag12.Liquidity.support	-0.009						
	(0.006)						
Lag12.Recapitalization		0.004					
		(0.006)					
Lag12.Guarantee			-0.007				
			(0.007)				
Lag12.Nationalization				0.016			
				(0.010)			
Lag12.Asset.purchase					-0.009		
					(0.008)		
Lag12.Bank.holidays						-0.008	
						(0.011)	
Lag12.Deposit.freezes							0.032**
							(0.013)
Observations	5,997	5,997	5,997	5,997	5,997	5,997	5,997
R^2	0.015	0.015	0.015	0.016	0.015	0.015	0.015
Adjusted R^2	-0.028	-0.028	-0.028	-0.027	-0.028	-0.028	-0.028
F Statistic (df = 2; 5746)	43.752***	42.579***	43.449***	45.268***	43.108***	42.318***	43.145***
Note:							*p<0.1; **p<0.05; ***p<0.01

Moving on to complete regressions, we confirm the stationarity and parallel trend assumption just like in previous cases. The variance inflation factor and analysis of data availability leads to the same choice of variables as in the case of GDP growth. Only the dependent variables are switched. As usual, we must take into account the robust standard errors. The reason is failure in both Breusch-Pagan and in Breusch-Godfrey test.

The full specifications offer much larger values of goodness of fit measure. The Table 7.10, Table 7.11 and Table 7.12 with results are provided below and two others can be found in the appendix under Table A.0.7 and Table A.0.8. The negative effects of systemic banking crisis dummy are of smaller magnitude as the individual coefficients indicate. Nevertheless, they remain significant.

The positive effect of bank nationalizations is confirmed once again. They increase quarter-on-quarter house price growth by 0.7 % with all possible lags. 2.2 % increase in year-on-year growth is found in regressions with the policy effect delayed by 8 and 12 months.

Furthermore, the coefficients of deposit freezes appear significant across the regressions. Quarterly house price growth is increased by 0.8–1.7 % with the largest value being reached with 2 years lag. Two years after deposit freezes adoption, the year-on-year prices grew by additional 6.3 %. In case of three years delay, this effect culminated at nearly 8 %.

The bank holidays, recapitalizations and liquidity support gained significant coefficients rather in distant periods. The largest effect of bank holidays on house price growth was detected with 12-months lag, 4 % increase in annual growth and 1.2 % in quarterly growth. The countries which used recapitalizations saw a 0.4 % increase in quarterly house prices growth and 1.5 % increase in year-on-year growth. All these effects are highly statistically significant at 0.01 level. Finally, liquidity support contributed to a greater increase of yearly house price growth by 1.1 % with two- and three-years delay. Quarterly, the house prices grew 0.3–0.4 % more in both larger lags.

Out of the control variables, the GDP growth, credit difference and the business confidence index gained positive significant coefficients. The private debt securities, on the other hand, negatively influence nominal house price growth.

Table 7.10: Complete models – Nominal house price growth QoQ, lag 4

	Dependent variable:						
	House.price.nom.growth.QoQ						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Systemic.banking.crisis	-0.010***	-0.009***	-0.009***	-0.011***	-0.008***	-0.009***	-0.009***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Lag4.Liquidity.support	0.002						
	(0.002)						
Lag4.Recapitalization		0.0002					
		(0.002)					
Lag4.Guarantee			0.001				
			(0.001)				
Lag4.Nationalization				0.007***			
				(0.002)			
Lag4.Asset.purchase					-0.003*		
					(0.002)		
Lag4.Bank.holidays						-0.003	
						(0.004)	
Lag4.Deposit.freezes							0.008*
							(0.004)
GDP.growth.QoQ.	0.074**	0.075**	0.075**	0.072**	0.076**	0.075**	0.075**
	(0.034)	(0.035)	(0.035)	(0.034)	(0.035)	(0.035)	(0.035)
Credit.differ.QoQ.	0.001**	0.001**	0.001**	0.001***	0.001**	0.001**	0.001**
	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)
Inflation.	0.001	0.001	0.001	0.001	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Unemployment.	-0.0003	-0.0003	-0.0003	-0.0003	-0.0002	-0.0003	-0.0003
	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)
Central.Gov.Debt.	-0.00001	-0.00001	-0.00002	-0.00003	-0.00002	-0.00001	-0.00002
	(0.00004)	(0.00004)	(0.00004)	(0.00004)	(0.00004)	(0.00004)	(0.00004)
Private.Debt.Sec.	-0.0002***	-0.0002***	-0.0002***	-0.0002***	-0.0002***	-0.0002***	-0.0002***
	(0.00003)	(0.00003)	(0.00004)	(0.00003)	(0.00003)	(0.00003)	(0.00003)
Total.reserves.	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003
	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)
Interest.payments.	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0005
	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)
BCI.	0.003***	0.003***	0.003***	0.003***	0.003***	0.003***	0.003***
	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)
Observations	2,932	2,932	2,932	2,932	2,932	2,932	2,932
R^2	0.114	0.114	0.114	0.117	0.115	0.114	0.114
Adjusted R^2	0.047	0.047	0.047	0.051	0.048	0.047	0.047
F Statistic (df = 11; 2725)	31.859***	31.789***	31.874***	32.956***	32.049***	31.791***	31.960***

Note: *p<0.1; **p<0.05; ***p<0.01

Table 7.11: Complete models – Nominal house price growth QoQ, lag 8

	Dependent variable:						
	House.price.nom.growth.QoQ						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Systemic.banking.crisis	-0.010***	-0.009***	-0.009***	-0.010***	-0.009***	-0.009***	-0.009***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Lag8.Liquidity.support	0.004***						
	(0.001)						
Lag8.Recapitalization		0.003					
		(0.002)					
Lag8.Guarantee			0.001				
			(0.001)				
Lag8.Nationalization				0.007***			
				(0.002)			
Lag8.Asset.purchase					0.004**		
					(0.002)		
Lag8.Bank.holidays						0.006*	
						(0.003)	
Lag8.Deposit.freezes							0.017***
							(0.005)
GDP.growth.QoQ.	0.075**	0.075**	0.075**	0.074**	0.075**	0.075**	0.075**
	(0.035)	(0.035)	(0.035)	(0.034)	(0.035)	(0.035)	(0.035)
Credit.differ.QoQ.	0.001**	0.001**	0.001**	0.001**	0.001**	0.001**	0.001**
	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)
Inflation.	0.001	0.001	0.001	0.001	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Unemployment.	-0.0004	-0.0004	-0.0003	-0.0003	-0.0004	-0.0003	-0.0003
	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)
Central.Gov.Debt.	-0.00002	-0.00002	-0.00002	-0.00003	-0.00001	-0.00001	-0.00003
	(0.00004)	(0.00004)	(0.00004)	(0.00004)	(0.00004)	(0.00004)	(0.00004)
Private.Debt.Sec.	-0.0002***	-0.0002***	-0.0002***	-0.0002***	-0.0002***	-0.0002***	-0.0002***
	(0.00003)	(0.00003)	(0.00003)	(0.00003)	(0.00003)	(0.00003)	(0.00003)
Total.reserves.	0.0003	0.0003	0.0003	0.0002	0.0003	0.0003	0.0003
	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)
Interest.payments.	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.001*
	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)
BCI.	0.003***	0.003***	0.003***	0.003***	0.003***	0.003***	0.003***
	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)
Observations	2,932	2,932	2,932	2,932	2,932	2,932	2,932
R^2	0.116	0.115	0.114	0.119	0.115	0.114	0.116
Adjusted R^2	0.049	0.048	0.047	0.052	0.048	0.047	0.050
F Statistic (df = 11; 2725)	32.445***	32.133***	31.919***	33.324***	32.297***	31.801***	32.632***
Note:							*p<0.1; **p<0.05; ***p<0.01

Table 7.12: Complete models – Nominal house price growth YoY, lag 12

	Dependent variable:						
	House.price.nom.growth.YoY						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Systemic.banking.crisis	-0.025***	-0.025***	-0.025***	-0.027***	-0.025***	-0.026***	-0.025***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Lag12.Liquidity.support	0.011**						
	(0.005)						
Lag12.Recapitalization		0.015***					
		(0.004)					
Lag12.Guarantee			0.008*				
			(0.005)				
Lag12.Nationalization				0.022***			
				(0.005)			
Lag12.Asset.purchase					0.011		
					(0.007)		
Lag12.Bank.holidays						0.040***	
						(0.011)	
Lag12.Deposit.freezes							0.079***
							(0.013)
GDP.growth.YoY.	0.488***	0.492***	0.485***	0.474***	0.491***	0.491***	0.499***
	(0.109)	(0.109)	(0.108)	(0.107)	(0.109)	(0.109)	(0.108)
Credit.differ.YoY.	0.002***	0.002***	0.002***	0.002***	0.002***	0.002***	0.002***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Inflation.	0.004	0.004	0.004	0.004	0.004	0.004*	0.004*
	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)
Unemployment.	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Central.Gov.Debt.	-0.0001	-0.0001	-0.0001	-0.0001	-0.0001	-0.0001	-0.0002
	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0001)
Private.Debt.Sec.	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Total.reserves.	0.001	0.001	0.001	0.001	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Interest.payments.	0.001	0.001	0.002	0.001	0.001	0.002	0.002**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
BCI.	0.006***	0.006***	0.006***	0.006***	0.006***	0.006***	0.006***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Observations	2,903	2,903	2,903	2,903	2,903	2,903	2,903
R^2	0.179	0.180	0.178	0.182	0.178	0.177	0.182
Adjusted R^2	0.116	0.118	0.115	0.119	0.115	0.114	0.120
F Statistic (df = 11; 2696)	53.284***	53.857***	53.083***	54.509***	53.055***	52.758***	54.594***
Note:							*p<0.1; **p<0.05; ***p<0.01

7.3 Effect of policies on Credit

The analysis of credit difference did not lead to expected results. Still, we attach the Table 7.13 and Table 7.14 with some of the results. As we stated in graphical analysis chapter, the behavior of credit difference around the time of systemic banking crisis follows a different pattern than GDP and house prices series. The negative difference persists for much longer time period with only very slow gradual move towards positive numbers. That is one of the main reasons why our econometric model could not track the possible positive effects of individual measures. On the contrary, some of them were even associated with decreases in credit difference. Our methods were not able to split the effect of crisis and measure dummies. Hence, the results provided are biased and unreliable.

Table 7.13: Complete models – Credit difference QoQ, lag 8

	Dependent variable:						
	Credit.differ.QoQ						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Lag8.Systemic.banking.crisis	0.803*	-0.137	-0.341*	-0.297	-0.430**	-0.347*	-0.385*
	(0.472)	(0.223)	(0.200)	(0.304)	(0.199)	(0.206)	(0.210)
Lag8.Liquidity.support	-1.238***						
	(0.466)						
Lag8.Recapitalization		-0.340					
		(0.208)					
Lag8.Guarantee			-0.005				
			(0.161)				
Lag8.Nationalization				-0.081			
				(0.340)			
Lag8.Asset.purchase					0.249		
					(0.277)		
Lag8.Bank.holidays						-2.015***	
						(0.356)	
Lag8.Deposit.freezes							-2.045***
							(0.532)
House.price.nom.growth.QoQ.	6.169***	6.117***	6.134***	6.156***	6.071***	6.151***	6.406***
	(1.745)	(1.755)	(1.736)	(1.756)	(1.739)	(1.739)	(1.762)
Inflation.	-0.019	-0.019	-0.020	-0.020	-0.021	-0.020	-0.016
	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)
Unemployment.	-0.082***	-0.080***	-0.083***	-0.084***	-0.085***	-0.082***	-0.077***
	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
Central.Gov.Debt.	-0.009***	-0.009***	-0.009***	-0.009***	-0.009***	-0.009***	-0.007**
	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)
Private.Debt.Sec.	-0.008***	-0.008***	-0.008***	-0.008***	-0.008***	-0.008***	-0.008***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Total.reserves.	-0.017	-0.019	-0.019	-0.018	-0.017	-0.018	-0.015
	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)
Interest.payments.	-0.026	-0.028	-0.027	-0.027	-0.028	-0.028	-0.036*
	(0.019)	(0.019)	(0.019)	(0.019)	(0.020)	(0.019)	(0.019)
BCI.	-0.089***	-0.085***	-0.089***	-0.088***	-0.089***	-0.090***	-0.089***
	(0.024)	(0.025)	(0.024)	(0.024)	(0.024)	(0.024)	(0.024)
Observations	3,242	3,242	3,242	3,242	3,242	3,242	3,242
R^2	0.089	0.087	0.086	0.086	0.086	0.086	0.091
Adjusted R^2	0.027	0.025	0.024	0.024	0.024	0.024	0.030
F Statistic (df = 10; 3035)	29.742***	29.045***	28.436***	28.457***	28.676***	28.677***	30.506***
Note:							*p<0.1; **p<0.05; ***p<0.01

Table 7.14: Complete models – Credit difference YoY, lag 12

	Dependent variable:						
	Credit.differ.YoY						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Lag12.Systemic.banking.crisis	0.123	-0.534	-1.663***	-1.134	-2.015***	-1.595***	-1.779***
	(1.294)	(0.724)	(0.564)	(0.853)	(0.618)	(0.611)	(0.638)
Lag12.Liquidity.support	-1.845						
	(1.377)						
Lag12.Recapitalization		-1.681***					
		(0.525)					
Lag12.Guarantee			0.176				
			(0.401)				
Lag12.Nationalization				-0.798			
				(0.809)			
Lag12.Asset.purchase					1.109		
					(0.710)		
Lag12.Bank.holidays						-3.670***	
						(1.222)	
Lag12.Deposit.freezes							-8.503***
							(1.784)
House.price.nom.growth.YoY.	7.624***	7.670***	7.504***	7.627***	7.385***	7.536***	7.936***
	(2.351)	(2.389)	(2.334)	(2.380)	(2.370)	(2.344)	(2.396)
Inflation.	-0.116*	-0.108*	-0.117*	-0.112*	-0.120*	-0.115*	-0.102
	(0.065)	(0.065)	(0.065)	(0.064)	(0.066)	(0.065)	(0.063)
Unemployment.	-0.329***	-0.321***	-0.330***	-0.336***	-0.339***	-0.328***	-0.316***
	(0.048)	(0.047)	(0.049)	(0.048)	(0.048)	(0.048)	(0.048)
Central.Gov.Debt.	-0.038***	-0.036***	-0.039***	-0.037***	-0.039***	-0.038***	-0.027**
	(0.012)	(0.012)	(0.013)	(0.011)	(0.012)	(0.012)	(0.013)
Private.Debt.Sec.	-0.018*	-0.019*	-0.018*	-0.019*	-0.018*	-0.018*	-0.018*
	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
Total.reserves.	-0.063	-0.066	-0.066	-0.055	-0.058	-0.064	-0.043
	(0.073)	(0.074)	(0.073)	(0.071)	(0.073)	(0.073)	(0.073)
Interest.payments.	-0.131*	-0.136*	-0.130*	-0.130*	-0.135*	-0.133*	-0.172***
	(0.070)	(0.070)	(0.070)	(0.069)	(0.070)	(0.070)	(0.066)
BCI.	-0.406***	-0.388***	-0.411***	-0.404***	-0.409***	-0.408***	-0.398***
	(0.096)	(0.099)	(0.097)	(0.095)	(0.095)	(0.096)	(0.094)
Observations	3,218	3,218	3,218	3,218	3,218	3,218	3,218
R^2	0.168	0.172	0.167	0.167	0.168	0.167	0.178
Adjusted R^2	0.111	0.115	0.110	0.110	0.111	0.110	0.122
F Statistic (df = 10; 3011)	60.618***	62.399***	60.187***	60.451***	60.913***	60.262***	65.419***

Note: *p<0.1; **p<0.05; ***p<0.01

7.4 Limitations

There are several issues identified which possibly limit the interpretation and reliability of our results. Other studies on this topic often point to possible endogeneity bias caused by the simultaneity of government interventions and real economic activity. Authors often provide additional regression with instrumental variables to address this issue and to provide a robustness test. Honohan & Klingebiel (2003) used political and institutional instruments such as corruption and law and order tradition, while Detragiache & Ho (2010) included an indicator of a country's political system. In our case of panel dataset and fixed effects model, this method would not be appropriate due to the static behavior of such variables and their disappearance in the estimated fixed effects. We rather used a technique of lagging the explanatory variables to limit the intratemporal mutual influences and we also modeled a large number of different specifications to provide sufficient robustness tests. Nevertheless, the danger of some crisis measures being adopted only in countries with worse crisis conditions might well be present and might bias our results and reasoning.

In the existing literature, sample selection bias might arise when analyzing only countries which were hit by a crisis. Laeven & Valencia (2013b) solve this problem by including other countries in their sample that did not experience any crisis during the examined period. In our analysis, we solved for this problem by using panel data of many countries which in case of any crisis always provided a control group of countries not going through such distress.

Moreover, there is a plenty of additional factors influencing our dependent variables for which we do not control in our regressions. Either there are no available data with such granularity, or we were not even able to identify these variables. We also excluded some of the collected variables from our specifications intentionally. The reason was their availability only for a limited number of countries with limited observations in time. Their inclusion in models would reduce the sample entering the regression, making it much harder to assign any effect to the crisis management measures of our interest. Hence, the omitted variable bias possibly limits the interpretability of our results.

The process of collection of our data also created several issues. At first, we decided to examine quarterly data to better distinguish the effects of specific measures. This was possible thanks to a detailed information on timing of a large sample of policy measures. On the other hand, only a minority of other variables were available in quarterly frequency for many countries around the world. These were our dependent variables, lending rate, business confidence index and expected default frequency. In

case of the other explaining variables, a linear interpolation between two known values was chosen to fill the blank cells. Although these variables are rather static and move only gradually and continuously, the interpolation still creates unprecise values. The possible extension of our research might be focused on improved control variables collection or annual data analysis.

The dummy variables for crisis episodes and individual policies were created manually. In case of systemic banking crises timing, the Laeven & Valencia (2020) database provided detailed information on their starting. However, sometimes, the exact ending of this distress was approximated or artificially set to a specific year. We also needed to address the question of how to track distinct measures in our panel dataset. Some of them are gradual and rather long-term. This is the case of liquidity support or guarantees. Others are used within a scope of several days, such as deposit freezes and bank holidays. If we had the information, we respected the exact timing of when the measures were in force based on the literature. In case of liquidity support, recapitalizations, nationalizations and asset purchases, this timing was mostly not available. Therefore, we marked these policies as in operation until the end of a given crisis.

Instead of using binary dummies, the exact amount of money used to finance a specific policy would create much better variable. Barucci et al. (2019) succeeded with this design but they needed to restrict their analysis to the European Union area in the period around the global financial crisis of 2008. In our research, however, we create value and uniqueness by exploring a wide sample of past crisis, for which collection of such data would be impossible. On the other hand, we are not able to track different financial burden caused by specific measures which might also be a source of a bias.

The deposit freezes and bank holidays process can be tracked precisely but these measures were usually implemented only in a couple of countries throughout the history. The bank holidays were mostly used only within a single quarter. Therefore, the resulting sample used to evaluate these policies is very limited and the results must be taken with caution.

7.5 Findings and hypothesis testing

The analysis of real GDP growth and nominal house prices led to interesting results from which we are able to draw several conclusions. However, the regressions explaining credit difference did not support these findings.

The nationalizations appear having a significant positive effect on the economy at the largest number of model specifications. They increase GDP growth by around 0.3 % quarterly and by 1 % annually with large statistical significance across most of the models. Neither the different examined lags in measure dummy, nor the inclusion of control variables seem to play any role. In case of nominal house prices, this effect of nationalizations persists, although less robust. The significance slightly improves with larger delay in measure and this time, mostly the models with more control variables favor the nationalizations effectiveness. Regarding the exact figures, the quarter-on-quarter nominal house prices grew at 0.7 % more and the yearly ratio increased by more than 2 % if nationalization was a measure adopted by a given state.

The other measure enjoying significant and positive coefficient across more regressions is the deposit freeze. It reaches larger magnitude with increasing lag in policy dummy. The 0.6 % rise in quarterly ratio and up to 2.8 % increase in year-on-year real GDP growth from basic models is not confirmed by complete models' analysis. However, the nominal house prices tend to rise more by up to 2 and 8 % quarterly and annually, respectively, if the country's authorities decided to freeze the deposits. This time, the effects are driven mainly by the complete models.

The evidence of bank holidays significance is mixed. The basic regressions indicate large effects on real GDP growth with three-years lag. The yearly growth appears to be enlarged by 4 %, whereas the quarterly growth rises by more than 1 %. On the other hand, the full regressions show the largest effect when examining the shortest lag of bank holidays. Moreover, the effect shrinks to around 1.7 % increase in year-on-year GDP growth and 0.5 % in the quarterly growth. The nominal house prices growth is elevated by 4 % annually if the 3-years lag of bank holidays is used, pointing out rather to the prolonged effect.

The liquidity support and recapitalizations seem to influence house prices with greater delay. The recapitalizations led to a 0.4 % increase in quarterly growth and 1.5 % increase in year-on-year growth. In comparison, 1.1 % annual increase and 0.3–0.4 % quarterly increase was achieved through the liquidity support, as the complete regressions suggest. When examining the real GDP growth, the coefficients of these measures only showed up positive and significant in basic regressions with shorter lag. The magnitude of the effect was rather small.

Finally, the guarantee and asset purchase showed any significant effect on both our dependent variables rather incidentally with limited support from other specifications. Furthermore, this effect was negligible.

In case of real GDP growth and nominal house prices growth, the inclusion of the systemic banking crisis dummy resulted in expected coefficients across completely all the regressions. This was vital as we were hopefully successful in filtering out the common decrease in macroeconomic indicators during the crisis which was then not assigned to our crisis management measures dummy variables. However, this was not achieved with credit difference analysis. Due to the persistent decreasing trend in this variable after the start of the crises, our regression method was not able to split the effects of crises and measures taken to tackle them. The negative effects of bank holidays and deposit freezes on the credit provision is not completely unreasonable. However, robustness test with more valid models would be necessary to support this finding.

Although the findings of most previous studies indicate no, or even negative effect of bailout policies on the economy, our results do not confirm this trend. However, with panel data analysis and our regression method, we differ to a large extent from the practice of other researchers. The most similar work of Barucci et al. (2019) indicates significant positive effects of guarantees and recapitalizations on the economic indicators. The effect of the latter measure is somewhat confirmed by our regressions results, but the former measure appeared with rather no effect. The examined sample of crises was largely different, though, and Barucci et al. (2019) included the expenses associated with a use of specific measures.

As for the hypothesis testing, we can confirm our first hypothesis stating that individual crisis management measures differ in their impact on the real economy. In case of the nationalizations, we are safe to state that they increase the growth of real GDP and nominal house prices. The effects of deposit freezes are of double to quadruple magnitude than the effects of nationalizations, but they achieve a lower robustness as the basic and complete models do not confirm each other. With increasing delay, the deposit freeze tends to have larger effect on the economy.

The bank holidays often appeared with positive sign and significance, but the models are not consistent regarding the magnitude of the effects and whether they are short-term or rather long-term. The nominal house prices are positively influenced by the liquidity support and recapitalizations with the largest lags. The guarantees and asset purchases either have only limited effect on both dependent variables, or our methods were not able to track it.

Our first hypothesis is not confirmed using the credit data due to the reasons mentioned in previous chapters. Despite that, we are able to provide robust results using a number of specifications and two alternative dependent variables.

In the second hypothesis, we proposed that policies associated with higher fiscal costs should contribute to a faster recovery of the economic performance after the crisis. Here, we accept the division of Detragiache & Ho (2010) who marked guarantees, nationalizations, recapitalizations and asset purchases as posing more risk to taxpayers and deposit freezes with bank holidays posing less risk to taxpayers. In that case, we did not collect enough evidence in favor of our second hypothesis. The countries which used deposit freezes seem to have the largest benefit of increased growth, whereas the guarantees and asset purchases as relative expensive measures did not achieve the desired results.

8 Conclusion

The systemic banking crisis represents a common phenomenon occurring in countries around the world. In response to downturn, the national authorities implement various crisis management measures to return their economic growth back on the pre-crisis track. The aim of this thesis was to present these policies and their use across many crisis periods in history and to provide analysis and comparison of their effectiveness. Quarterly panel dataset was created, and timing of measures tracked with detail to contribute to the existing research on this topic. In our research, we followed a difference-in-differences design which was analysed using two-way fixed effects model. As our dependent variables, the growths of real GDP and nominal house prices were chosen alongside the difference of credit provision to non-financial corporations. To provide robust results, both year-on-year and quarter-on-quarter changes were examined. Furthermore, basic and complete models were specificized, differing in the inclusion of additional control explaining variables.

Our first hypothesis that the crisis management measures differ in their influences on the economy is confirmed by the regressions results. The analysis of real GDP growth and growth in nominal house prices showed a significant positive effect of nationalizations and deposit freezes. Although the latter measure achieves larger magnitudes of its effect, the influences of the former policy are the most robust ones, being supported by results of an absolute majority of our regressions. The bank holidays, liquidity support and recapitalizations enjoyed the expected positive coefficients in some of our specifications with large significance, indicating a positive influence on our macroeconomic dependent variables. Nevertheless, these results are less robust as the magnitudes and estimated delays of the effects differ across the models. Finally, the guarantees and asset purchases do not influence the GDP and nominal house prices at all.

In contrast, the second hypothesis of our research is rejected as measures with larger risk to taxpayers did not lead to increased growth variables. The nationalizations represent a policy with huge demands on public budget and its effect on the economy is weaker than that of relative cheap deposit freezes. Moreover, the outcomes of the analysis of credit difference are problematic which prevents us from drawing conclusions and limits the robustness of our results. The possible reason is the different behaviour in credit provision after a crisis outbrake as compared to the remaining

macroeconomic variables. The credit persistently remains low, and our method was unable to distinguish the effects of the crisis itself and of specific policies. We are also aware of additional issues which burden our research. The omitted variable bias violates our results due to the limited availability of the data and the timing of individual measures had to be assigned only approximately in many cases. The interpolation of some of the control variables burdens our analysis as well.

To conclude, our study provides evidence that some of the policies implemented during a crisis do lead to an increase in economic recovery. The contribution of our thesis lies in the analysis of detailed panel dataset with identified timings of measures used across the crisis periods. Possible future extension of our work might focus on the implementation of expenses associated with the adoption of individual measures. The data collection with rather annual frequency might be supplemented to include other countries and periods into the analysis. Finally, the parallel dataset comparing the quarterly evolution processes across crisis periods might be used to create additional models.

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Appendix A: Additional regression results, sample of crises

Table A.0.1: Basic models – GDP growth YoY, lag 4

	Dependent variable:						
	GDP.growth.YoY						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Systemic.banking.crisis	-0.027***	-0.028***	-0.027***	-0.031***	-0.027***	-0.028***	-0.027***
	(0.005)	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)	(0.004)
Lag4.Liquidity.support	-0.001						
	(0.003)						
Lag4.Recapitalization		0.001					
		(0.003)					
Lag4.Guarantee			-0.001				
			(0.003)				
Lag4.Nationalization				0.010**			
				(0.004)			
Lag4.Asset.purchase					-0.002		
					(0.004)		
Lag4.Bank.holidays						-0.018	
						(0.015)	
Lag4.Deposit.freezes							-0.015
							(0.013)
Observations	7,439	7,439	7,439	7,439	7,439	7,439	7,439
R^2	0.038	0.039	0.038	0.041	0.039	0.039	0.039
Adjusted R^2	0.001	0.001	0.001	0.004	0.001	0.001	0.002
F Statistic (df = 2; 7160)	143.191***	143.404***	143.236***	152.568***	143.556***	143.517***	147.067***
Note:							*p<0.1; **p<0.05; ***p<0.01

Table A.0.2: Basic models – GDP growth QoQ, lag 8

	Dependent variable:						
	GDP.growth.QoQ						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Systemic.banking.crisis	-0.007***	-0.007***	-0.007***	-0.007***	-0.007***	-0.007***	-0.007***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Lag8.Liquidity.support	0.001						
	(0.001)						
Lag8.Recapitalization		0.001					
		(0.001)					
Lag8.Guarantee			0.001*				
			(0.001)				
Lag8.Nationalization				0.003**			
				(0.001)			
Lag8.Asset.purchase					0.0003		
					(0.001)		
Lag8.Bank.holidays						-0.005	
						(0.006)	
Lag8.Deposit.freezes							0.007***
							(0.002)
Observations	7,602	7,602	7,602	7,602	7,602	7,602	7,602
R^2	0.008	0.009	0.008	0.009	0.008	0.008	0.009
Adjusted R^2	-0.029	-0.029	-0.029	-0.028	-0.029	-0.029	-0.028
F Statistic (df = 2; 7327)	31.251***	31.562***	31.222***	33.636***	30.368***	30.514***	33.772***
Note:							*p<0.1; **p<0.05; ***p<0.01

Table A.0.3: Basic models – GDP growth QoQ, lag 12

	Dependent variable:						
	GDP.growth.QoQ						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Systemic.banking.crisis	-0.007***	-0.007***	-0.007***	-0.007***	-0.007***	-0.007***	-0.007***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Lag12.Liquidity.support	0.002*						
	(0.001)						
Lag12.Recapitalization		0.002*					
		(0.001)					
Lag12.Guarantee			0.001				
			(0.001)				
Lag12.Nationalization				0.003**			
				(0.001)			
Lag12.Asset.purchase					0.001		
					(0.001)		
Lag12.Bank.holidays						0.011***	
						(0.003)	
Lag12.Deposit.freezes							0.006**
							(0.002)
Observations	7,582	7,582	7,582	7,582	7,582	7,582	7,582
R^2	0.009	0.009	0.008	0.009	0.008	0.009	0.009
Adjusted R^2	-0.028	-0.028	-0.028	-0.027	-0.028	-0.028	-0.028
F Statistic (df = 2; 7311)	32.728***	32.090***	30.783***	34.255***	30.439***	31.823***	32.659***
Note:							*p<0.1; **p<0.05; ***p<0.01

Table A.0.4: Complete models – GDP growth QoQ, lag 4

	Dependent variable:						
	GDP.growth.QoQ						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Systemic.banking.crisis	-0.006***	-0.005***	-0.005***	-0.006***	-0.005***	-0.005***	-0.005***
	(0.002)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)
Lag4.Liquidity.support	0.002*						
	(0.001)						
Lag4.Recapitalization		0.002*					
		(0.001)					
Lag4.Guarantee			0.0002				
			(0.001)				
Lag4.Nationalization				0.003**			
				(0.002)			
Lag4.Asset.purchase					-0.0005		
					(0.001)		
Lag4.Bank.holidays						0.004**	
						(0.002)	
Lag4.Deposit.freezes							0.001
							(0.003)
House.price.nom.growth.QoQ.	0.019	0.020	0.019	0.018	0.019	0.019	0.019
	(0.016)	(0.016)	(0.017)	(0.016)	(0.016)	(0.016)	(0.016)
Credit.differ.QoQ.	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)
Inflation.	-0.0002	-0.0002	-0.0002	-0.0002	-0.0002	-0.0002	-0.0002
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Unemployment.	0.0001	0.0001	0.0001	0.0001	0.0002	0.0001	0.0001
	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Central.Gov.Debt.	0.00001	0.00001	0.00001	0.00000	0.00001	0.00001	0.00001
	(0.00003)	(0.00003)	(0.00003)	(0.00003)	(0.00003)	(0.00003)	(0.00003)
Private.Debt.Sec.	-0.00003	-0.00003	-0.00003	-0.00003	-0.00003	-0.00003	-0.00003
	(0.00002)	(0.00002)	(0.00002)	(0.00002)	(0.00002)	(0.00002)	(0.00002)
Total.reserves.	0.0001	0.0001	0.0001	0.00005	0.0001	0.0001	0.0001
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Interest.payments.	-0.00004	-0.00004	-0.00004	-0.00004	-0.00003	-0.00003	-0.00003
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
BCI.	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***
	(0.0002)	(0.0002)	(0.0003)	(0.0002)	(0.0003)	(0.0003)	(0.0003)
Observations	2,933	2,933	2,933	2,933	2,933	2,933	2,933
R^2	0.044	0.044	0.043	0.045	0.043	0.043	0.043
Adjusted R^2	-0.028	-0.028	-0.029	-0.027	-0.029	-0.029	-0.029
F Statistic (df = 11; 2726)	11.417***	11.469***	11.218***	11.617***	11.224***	11.222***	11.218***
Note:							*p<0.1; **p<0.05; ***p<0.01

Table A.0.5: Complete models – GDP growth QoQ, lag 8

	Dependent variable:						
	GDP.growth.QoQ						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Systemic.banking.crisis	-0.005***	-0.005***	-0.005***	-0.005***	-0.005***	-0.005***	-0.005***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Lag8.Liquidity.support	-0.0001						
	(0.001)						
Lag8.Recapitalization		-0.0004					
		(0.001)					
Lag8.Guarantee			0.001				
			(0.001)				
Lag8.Nationalization				0.001			
				(0.001)			
Lag8.Asset.purchase					-0.0003		
					(0.001)		
Lag8.Bank.holidays						0.007***	
						(0.002)	
Lag8.Deposit.freezes							0.001
							(0.003)
House.price.nom.growth.QoQ.	0.019	0.019	0.019	0.018	0.019	0.019	0.019
	(0.017)	(0.017)	(0.016)	(0.017)	(0.017)	(0.016)	(0.016)
Credit.differ.QoQ.	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)
Inflation.	-0.0002	-0.0002	-0.0002	-0.0002	-0.0002	-0.0002	-0.0002
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Unemployment.	0.0001	0.0002	0.0001	0.0001	0.0002	0.0001	0.0001
	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Central.Gov.Debt.	0.00001	0.00001	0.00000	0.00000	0.00001	0.00001	0.00001
	(0.00003)	(0.00003)	(0.00003)	(0.00003)	(0.00003)	(0.00003)	(0.00004)
Private.Debt.Sec.	-0.00003	-0.00003	-0.00003	-0.00003	-0.00003	-0.00003	-0.00003
	(0.00002)	(0.00002)	(0.00002)	(0.00002)	(0.00002)	(0.00002)	(0.00002)
Total.reserves.	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Interest.payments.	-0.00004	-0.00003	-0.00004	-0.00004	-0.00003	-0.00003	-0.00003
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
BCI.	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***
	(0.0002)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)
Observations	2,933	2,933	2,933	2,933	2,933	2,933	2,933
R^2	0.043	0.043	0.044	0.044	0.043	0.043	0.043
Adjusted R^2	-0.029	-0.029	-0.029	-0.029	-0.029	-0.029	-0.029
F Statistic (df = 11; 2726)	11.215***	11.226***	11.284***	11.321***	11.217***	11.246***	11.218***
Note:							*p<0.1; **p<0.05; ***p<0.01

Table A.0.6: Complete models – GDP growth YoY, lag 12

	Dependent variable:						
	GDP.growth.YoY						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Systemic.banking.crisis	-0.018***	-0.018***	-0.017***	-0.018***	-0.018***	-0.018***	-0.018***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Lag12.Liquidity.support	0.003						
	(0.002)						
Lag12.Recapitalization		-0.001					
		(0.003)					
Lag12.Guarantee			0.003				
			(0.002)				
Lag12.Nationalization				0.009***			
				(0.003)			
Lag12.Asset.purchase					-0.0002		
					(0.002)		
Lag12.Bank.holidays						-0.008	
						(0.007)	
Lag12.Deposit.freezes							-0.024*
							(0.014)
House.price.nom.growth.YoY.	0.054***	0.055***	0.054***	0.052***	0.055***	0.055***	0.057***
	(0.018)	(0.018)	(0.018)	(0.017)	(0.018)	(0.018)	(0.018)
Credit.differ.YoY.	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***
	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)
Inflation.	-0.001***	-0.001***	-0.001***	-0.002***	-0.001***	-0.001***	-0.001***
	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)
Unemployment.	-0.0003	-0.0002	-0.0002	-0.0002	-0.0002	-0.0002	-0.0002
	(0.0005)	(0.0004)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)
Central.Gov.Debt.	-0.0001	-0.0001	-0.0001	-0.0001	-0.0001	-0.0001	-0.00004
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Private.Debt.Sec.	-0.0001**	-0.0001*	-0.0001**	-0.0001*	-0.0001*	-0.0001*	-0.0001*
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Total.reserves.	-0.0002	-0.0002	-0.0002	-0.0004	-0.0002	-0.0002	-0.0002
	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0004)
Interest.payments.	-0.0005	-0.0004	-0.0004	-0.0005	-0.0004	-0.0004	-0.001*
	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0003)
BCI.	0.006***	0.006***	0.006***	0.006***	0.006***	0.006***	0.006***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Observations	2,903	2,903	2,903	2,903	2,903	2,903	2,903
R^2	0.287	0.287	0.287	0.291	0.286	0.287	0.289
Adjusted R^2	0.233	0.232	0.233	0.237	0.232	0.232	0.235
F Statistic (df = 11; 2696)	98.753***	98.482***	98.807***	100.816***	98.414***	98.432***	99.857***
Note:							*p<0.1; **p<0.05; ***p<0.01

Table A.0.7: Complete models – Nominal house price growth YoY, lag 8

	Dependent variable:						
	House.price.nom.growth.YoY						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Systemic.banking.crisis	-0.028***	-0.026***	-0.026***	-0.031***	-0.027***	-0.026***	-0.025***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Lag8.Liquidity.support	0.011**						
	(0.005)						
Lag8.Recapitalization		0.006					
		(0.006)					
Lag8.Guarantee			0.005				
			(0.005)				
Lag8.Nationalization				0.022***			
				(0.005)			
Lag8.Asset.purchase					0.010		
					(0.006)		
Lag8.Bank.holidays						0.014	
						(0.012)	
Lag8.Deposit.freezes							0.063***
							(0.018)
GDP.growth.YoY.	0.487***	0.488***	0.486***	0.482***	0.490***	0.491***	0.488***
	(0.109)	(0.110)	(0.108)	(0.108)	(0.109)	(0.109)	(0.108)
Credit.differ.YoY.	0.002***	0.002***	0.002***	0.002***	0.002***	0.002***	0.002***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Inflation.	0.004	0.004*	0.004	0.004	0.004	0.004*	0.004
	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)
Unemployment.	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Central.Gov.Debt.	-0.0001	-0.0001	-0.0001	-0.0001	-0.00005	-0.0001	-0.0001
	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Private.Debt.Sec.	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Total.reserves.	0.001	0.001	0.001	0.001	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Interest.payments.	0.001	0.002	0.002	0.001	0.001	0.002	0.002*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
BCI.	0.006***	0.006***	0.006***	0.006***	0.006***	0.006***	0.006***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Observations	2,903	2,903	2,903	2,903	2,903	2,903	2,903
R^2	0.178	0.177	0.177	0.182	0.178	0.177	0.180
Adjusted R^2	0.116	0.115	0.115	0.119	0.115	0.114	0.118
F Statistic (df = 11; 2696)	53.198***	52.875***	52.855***	54.365***	52.985***	52.704***	53.922***

Note: *p<0.1; **p<0.05; ***p<0.01

Table A.0.8: Complete models – Nominal house price growth QoQ, lag 12

	Dependent variable:						
	House.price.nom.growth.QoQ						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Systemic.banking.crisis	-0.009***	-0.009***	-0.009***	-0.009***	-0.009***	-0.009***	-0.009***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Lag12.Liquidity.support	0.003**						
	(0.001)						
Lag12.Recapitalization		0.004***					
		(0.001)					
Lag12.Guarantee			0.002				
			(0.001)				
Lag12.Nationalization				0.007***			
				(0.002)			
Lag12.Asset.purchase					0.002		
					(0.002)		
Lag12.Bank.holidays						0.012***	
						(0.003)	
Lag12.Deposit.freezes							0.014**
							(0.006)
GDP.growth.QoQ.	0.074**	0.076**	0.075**	0.071**	0.075**	0.075**	0.078**
	(0.035)	(0.035)	(0.035)	(0.033)	(0.035)	(0.035)	(0.034)
Credit.differ.QoQ.	0.001**	0.001**	0.001**	0.001**	0.001**	0.001**	0.001**
	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)
Inflation.	0.001	0.001	0.001	0.001	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Unemployment.	-0.0004	-0.0004	-0.0003	-0.0003	-0.0003	-0.0003	-0.0003
	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)
Central.Gov.Debt.	-0.00002	-0.00002	-0.00003	-0.00004	-0.00002	-0.00001	-0.00003
	(0.00004)	(0.00004)	(0.00004)	(0.00004)	(0.00004)	(0.00004)	(0.00004)
Private.Debt.Sec.	-0.0002***	-0.0002***	-0.0002***	-0.0002***	-0.0002***	-0.0002***	-0.0002***
	(0.00003)	(0.00003)	(0.00003)	(0.00003)	(0.00003)	(0.00003)	(0.00003)
Total.reserves.	0.0003	0.0003	0.0003	0.0002	0.0003	0.0003	0.0003
	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)
Interest.payments.	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.001*
	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)
BCI.	0.003***	0.003***	0.003***	0.003***	0.003***	0.003***	0.003***
	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)
Observations	2,932	2,932	2,932	2,932	2,932	2,932	2,932
R^2	0.115	0.116	0.114	0.119	0.114	0.114	0.116
Adjusted R^2	0.048	0.049	0.047	0.052	0.047	0.047	0.049
F Statistic (df = 11; 2725)	32.180***	32.461***	31.987***	33.341***	31.963***	31.840***	32.374***
Note:							*p<0.1; **p<0.05; ***p<0.01

Table A.0.9: Sample of crises – country and starting date

Country	Start
Argentina	Q2 1980
Argentina	Q4 1989
Argentina	Q1 1995
Argentina	Q4 2001
Austria	Q4 2008
Belgium	Q4 2008
Brazil	Q1 1990
Bulgaria	Q2 1996
Chile	Q4 1981
Colombia	Q3 1982
Colombia	Q2 1998
Croatia	Q1 1998
Cyprus	Q3 2011
Czech Republic	Q2 1996
Denmark	Q3 2008
Ecuador	Q3 1998
Estonia	Q4 1992
Finland	Q3 1991
France	Q3 2008
Germany	Q3 2008
Greece	Q3 2008
Hungary	Q3 2008
Indonesia	Q4 1997
Ireland	Q3 2008
Italy	Q3 2008
Jamaica	Q4 1996
Japan	Q4 1997
Kazakhstan	Q4 2008
Korea	Q3 1997
Latvia	Q2 1995
Latvia	Q3 2008
Lithuania	Q4 1995
Luxembourg	Q3 2008
Malaysia	Q3 1997
Mexico	Q4 1994
Moldova	Q4 2014
Norway	Q4 1991
Philippines	Q3 1997
Portugal	Q3 2008
Russia	Q3 1998
Russia	Q3 2008
Slovenia	Q3 2008
Spain	Q3 2008
Sweden	Q3 1991
Sweden	Q3 2008
Switzerland	Q3 2008
Thailand	Q3 1997
The Netherlands	Q3 2008
Türkiye	Q4 2000
Ukraine	Q3 1998
Ukraine	Q3 2008
Ukraine	Q1 2014
United Kingdom	Q3 2007
United States	Q4 2007