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BACHELOR THESIS

Financial Stability Transparency and Interest Rates

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Declaration of Authorship

The author hereby declares that he compiled this thesis independently, using only the listed resources and literature.

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Abstract

This paper examines the relationship between financial stability transparency and nominal interest rates on a panel data with more than 50 countries in years 2000 to 2010, controlling for macroeconomic conditions. We investigate the same relationship using monetary policy transparency, we compare the results and based on the existing literature we check for non-linear effects of transparency. Moreover, we examine how this relationship changes in financially good and bad times in terms of financial stress. We find negative relationship between both financial stability and monetary policy transparency and short-term interest rates. Especially in the case of monetary policy transparency our results suggest non-linear relationship and the existence of an intermediate optimal level of transparency. For financially good and bad times our findings are miscellaneous, some in accordance and some in contradiction with the literature. Generally, our results suggest that the effect of financial stability transparency on short-term interest rates is weaker than the effect of monetary policy transparency. For the long-term interest rates, we find no evidence of the effect of financial stability nor monetary policy transparency. Examining the data in financially good and bad times, our results remain insignificant.

JEL Classification	E52, E58, E61
Keywords	central bank transparency, interest rates, financial stability transparency, monetary policy transparency

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Abstrakt

Práce se zabývá vztahem mezi transparentností finanční stability a nominálními úrokovými mírami, očištěnými o makroekonomické podmínky. Naše výsledky vychází z panelových dat, obsahujících více než 50 zemí v letech 2000 až 2010. Stejný vztah zkoumáme také pro transparentnost monetární politiky, výsledky porovnáváme a na základě existující literatury hledáme nelineární vlivy transparentnosti. Vztah také zkoumáme zvlášť v dobách vysokého a nízkého finančního stresu. Naše výsledky ukazují negativní vztah mezi krátkodobými úrokovými mírami a oběma oblastmi transparentnosti. Zvlášť v případě transparentnosti monetární politiky naše výsledky naznačují, že nelineární vztah s optimální střední úrovni transparentnosti odpovídá realitě. V dobách vysokého a nízkého finančního stresu jsou naše výsledky různorodé, některé v souladu s literaturou, jiné v rozporu. Obecně naše výsledky ukazují, že vliv transparentnosti finanční stability na krátkodobé úrokové míry je menší než v případě transparentnosti monetární politiky. Pro dlouhodobé úrokové míry jsme nenalezli žádnou evidenci vztahu transparentosti centrální banky na dlouhodobé úrokové míry. Při zkoumání tohoto vztahu v dobách nízkého a vysokého finančního stresu naše výsledky zůstávají nesignifikantní.

Klasifikace JEL	E52, E58, E61
Klíčová slova	transparentnost centrální banky, úrokové míry, transparentnost finanční stability, transparentnost monetární politiky

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Contents

Bachelor Thesis Proposal

Author	Petr Pařízek
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Proposed topic	Financial Stability Transparency and Interest Rates

Topic characteristics The aim of the thesis is to examine the influence of change in financial stability transparency on nominal interest rate. Relevant theoretical background and recent empirical studies will be discussed and used as a starting point for stating hypotheses. The concept of financial stability transparency will be explained, nominal interest rates will be controlled for inflation and output growth and an econometric model will be constructed. This model will be estimated and the hypotheses will be tested for data of high and low financial stress time periods separately.

Hypotheses Increase in level of financial stability transparency yields lower interest rates.

Methodology Constructing econometric model and using econometric tools to estimate the model and to test stated hypotheses.

Outline

1. Introduction
2. Literature Overview
3. Empirical Part
4. Results
5. Conclusion

Core bibliography

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2. Horváth, R. and Vaško, D., 2012. *Central Bank Transparency and Financial Stability: Measurement, Determinants and Effects.* IES Working Paper 25/2012. IES FSV. Charles University.

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Author Supervisor

Chapter 1

Introduction

After decades of monetary policy veiled in secrecy, willingness of central banks to communicate openly tends to reverse. In the last two decades, increasing central bank transparency beyond the statutory accounting requirements has become a worldwide trend. The advantages are intuitive - higher transparency should lead to higher credibility, reputation and flexibility of central banks and consequently to lower interest rates and more accurate forecasts of the private sector. However, too much public information may decrease effort of the private sector to gather information. Among other arguments, this leads some economists to argue that there is an optimal level of transparency (e.g. van der Cruijsen, et al., 2010; Horváth and Vaško, 2012; Goldstein and Leitner, 2013). The empirical literature provides miscellaneous results. Crowe (2010), Ehrmann, et al. (2012) and van der Cruijsen, et al. (2010) conclude that higher transparency leads to more accurate and less dispersed private forcasts. However, they admit that there are certain limits such as decreasing marginal returns to transparency (Ehrmann, et al., 2012) or a certain degree of transparency beyond which increasing transparency is not beneficial (van der Cruijsen et al., 2010). Meade and Stasavage (2008) show that releasing monetary policy transcripts of the Federal Reserve motivates its participants to avoid presenting dissent opinions.

Central banks nowadays provide detailed information in many areas, based on which various indices are constructed. To describe changes and differences in monetary policy transparency, Dincer and Eichengreen (2010) constructed an index for 100 countries capturing degree of central banks' communication regarding monetary policy. Index of Horváth and Vaško (2012) is based on transparency of financial stability framework. Both indices show that in years

1998 to 2006 or 2000 to 2011, respectively, there is almost no occasion of decrease in central bank transparency. However, this behaviour of central banks is not fully supported by either theoretical arguments or empirical findings provided by the literature.

The aim of this paper is to examine influence of central bank transparency on nominal short-term and long-term interest rates controlling for inflation and output gap. Geraats, et al. (2006) investigated influence of particular changes in monetary policy transparency of 8 central banks (in advanced economies) on interest rates controlling for the same macroeconomic conditions. In this paper a similar model and the same short-term and long-term interest rates are used, but instead of transparency changes we use Financial Stability Transparency Index ($FSTI$), developed by Horvárth and Vaško (2012), for a panel data consisting of 64 countries (and 51 countries for long-term interest rates, respectively) for time period from 2000 to 2010. We also examine the same relationship using Monetary Policy Transparency Index ($MPTI$), developed by Eijffinger and Geraats (2006), and we compare the results. Based on the literature enhancing an optimal level of transparency, we check for non-linear relationship between transparency and interest rates using alternative specification of the model, which captures possible non-linearity. Moreover, using Financial Stress Index (Balakrishnan, et al., 2009), we investigate how this relationship changes in good and bad times in terms of financial stress.

The results for short-term interest rate on the whole dataset are in accordance with our expectations and with the results of Geraats et al. (2006); a higher transparency (both $FSTI$ and $MPTI$) yields lower nominal short-term interest rates, controlling for macroeconomic conditions. Comparing our two specifications, we find that especially in the case of $MPTI$ there is a non-linear relationship suggesting existence of an optimal level of transparency. Dividing the data by the sign of Financial Stress Index (FSI) we obtain two subsamples. For short-term interest rates our results are miscellaneous, some in accordance and some in contradiction with the literature. For the nominal long-term interest rates, controlling for macroeconomic conditions, we find no evidence of the relationship between long-term interest rates and both $MPTI$ and $FSTI$. Using our subsamples based on the level of financial stress, our results remain insignificant.

The following section discusses relevant literature on the topic of financial stability and monetary policy transparency, their impacts and desirability. In the empirical part the model is derived and the data are described. Sub-

sequently, the results are presented and discussed and the paper ends with conclusion.

Chapter 2

Literature Overview

This chapter gives a literature overview and theoretical background relevant to the empiric part of this paper. First subsection defines financial stability transparency, describe its aspects and historical background. Next subsection is dedicated to the interest rates. Using this base, a theory relevant to the central bank transparency and its effect on interest rates is discussed, followed by the empiric findings provided by the literature.

2.1 Financial Stability Transparency

Central bank transparency (CBT) consists of various aspects of central banks communication, such as publishing their objectives, models, forecasts, rules, strategy or decisions. While most of the literature is focused on monetary policy transparency (e.g. Geraats, 2000; Eijifinger and Geraats, 2006; Dincer and Eichengreen, 2007), this paper examines effects of financial stability transparency and compares them with effects of monetary policy transparency.

Eijfinger and Geraats (2006) define transparency of monetary policy as the extent to which a central bank discloses information related to the policymaking process. Exploiting this definition, financial stability transparency could be defined as the extent to which a central bank discloses information related to the framework used to protect financial stability. To properly understand this definition, financial stability should be defined as well. There is not an academic definition, but most central banks provide a definition based on the same idea. The Sveriges Riksbank (2014) defines financial stability as a state in which "the financial system must be able to maintain its basic functions and also be resilient to shocks" (Sveriges Riksbank, 2014). The Czech National Bank

(2014) defines financial stability as "a situation where the financial system operates with no serious failures or undesirable impacts on the present and future development of the economy as a whole, while showing a high degree of resilience to shocks" (Czech National Bank, 2014). The Bank of England established an independent Financial Policy Committee to promote financial stability, which relies in "identifying, monitoring and taking action to remove or reduce systematic risks with a view to protecting and enhancing the resilience of the UK financial system" (Bank of England, 2014). Other central banks define financial stability and its promotion in a similar way, while most of them have maintenance of financial stability set as one of the main tasks.

Maintenance of financial stability is a complex task. Financial markets are deeply interconnected across the world and the shock can arise from both external and internal environment, including a macroeconomic development, political tensions or changes in policies. Therefore, a cooperation with other national and international institutions is crucial. On the international level central banks cooperate among each other and there are also international institutions with the goal of financial stability. For instance, as a reaction to the financial crisis, the European Union established the European Systematic Risk Board charged with indicating systematic risk in the European Financial System. Besides its own analyses and actions, this institution involves representatives of European central banks and supports cooperation. On the national level communication with government and central bank departments responsible for monetary policy or financial markets and banks supervision is necessary. Especially the monetary policy is important for the financial stability, as the price stability is the key precondition for maintaining stable financial system (Czech National Bank, 2014).

Compared to many other departments of a central bank such as bank supervision, the analysis of the financial stability requires information from broad range of economic subjects. Besides banks, it includes also investment companies, funds or insurance companies. Maintenance of financial stability is closely tightened to macroprudential policy, which, similarly to financial stability, gained a lot on its importance after the financial crisis of 2008. The cooperation between macroprudential policy and maintenence of financial stability slightly differs among central banks. Some have unanimous authority responsible for both areas, whereas others have two separate departments or committees in tight cooperation. The standard output of the authority responsible for the financial stability is a regular publishing of reports of its analysis.

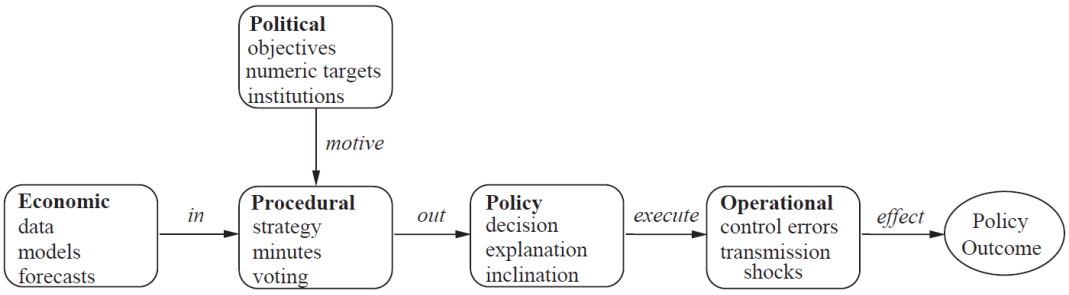
If any actions are needed, they usually take form of a recommendation or a directive. The extent to which central banks provide detailed information of its analyses and actions to the public is financial stability transparency, corresponding to the definition provided in this paper.

The aspects of the transparency regarding central banks' framework to promote stability (*financial stability transparency* in short) are captured in the financial stability transparency index ($FSTI$), developed by Horváth and Vaško (2012). This index is based on four areas of information publishing. First, *General framework* refers to goals, macroprudential policy and financial stability committee. Main part of the $FSTI$ is concerned about *Financial Stability Reports*, particularly about the frequency of publishing and its content. Third part involves publishing of *Tests and indicators*. The last part, *Website* reflects whether a central bank has financial stability section on the web and whether the database of speeches is provided.

Geraats (2002) distinguishes five aspects of transparency in monetary policymaking. First, *Political transparency* refers to the openness about policy objectives, quantitative targets, institutional arrangements (such as central bank independence or bank contracts) and potentially conflicting goals. *Economic transparency* includes publishing of economic data, used models and internal forecasts. *Procedural transparency* refers to the way how the policy decisions are taken, which includes voting framework and the release of minutes and voting records. *Policy transparency* concerns with the announcements of policy decisions, particularly how promptly are they released and what details, explanations and expectations about future they include. The last, *Operational transparency* involves implementation of central bank's policy and its effects, including discussion of control errors and transmission shocks. As depicted on figure 2.1, each of the aspects can be divided into three areas, which served as a base for creation of $MPTI$ by Eijffinger and Geraats (2006).

Although these five aspects were created for purpose of observing monetary policy transparency, they can be applied on financial stability transparency as well. Taking the four areas of $FSTI$, we can see that *General framework* is similar to the *Political transparency* and *Financial Stability Reports* is corresponding to the *Economic transparency*. *Tests and indicators* and *Website* have no exact counterparts; however, *Tests and indicators* is corresponding to areas of more aspects, especially to *Economic transparency* and *Operational transparency*. *Website* is relevant to all of the aspects as it serves as a mean of communication.

Figure 2.1: Conceptual framework for monetary policymaking process.



Source: Eijffinger and Geraats (2006)

To properly understand the trend of increasing central bank transparency and before discussing the theory behind it, it is useful to describe the development of transparency in the historical context. In their work, Dincer and Eichengreen (2007) highlight the role of development of central bank position and function on transparency. In the era of gold standard, the possible decisions of central bank were significantly constrained. The banks guaranteed the convertibility of money into the gold at a fixed rate which was an important principle regarding their transparency. Moreover, many central banks made a commitment to publish changes in their gold reserves. Therefore, an agent was able to use this information to construct a model on a price-specie flow basis and infer what was actually happening, even though most of the policy of central banks was kept in secrecy. This was the counterpart to the exchange rate target, which is commonly published today.

After the fall of the gold standard, the era of pegged exchanged rates took place. Central banks were still closely cooperating with governments, keeping monetary policy secret. However, there was still no need for transparency, because it was easy to evaluate whether the central bank was fulfilling its commitments using information from the foreign exchange market.

It was in the late 20th century, with spread of more flexible exchange rates, when the need for higher central bank transparency arised. Dincer and Eichengreen (2007) argue that this shift is not an exogenous, isolated event in the economy, but it is a process related to two important late-20th century trends: financial liberalization and political liberalization. The liberalization of international capital flows made it impossible to maintain fixed exchange rates and

to promote other economic goals such as low unemployment or GDP growth.[1] At the same time, keeping pegged exchange rate became more difficult, as the public created pressure on the government and central bank to pursue more socially important goals. With more democratization and political liberalization, this public pressure led to an abolishment of fixed exchange rates.

The trends of political and financial liberalization led to the pressure for higher accountability and thus higher transparency. There are three mechanisms described by Dincer and Eichengreen (2007). First, the democratization led directly to the requirement of higher accountability of public institutions, including the central bank. The second mechanism is the effect of more flexible exchange rates. With more flexible exchange rates, the banks gained more power in terms of possibilities of conducting their policies and effects of their decisions. This comes with demand for higher accountability, as the public wishes to control whether the actions of the central bank are in compliance with the public preferences. The third way is a combination of both previous mechanisms and it is related to the central bank independence. With more flexible exchange rate the central bank acquired a powerful tool to finance government expenditures. The public pressure on government accountability and transparency while criticising this dangerous opaque linkage between government and central bank resulted in granting independence to central banks in many countries.[2] The grant of independence creates pressure from both public and government for higher transparency of the central bank.

The last point of Dincer and Eichengreen (2007) is that the financial liberalization enhanced the importance of the predictability and stability of impact of the central bank actions on macroeconomic variables. With more international transactions and faster electronic trading, the volatility is more disruptive and transmitted faster which underlines the importance of predictability and stability. What are the true effects of transparency, both theoretically and empirically, is a subject of the following subsections.

[1] This phenomenon is known as the *Impossible Trinity*. It states that fixed exchange rates, autonomous monetary policy and free capital movements cannot be achieved simultaneously.

[2] The advantages of central bank independence has been well described in the literature. However, there are findings showing that partial independence (independence with respect to instruments but not with respect to goals) might be the optimal setting for the relationship between government and the central bank. See e.g. Debelle and Fisher (1994).

2.2 Theoretical Background

Most of the theoretical literature regarding the impacts of central bank transparency is devoted to the effects of monetary policy transparency. The advantages of transparency are linked to higher accountability, credibility, reputation and time-inconsistency problems, whereas the critique is based on the uncertainty, information overload and crowding out private information. There is an increasing number of studies on the topic of transparency, yet the literature has not reached a consensus. The recent findings enhance the existence of an optimal level of transparency (e.g. van der Cruijsen, et al., 2010; Gick and Pausch, 2012; Goldstein and Leitner, 2013), suggesting that this might be the right setting for the central bank. Moreover, they point out that there is a discrepancy between the theory and practice.

2.2.1 Desirability of Central Bank Transparency

The advantage of central bank transparency linked to the accountability has been described in the previous subsection. With the democratization and liberalization came the requirement of independence and accountability, which cannot be obtained without transparency. Geraats (2002) argues that the accountability issues may explain the trend of increasing transparency; however, Fry, et al. (2000) show that there is only a small correlation between transparency and accountability.

One of the major arguments for desirability of central bank transparency is linked to the credibility, reputation and incentives effects. The origin of this argument is in the time-inconsistency problem analysis of Kydland and Prescott (1977), later formalized by Barro and Gordon (1983). Basically, these analyses are on the basis of expected future monetary policy and the time-inconsistency problem refers to the situation when the optimal policy of central bank is no longer optimal when the action is taken, as the public agents change their expectations. Based on the works of Kydland and Prescott (1977) and Barro and Gordon (1983), a various models were created in order to analyse the effects of central bank transparency, usually regarding monetary policy (e.g. Cukierman and Metzler, 1986; Geraats, 2002; Dincer and Eichengreen, 2010). A simple example illustrating the idea is provided by Dincer and Eichengreen (2010). They consider a situation in which unions contemplate rising demand for higher wages, based on the inflationary pressures. A transparent central

bank gives a signal to the public about the central bank's priority of price stability, inflation target and the risks that the inflation exceed the inflation target. As a result, the unions can recognize the intentions of the central bank's actions and lower their inflation expectations and thus decrease their demands for higher wages, which may cause avoiding costly and difficult wage reductions in the future. Using results of the research based on the Barro and Gordon (1983) model, Dincer and Eichengreen (2010) conclude that the transparency helps to communicate more effectively with the markets and it allows the central bank to react flexibly on economic shocks without losing confidence in its long-term target commitments. Similarly, using the concept of *incentive effects*, Geraats (2002) show that based on the asymmetric information the central bank (which is the agent with the exclusive information) can influence public expectations through signalling, build a reputation and consequently reduce the inflation bias. However, Geraats (2002) admits that the effects and desirability depend on a specific context, such as the presence of some additional information asymmtery. This conclusion is in accordance with Barro (1986) and Cukierman and Metzler (1986) who also find mixed results according to the specific situation.

The critique of central bank transparency is tightly linked to the quality of private sector forecasts. The literature generally agrees on the fact that in the case of relatively opaque central bank, a higher transparency might be beneficial as the provision of more information to the private sector may increase the accuracy of its forecasts. However, at some degree of transparency providing more information might worsen these forecasts. Van der Cruijsen, et al. (2010) provide two reasons for that. First, providing too much information about the complexity and uncertainty around forecasts leads private agents to focus on the complexity of the central bank's forecast and to perceive their own forecasts to be worse, even if their quality is not affected. Second, too much transparency can result in information overload and confusion of private agents. This arguments confronts the assumption of the capability of individuals to understand, absorb and evaluate the amount of information provided by the central bank.

To the extent of private sector forcasts, Morris and Shin (2002) argue that a high degree of transparency might crowd out private information as the economic agents can absorb only limited amount of information (in the case of their model either public or private) and as they wish to coordinate their actions with other agents, they prefer the public information. They conclude that

if the public information is sufficiently noisy compared to the private information, it is not beneficial to be more transparent. However, Svensson (2006) shows that their research is actually pro-transparency when they consider empirically reasonable values of model parameters.[3] Demertzis and Hoeberichts (2007) extend the model of Morris and Shin (2002) by introducing costs showing that even for reasonable parameter values suggested by Svensson (2006), the high degree of transparency does not have to be desirable when it is costly for private sector to process public information. Obviously, the literature criticizing central bank transparency does not suggest complete opaqueness but rather optimal level of transparency. A richer summary of the literature enhancing optimal level of transparency is provided by van der Cruijsen, et al. (2010).

The literature regarding the desirability of financial stability transparency is considerably less extensive. To our knowledge, theoretical models developed especially for the purpose of examining impacts of financial stability transparency are missing in the literature. However, the models for monetary policy transparency are based on the presence and reduction of asymmetric information, thus the concept can be extended for financial stability transparency as well, as it is another mean of central bank communication. Accordingly, the critique can be extended to the financial stability transparency as well. For instance, the theory of the second-best suggests that removing one distortion (information asymmetry regarding financial stability) does not necessarily improve welfare (Morris and Shin, 2002).

2.2.2 Central Bank Transparency and Interest Rates

The theoretical literature focuses mainly on the impacts of central bank transparency on reducing inflation bias, inflation persistence or variability of macroeconomic variables. The point that monetary policy transparency can influence the level of interest rates is emphasized by Geraats, et al. (2006), who argue, that "enhanced flexibility would allow a reduction in policy and short-term interest rates without increasing long-term nominal interest rates, and improved reputation would reduce inflation expectations and thereby long-term nominal interest rates" (Geraats, et al., 2006). They also develop a theoretical model

[3] In their reply, Morris, et al. (2006) admit the conclusion of Svensson (2006); however, they open a discussion about further parameter values and assumptions of the model. A detailed analysis is beyond the scope of this text.

showing the effect of monetary policy transparency on interest rates. As it is closely related to our research, we briefly describe the model.

The model of Geraats, et al. (2006) is based on the assumption, that the public does not have perfect information about central bank's inflation target τ, particularly the public agents expect inflation "to be around the mean from previous years." Mathematically expressed, $\tau \sim N(\bar{\tau}, \sigma_\tau^2)$ with $\sigma_\tau^2 > 0$ representing uncertainty in expectations. In addition, the model assumes that the bank suffers from a reputation problem, $\overline{\tau} > \tau$. The central bank is using short-term nominal interest rate s as a monetary policy instrument:

$$s = c - \tau + \epsilon \tag{2.1}$$

where $c > 0$ is a constant reflecting neutral policy rate and $e \sim N(\bar{\tau}, \sigma_\epsilon^2)$ is an economic shock to which the central bank decides to offset. In the long term, nominal interest rate l is determined as:

$$l = r + z \tag{2.2}$$

where r is a long-term real interest rate and z is private sector inflation expectation. This expectation is rational and it exploits the short-term policy rate s to estimate the central bank's inflation target τ as a posterior mean of inflation target E_P:

$$z = E_P[\tau|s] \tag{2.3}$$

In the case of transparent central bank (denoted by subscript T), the bank publishes information about its intentions and about the economic shocks ϵ which they decide to offset. As a result, the public can perfectly infer inflation target tau (using s), and thus $z = \tau$. Then the long-term nominal interest rate can be expressed as:

$$l_T = r + \tau \tag{2.4}$$

In the case of opaque central bank (denoted by subscript O), the public cannot infer whether any action of the central bank was taken in order to keep inflation on target τ or whether it is an intention to offset economic shock ϵ. As a result, the public inference of the inflation target is influenced by the uncertainty about the nature of policy actions and thus the long-term nominal interest rate equals:

$$l_O = r + \frac{\sigma_\epsilon^2}{\sigma_\epsilon^2 + \sigma_\tau^2}\bar{\tau} - \frac{\sigma_\tau^2}{\sigma_\epsilon^2 + \sigma_\tau^2}(s - c) \tag{2.5}$$

Employing 2.1 into 2.5 we obtain 2.6:

$$l_O = r + \tau + \frac{\sigma_\epsilon^2}{\sigma_\epsilon^2 + \sigma_\tau^2}(\bar{\tau} - \tau) - \frac{\sigma_\tau^2}{\sigma_\epsilon^2 + \sigma_\tau^2}\epsilon \tag{2.6}$$

By simple comparison of 2.4 and 2.6, it is obvious that the opaque central bank's decisions to offset economic shock affects long-term nominal interest rates. On the contrary, in the case of transparent central bank, the private sector is able to infer the intentions of the central bank perfectly, which leads to the lower inflation expectations and thus lower long-term interest rate.[4]

The reason, why higher financial stability transparency should decrease interest rates is related to the uncertainty. The publication of additional information regarding financial stability can have calming effect and reduce private agents' expectations of the risks in the economy. Consequently, it can reduce the interest rates in a similar manner as the reduced inflation expectations in the model of Geraats, et al. (2006). On the other hand, too much information does not have to be beneficial for the same reasons as in the case of monetary policy transparency, related to the quality and importance of private sector forecasts. It is thus one of the aims of this paper to examine the character of the relationship between financial stability transparency and interest rates.

2.3 Empirical Evidence

The breakthrough point in the empirical literature regarding effects of monetary policy transparency was the creation of time-varying monetary policy transparency index (Eijffinger and Geraats, 2006). Before then, the literature was based on the indices computed in a given point of time (e.g. Fry, et al., 2000; De Haan, et al., 2004), which had only limited power in evaluation of the effects of central bank transparency. The recent empirical literature is in accordance with the recent theoretical findings. Using transparency data by Eijffinger and Geraats (2006), Van der Cruijsen and Demertzis (2007) find that central bank transparency improves private sector inflation expectations. Dincer and Eichengreen (2007) who extended this index on the dataset of 100 countries, show that transparency has weak but favourable impact on inflation

[4]For specific details, see Geraats, et al. (2006)

and output variability. In their later work, Dincer and Eichengreen (2010) find again beneficial impact on inflation variability but less evidence on inflation persistence. In line with the theoretical literature enhancing optimal level of transparency, Van der Cruijsen, et al. (2010) empirically show that increasing transparency is desirable when the degree of transparency is low, whereas in the case of high transparency it can be harmful. Similarly, Ehrmann, et al. (2012) provide findings of favourable impact of transparency on private forecasts; however, with decreasing marginal returns to increasing transparency.

Most of the literature regarding the relationship between central bank transparency and interest rates is focused on immediate (daily) effects of central bank communication, which is described in a number of studies for the individual countries. Fracasso, et al. (2003) use data for 20 central banks and find that a higher quality of inflation reports reduces the variability of market interest rate on the monetary policy decisions. Geraats, et al. (2006) examine whether transparency has enduring effects on interest rates for eight major central banks. Their findings are that in most of the cases, increase in transparency causes significant decrease of the policy, short-term and/or long-term interest rates. However, in several cases they find opposite relationship suggesting a trade-off between reputation and flexibility, which again points to the fact that increasing transparency does not have to be beneficial under some circumstances.

The effects of financial stability transparency are described rather scarcely in the literature. Using a large dataset of 110 countries and financial stability transparency index, Horváth and Vaško (2012) find that transparency is beneficial for the stability on financial markets unless the degree of transparency is too high. Moreover, they show that increasing transparency can be harmful in the times of financial stress. Born, et al. (2014) use dataset of more than 1000 releases of Financial Stability Reports to show that optimistic FSRs have beneficial long-lasting effects on the stock market returns, whereas no effect is found for pessimistic FSRs. As we showed, there are some papers examining effects of financial stability transparency and there is a number of papers examining effects of monetary policy transparency on interest rates. However, the link between financial stability transparency and interest rates is missing in the literature.

Chapter 3

Empirical Part

At the beginning of this chapter we present econometric model used for research of this paper. Then, we discuss the data and their consequences for the model based on their character or availability. At the end of the chapter, the econometric method is presented.

3.1 Model

This paper exploits a model developed by Geraats, et al. (2006), particularly its backward-looking specification:

$$i_t = \beta_0 + \sum_{l=1}^{L_\pi} \beta_{\pi,l}\pi_{t-l} + \sum_{l=1}^{L_y} \beta_{y,l} y_{t-l} + \sum_{l=1}^{L_i} \beta_{i,l} i_{t-l} + \sum\nolimits_{MM/YY} \beta_{MM/YY} d_{MM/YY,t} + \epsilon_t \tag{3.1}$$

where

- $i \in i_p, i_s, i_l$ where i_p is policy interest rate, i_s is short-term interest rate corresponding to three-month deposit rate or the money market rate and i_l is long-term interest rate based on the nominal yield of 10-year government bonds
- π is annual percentage change in consumer price index (CPI)
- y is output gap computed as a percentual deviation from the trend in gross domestic product (GDP) computed using Hodrick-Prescott filter
- $d_{MM/YY}$ is transparency change indicator, switching from 0 to 1 in a month/year (MM/YY) when the change took place

- ϵ is a white noise

Geraats, et al. (2006) points out that this specification resembles the Taylor rule; however, their interest is in conditional expectations and in the coefficient $\beta_{MM/YY}$ representing influence of the changes in transparency on the interest rates, controlling for macroeconomic conditions.

For the purpose of this paper, the model is altered in two ways. First, we use this model on a panel data instead of a number of time series (each for an individual central bank). Second, we use transparency index (TI) instead of transparency changes ($d_{MM/YY}$). Geraats, et al. (2006) argue that they use transparency changes instead of index because the degree of central bank transparency increased significantly but unevenly across countries.[1] However, this argument is irrelevant in the case of panel data, which allows us to use index instead of transparency changes. Employing these changes in the model, we obtain:

$$i_{j,t} = \beta_0 + \sum_{l=1}^{L_\pi} \beta_{\pi,l}\pi_{j,t-l} + \sum_{l=1}^{L_y} \beta_{y,l}y_{j,t-l} + \sum_{l=1}^{L_i} \beta_{i,l}i_{j,t-l} + \beta_{TI}TI_{j,t} + \epsilon_t \qquad (3.2)$$

where j is subscript denoting particular country and TI is transparency index. In this paper two transparency indices are used: monetary policy transparency index and financial stability transparency index, both described in the following subsection. The shortage of this decision is that neither of the indices is available on monthly or quarterly basis. Therefore, we examine yearly data whereas the findings of Geraats, et al. (2006) were based on monthly and quarterly data. On the other side, there are two advantages of this approach. The first is that a rich dataset can be obtained and the second lies in the interpretation of the transparency index. The coefficient captures the effect of the overall level of transparency, which is more useful for a central bank to decide to which extent to be transparent.

Geraats, et al. (2006) used a systematic method to determine optimal number of lags in the model using selection program PcGets, based on the *general-to-specific* methodology.[2] On a quarterly data, they found that the optimal number of lags is $L_\pi = L_y = L_i = 5$. As a result, we decide to use only one lag on our yearly data, as it corresponds most accurrately with the suggested 5-quartile lag. This specification does not involve GDP gap y and

[1] As it was showed by Eijffinger and Geraats (2006).
[2] Based on Hendry (1995).

inflation π without lag, i.e. in the time t; however, we decide to employ it based on two arguments. First, compared to quarterly data, one year is a time long enough for interest rates to react on economic situation or unexpected inflation. Therefore, high values of interest rate in the second half of the year could be result of an economic shock in the first half of the year and this should be reflected in the model. Second reason is that it corresponds with the forward-looking specification of the model provided by Geraats, et al. (2006). The forward-looking specification suggests employing current and future values of macroeconomic variables to reflect public expectations. Employing these changes into the model we obtain:

$$i_{j,t} = \beta_0 + \beta_\pi \pi_{j,t} + \beta_{\pi 1} \pi_{j,t-1} + \beta_y y_{j,t} + \beta_{y1} y_{j,t-1} + \beta_i i_{j,t-1} + \beta_{TI} TI_{j,t} + \epsilon_t \quad (3.3)$$

which is the specification of the model used in this paper. In line with theoretical literature suggesting that there is an optimal level of transparency and that too much transparency is not beneficial (e.g. Gick and Pausch, 2012; Horváth and Vaško, 2012; Goldstein and Leitner, 2013) we decided to examine one more specification. In order to capture non-linear relationship between transparency and interest rates, a squared transparency index is included in the model and the second specification is obtained:

$$i_{j,t} = \beta_0 + \beta_\pi \pi_{j,t} + \beta_{\pi 1} \pi_{j,t-1} + \beta_y y_{j,t} + \beta_{y1} y_{j,t-1} + \beta_i i_{j,t-1} + \beta_{TI} TI_{j,t} + \beta_{TI2} TI^2_{j,t} + \epsilon_t \quad (3.4)$$

For simplicity, let's call the model 3.3 a *linear specification* and the model 3.4 a *non-linear specification*. Although both models are linear in terms of econometrics, this terminology reflects the character of the examined relationship between transparency index and interest rates.

The weakness of the model is that the transparency index could be endogenous, meaning that the decision to increase transparency can be triggered by the central bank's aim to change interest rates. On the other hand, there is a number of transparency changes that are results of external events. Nevertheless, since the transparency index could be endogenous, the results should be interpreted carefully. In comparison with the forward-looking specification of the model developed by Geraats, et al. (2006), our models do not involve future expectations, except for the expectations in a single year. However, our *non-linear specification* tries to capture non-linearity in the relationship between

transparency and interest rates, which is missing in the research of Geraats, et al. (2006).

3.2 Data

Our dataset is based on a panel of 110 countries, for which Dincer and Eichengreen (2010) computed monetary policy transparency index in years 1998 to 2006. Horváth and Vaško (2012) updated this index through 2010 using the same methodology and they also created financial stability transparency index for the same set of countries in years 2000 to 2011. We take this panel of 110 countries containing both indices as a starting point for collecting the rest of the data needed for the estimation of our model. Regrettably, at the end we had to exclude a number of countries due to the unavailable data. This subsection provides detailed information about each variable in our dataset and then the characteristics of the whole dataset is discussed.

3.2.1 Interest Rates

Our dataset contains short-term and long-term interest rates. For the short-term interest rate, the Money Market Rate or its alternative such as Call Money Rate or Interbank Rate is used. In the case of long-term interest rate, a 10-year Government Bond yield or a related index is used. All the data are obtained from the IMF Financial Statistics database and the complete list of indices can be found in Appendix A, table A.1.

3.2.2 Inflation and GDP Gap

Inflation and GDP gap are used to control for macroeconomic conditions in our model. For the inflation we use percentage change in Consumer Price Index (CPI), mathematically $\pi_{2001} = log(CPI_{2001}) - log(CPI_{2000})$ with CPI starting point in 2005, i.e. $CPI_{2005} = 1$. For computing GDP gap we used the same methodology as Geraats, et al. (2006):

$$y_{2000} = \left(\frac{GDP_{2000}}{HPtrend_{2000}} - 1 \right) * 100 \tag{3.5}$$

The GDP is a gross domestic product per capita in current prices, expressed in the U.S. dollars. The data are extracted from the IMF World Economic

Outlook Databases. The Hodrick-Prescott filter was applied on yearly GDP data from 1980 until 2011 with smoothing parameter $\lambda = 10$. Subsequently, the GDP gap y was computed according to formula 3.5.

3.2.3 Transparency Indices

This paper focuses mainly on examining the effects of the *Financial Stability Transparency Index* ($FSTI$) developed by Horváth and Vaško (2012). The second index used in this paper - the *Monetary Policy Transparency Index* ($MPTI$) developed by Eijffinger and Geraats (2006) - is older and it is used more frequently in the literature, thus it is important to examine its effects as well and compare them with those of $FSTI$.

The construction of the $MPTI$ originates in the work of Geraats (2002), who divided the framework for monetary policymaking process into five aspects: *political transparency*, *economic transparency*, *procedural transparency*, *policy transparency* and *operational transparency*, which were described in the theoretical part of this paper. As it is showed on figure 2.1, three underlying areas for each aspect can be distinguished. Eijffinger and Geraats (2006) allocated up to 1 point for each area and created the $MPTI$. As a result, the value of the $MPTI$ for each country in a given year is between 0 and 15. Contribution of Dincer and Eichengreen (2007) was in creating dataset of 110 countries containing computed $MPTI$, which they later updated (Dincer and Eichengreen, 2010).

The $FSTI$, constructed by Horváth and Vaško (2012) is based on publishing information in four areas regarding framework to promote financial stability: *General framework*, *Financial Stability Reports*, *Tests and indicators* and *Website*. Table 3.1 shows that the first two areas of both indices are similar in their focus, whereas the rest is more specific for each index. Nevertheless, even in the remaining areas it is possible to find points with the same idea such as publication of macroeconomic disturbances ($MPTI$) and publication of stress tests or FSIs ($FSTI$). Both indices express the same idea: the higher the index, the higher the transparency and they also have approximately similar scale. The difference is in the area of central bank communication on which they are focused and in the fact that composition of $MPTI$ is evenly divided into five aspects, whereas the core of $FSTI$ relies in Financial Stability Reports - their publishing and content.

Table 3.1: Comparison of construction of MPTI and FSTI

MPTI	*FSTI*
Political transparency • Statement of objective(s) with prioritization (1). • Quantification of objectives (1). • Institutional Arrangements between government and monetary authority (1).	**General framework** • Explicitly stated goal of financial stability (1). • Macro-prudential policy transparency (1). • Existence of a financial stability policy committee (1).
Economic transparency • Economic data availability (1). • Publishing formal macroeconomic model used for policy analysis (1). • Regularly published macroeconomic forecasts (1).	**Financial Stability Reports** • Publication of FSR (1). • Frequency of publication FSR (1). • FSR is forward-looking (1). • Coverage of FSR (1.5).
Procedural transparency • Explicit policy rule or strategy published (1). • Comprehensive account of policy deliberations (1). • Publication of each decision regarding main operating instrument or target (1).	**Tests and indicators** • Publication of stress test (1). • Publication of FSIs (1).
Policy transparency • Prompt announcement of the decisions regarding adjustments of operating instruments (1). • Explanation of policy decisions (1). • Regular publication of likely future policy actions (1).	**Website** • Separate section on financial stability on central bank's website (1). • Separate section (database) for speeches about financial stability (0.5).
Operational transparency • Publication of evaluation of achievements regarding targets (1). • Publication of macroeconomic disturbances affecting policy decisions (1). • Regular evaluation of the policy outcome (1).	
Total points: 15	**Total points: 13**

Source: Author, based on Eijffinger and Geraats (2006) and Horváth and Vaško (2012). Maximum possible points for each item are in brackets.

3.2.4 Financial Stress Index

One of the aims of this paper is to examine whether the relationship between central bank transparency and interest rates changes in good and bad financial times. In order to obtain the results, the *Financial Stress Index* (FSI) developed by Balakrishnan, et al. (2009) is used. Based on the value of FSI in each year for each country we divide the data and examine the relationship on the subsamples separately.

The FSI is computed for advanced and emerging countries separately with different formulas, which, however, follow the same idea. Both formulas contain *banking-sector beta*, which is the beta from standard capital asset pricing model, *stock market returns*, computed as a negative year-on-year change in the stock index and *stock market volatility*, obtained as the 6-month backward looking moving average of the squared month-on-month growth rate. Other components slightly vary, but in both cases they reflect bond spreads and fluctuation of exchange rate.[3] The value of 0 represents the standard (average) financial conditions and value of 1 indicates one standard deviation from the average conditions across subindices. Positive values of the index represent financial strain, whereas negative values correspond with financially good times.

As the data are provided on a monthly basis, an average of each year is used for our research. The drawbacks of the FSI are that it is available only for limited amount of countries (18 advanced and 27 emerging economies) and it is provided only until year 2008 or 2009 (depending on country). This has a negative impact on the size of our dataset; however, to our knowledge it is the best dataset containing financial stress data. Based on the sign of FSI ($FSI < 0$ and $FSI > 0$, respectively), we obtained two subsamples representing observations in the times with financial stress index below average (financially good times) and in the times with financial stress index above average (financially bad times). Our other aim was to select only the crisis years to obtain another subsample. Based on Balakrishnan, et al. (2009), the crisis years (not the "above average years" as in our previous selection) are associated with values above 1 for advanced countries and above 1.5 for emerging countries. However, the number of observations was too small, giving us less than 10 degrees of freedom. Since the information from such a regression has no value, we decided to exclude it from the results.

[3]For more details, see Balakrishnan, et al. (2009)

3.2.5 Final Dataset

The final dataset contains 582 observation and 79 countries, from which 64 countries have available data for short-term interest rate and 51 for long-term interest rate. The list of the countries and indices of interest rates can be found in Appendix A, table A.1. Approximately half of the observations (293) has available FSI.

3.3 Econometric Method

When choosing an appropriate method for estimation, it is necessary to find out whether the individual effect of all countries is constant across the dataset and if it is not, then the information about its (non)correlation with explained variable i is needed. Intuitively, the unobserved term is not constant and it is correlated with explained variable, as there are many other factors influencing interest rates not captured in our model, such as central bank's policy rates, institutional background (including property rights and enforceability of law) or the quality of the banking system. This suggests use of the fixed effect estimator and it is also confirmed statistically. Using Hausman test, the null hypothesis is resoundingly rejected ($Prob > chi2 = 0.0000$ for all specifications), which means that the random effect estimator is inconsistent. The F-test that all $\epsilon_i = 0$ does not reject null hypothesis, which means it does not exclude use of pooled OLS; however, for the intuitive reasons we use fixed effect (within) estimator.

Using Likelihood-ratio test to check for heteroskedasticity, the null hypothesis is rejected in all of our settings, which means that our data are heteroskedastic. We also check for serial correlation following the test for fixed-effects one-way models developed by Wooldridge (2002). This test is based on the fact, that if no serial correlation is present, then the correlation of two following residuals from first-difference regression should be equal to -0.5. The null hypothesis is again rejected and thus we have also presence of serial correlation in our data. As a result, we use HAC robust estimator in order to correct for both violations.

Chapter 4

The Results

In this paper, two specifications of the model were developed, examining two interest rates (short-term and long-term), using two different transparency indices and applied on the whole dataset and various subsamples. Consequently, a number of regressions is estimated. In order to keep the results well arranged, only the coefficients of transparency indices and squared transparency indices with their p-values are presented in the text. As some of the subsamples are small-sized, the results are accompanied by the number of degrees of freedom for each regression. The detailed results of all regressions can be found in Appendix B.

4.1 Short-term Interest Rates

The results for short-term interest rates for both transparency indices on all data samples are presented in the table 4.1. The *linear specification* refers to the model 3.3 with transparency index and *non-linear specification* refers to the model 3.4 with transparency index and squared transparency index included. The table 4.1 shows estimated coefficients with p-values in the brackets. The significance levels are denoted as ***, ** and * for 1%, 5% and 10% significance levels

We evaluate the results of the models with $FSTI$ first. The *linear specification* on the whole dataset shows significant negative relationship between financial stability transparency and short-term interest rates. Looking at the results of *non-linear specification*, we find a non-linear parabolic-shaped relationship, which suggests optimal level of financial stability transparency described by the literature (Horváth and Vaško, 2012). If we take the estimates

Table 4.1: The Results for the Short-term Interest Rates

	Linear Specif. (3.3)		Non-linear Specification (3.4)			
Dataset	$FSTI$		$FSTI$		$FSTI^2$	
whole dataset	-0.391 (0.023)	**	-0.797 (0.008)	***	0.055 (0.079)	*
$FSI < 0$	-0.120 (0.358)		-0.130 (0.679)		0.001 (0.975)	
$FSI > 0$	-0.386 (0.177)		0.449 (0.243)		-0.129 (0.020)	**
	$MPTI$		$MPTI$		$MPTI^2$	
whole dataset	-0.672 (0.075)	*	-2.938 (0.011)	**	0.171 (0.012)	**
$FSI < 0$	0.505 (0.004)	***	1.448 (0.068)	*	-0.058 (0.199)	
$FSI > 0$	-0.345 (0.336)		-4.846 (0.026)	**	0.296 (0.039)	**

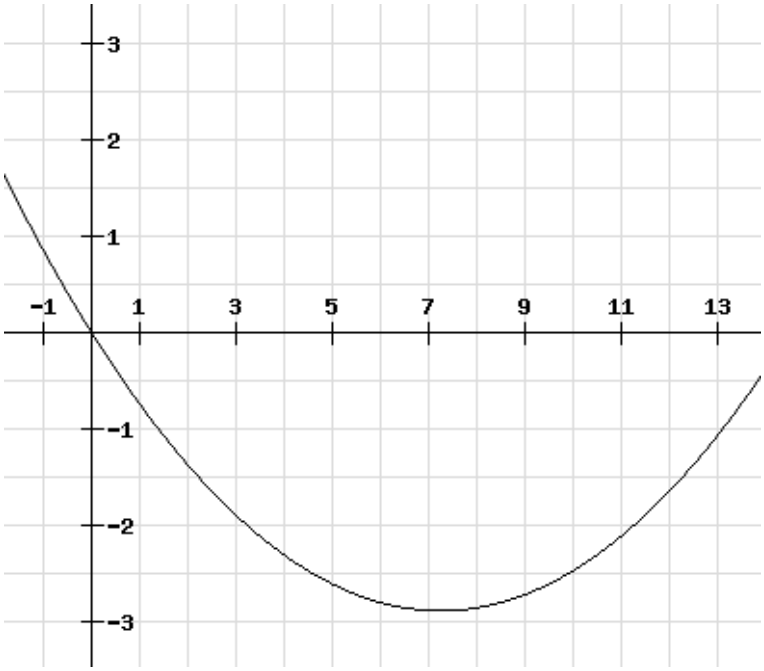
Source: Author. The p-values are in the brackets. Other parameter estimates are not reported in the table. Full results can be found in Appendix B. The significance levels are denoted as ***, ** and * for 1%, 5% and 10% significance levels in the same order.

and construct a function $f(x) = 0.55x^2 - 0.797x$ we obtain a parabolic curve depicted on figure 4.1, showing that in this case the optimal level of financial stability transparency yielding lowest short-term interest rates is around 7.25 on the scale of FSTI. In order to resolve which model is more suitable for our data, we test the significance of the $FSTI^2$ coefficient and we also observe the change in Akaike Information Criterion (AIC) and Shwarz's Bayesian Information Criterion (BIC)[1] when omitting the $FSTI^2$ and thus getting the *linear specification* from the *non-linear specification*. The table 4.1 shows, that the $FSTI^2$ is significant on 10% significance level, but not on 5% significance level. When we omitted the $FSTI^2$, the information criteria changed only very slightly, AIC remained almost unchanged while BIC decreased, which suggests that the *linear specification* (with lower BIC) should be correct, but it does not give us a strong argument. On the other hand, the p-value 0.079 suggests that the *non-linear specification* could reflect the reality, but it is only a weak evidence.

In the financially good times ($FSI < 0$) we obtained the estimated coefficients in both specifications highly insignificant. It suggests that in the times of low financial stress the influence of financial stability transparency on interest rates becomes null or at least much weaker. The possible explanation is that such times are described by high returns on the stock markets with low volatility and stable exchange rates, which may lead economic agents to focus only on returns and to mitigate potential risks. As a result, they do not care much about the information regarding risks for financial stability and how the

[1]The values of both criteria can be found in Appendix B

Figure 4.1: The function of FSTI coefficients.



Source: Author, using www.rechneronline.de/function-graphs/. The $x - axis$ represents the value of $FSTI$ (0-13) and $y - axis$ represents the effect on short-term interest rates.

central bank would react on problems in financial sector.

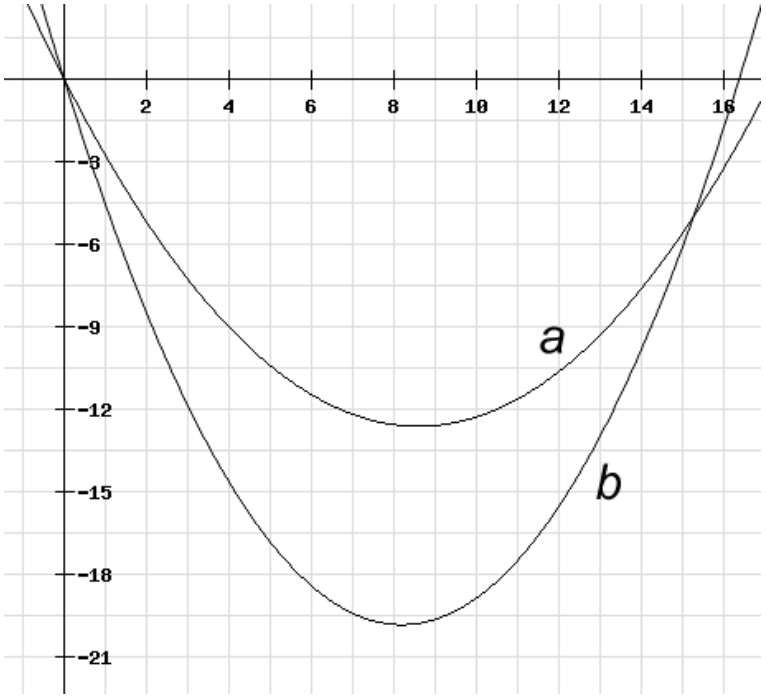
In the financially bad times, the *linear specification* provides also insignificant coefficient of $FSTI$. In the *non-linear specification*, we obtained a significant negative estimate of coefficient $FSTI^2$, which suggests that in the times of financial strain it is beneficial to be transparent regarding financial stability as much as possible. The intuition behind is quite straightforward. In financially bad times, the publication of the risks to the financial stability and both taken and potential actions of the central bank can provide at least some credible information about the situation in the economy. It is corresponding to the behaviour of central banks during financial crisis; however, it is not in accordance with findings in the literature. While the communication regarding financial stability gained on its importance dramatically during the financial crisis, the empirical evidence of the benefits is rather scarce (Born, et al., 2014). Moreover, Hovráth and Vaško (2012) showed that especially in the times of high financial stress, publishing too much information may, in fact, escalate the crisis. The lower short-term interest rates may be one of the few benefits of high transparency in the financially bad times; our results are based on a very small subsample, which means that our estimates are not reliable. In this case, the same procedure we performed on the whole dataset to compare our two spec-

ifications does not provide an explicit result. The significance of $FSTI^2$ on a 5% significance level suggests it is a variable capturing at least part of the real relationship; however, omitting it does not substantially increase nor decrease the information criteria. If the *non-linear specification* was closer to the reality, the relationship would be still reversed in comparison with the literature. It is thus important to emphasize that the discrepancy may have been caused by the lack of the data.

Using $MPTI$ as a second transparency index we find an interesting evidence for the relationship between monetary policy transparency and nominal short-term interest rates, controlling for macroeconomic conditions. On the whole dataset, the *linear specification* gives us a negative relationship, significant only on 10% level. The results of the regression with *non-linear specification* are in line with the literature emphasizing existence of the optimal level of transparency (e.g. van der Cruijsen, et al., 2010; Gick and Pausch, 2012; Goldstein and Leitner, 2013). From the perspective of the lowest short-term interest rates, the data for the whole dataset suggest optimal level of monetary policy transparency around 8.6 on the scale of MPTI, as depicted on figure 4.2, curve *a*. Our result is relatively close to the result of van der Cruijsen, et al. (2010) who suggest $MPTI$ optimal level of 7.5, based on a dataset involving 11 OECD countries. Comparing our two specifications, we can see that the coefficient of $MPTI^2$ is significant; moreover, adding $MPTI^2$ decreased both AIC and BIC substantially which suggests, that the *linear specification* is in this case incorrect and that the *non-linear specification* is more corresponding to the reality. Consequently, our findings are that there is a non-linear effect of monetary policy transparency on short-term interest rates reflecting the fact that too much transparency can be harmful.

The interpretation of the regressions for financially good times ($FSI < 0$) is ambiguous. The *linear specification* gives positive relationship between monetary policy transparency and short-term interest rates, significant on 1% significance level, meaning that higher transparency of communication regarding monetary policy yields higher short-term interest rates in the times of low financial stress. Comparing our two models, the information criteria does not provide any helpful information - the AIC is higher and BIC is lower for the first specification. The p-value of $MPTI^2$ from the *non-linear specification* suggests that $MPTI^2$ has probably no effect on interest rates in this case. However, a positive linear relationship is in contradiction with both theoretical and empirical literature and we do not have an explanation for such result. If we

Figure 4.2: The function of MPTI coefficients.



Source: Author, using www.rechneronline.de/function-graphs/. The $x-axis$ represents the value of $MPTI$ (0-15) and $y-axis$ represents the effect on short-term interest rates. Curve a represents the whole dataset, curve b represents the reaction in financially bad times.

consider coefficient $MPTI^2$ to be significant and indeed negative in the reality, the consequent relationship would be non-linear, but opposite to the findings on the whole dataset. This relationship would suggest that in financially good times it is worth to be as transparent as possible or alternatively as opaque as possible. Using our estimates, the absolute opaqueness would be the best solution for a central bank in financially good times. Nevertheless, it is only intuitive interpretation and we do not have a strong evidence for stating this conclusion.

The estimate of the $MPTI$ coefficient in the *linear specification* in the times of financial strain ($FSI > 0$) is insignificant. As the coefficients are significant on 5% level in the *non-linear specification* and both AIC and BIC are lower for the latter specification, we can conclude that in the financially bad times, the *non-linear specification* is reflecting the reality better than the *linear specification*. The results show that there is a non-linear relationship, in accordance with the literature and similar to the case using whole dataset. The interpretation is that in the times of financial stress, too transparent communication regarding monetary policy may escalate the crisis by increasing short-term interest rates.

Based on our findings, the optimal level of MPTI should be approximately 8.2 (figure 4.2, curve *b*). However, these estimates are based on a small number of observations so this predication must be taken with caution.

If we compare the results of both transparency indices, we can see similar pattern in the case of the whole dataset, but various results on the subsamples. For the whole dataset our results suggest that the *non-linear specification* is better specification for monetary policy transparency, whereas in the case of financial stability transparency this question remains unanswered, although Horváth and Vaško (2012) find that there is probably an optimal level of $FSTI$ as well. The coefficients are significant at least on the 10% significance level and with the same sign and the optimal values of indices are approximately the same, but the effect of $MPTI$ is multi-fold compared to $FSTI$. Considering *non-linear specification* and comparing the figures 4.1 and 4.2, we can see that the effect of monetary policy transparency on the short-term interest rates is significantly higher and that a deviation from the optimal transparency level causes losing benefits faster. The findings for financially good times are that $FSTI$ has no effect on short-term interest rates, whereas monetary policy transparency seems to increase them, which is, however, in contradiction with theory and the literature. Our results for the financially bad times have relatively small predication value as they are based on small subsamples. In the case of $MPTI$ the results are in line with theoretical literature emphasizing optimal level of transparency. For the financial stability transparency in the times of financial stress our findings are that it is worth to be as transparent as possible.

One of the aims of this paper is to compare the results with findings of Geraats, et al. (2006), as our model is based on theirs. As the research of Geraats, et al. (2006) is based on changes in monetary policy transparency from 1998 until 2002, our results for $MPTI$ should be relevant, although we examine different period of time. Geraats, et al. (2006) conclude that higher transparency tends to be accompanied by lower nominal policy, short-term and/or long-term interest rates, controlling for macroeconomic conditions. Our results for $MPTI$ on the whole dataset and in the times of financial strain are in agreement up to the point of optimal transparency level, beyond which more transparency is not beneficial, according to our findings. Comparing our *linear specification* and *non-linear specification* on the whole dataset we find that the effects of transparency are in reality non-linear, which is not reflected in the model of Geraats, et al. (2006), which involves only transparency changes

regardless of the level. On the other hand, forward-looking specification of the model by Geraats, et al. (2006) captures future expectations which are missing in our model, except for the expectations in a single year. The positive relationship between transparency and short-term interest rates we found on the data of financially good times are not in accordance with the results of Geraats, et al. (2006); however, Geraats, et al. (2006) admit that on some occasions the increase of transparency led to higher interest rates, suggesting a trade-off between flexibility and reputation.

4.2 Long-term Interest Rates

In this subsection, we present the results for the long-term interest rates in the same manner as for the short-term interest rates. Estimates are provided in the table 4.2, accompanied by their p-values and the signs for significance level.

Table 4.2: The Results for the Long-term Interest Rates

	Linear Specif. (3.3)	Non-linear Specification (3.4)	
Dataset	$FSTI$	$FSTI$	$FSTI^2$
whole dataset	0.029 (0.733)	0.051 (0.786)	-0.003 (0.877)
$FSI < 0$	0.102 (0.247)	0.241 (0.214)	-0.018 (0.308)
$FSI > 0$	-0.127 (0.244)	-0.268 (0.246)	0.027 (0.387)
	$MPTI$	$MPTI$	$MPTI^2$
whole dataset	0.084 (0.398)	-0.125 (0.767)	0.012 (0.576)
$FSI < 0$	0.085 (0.591)	0.840 (0.197)	-0.041 (0.228)
$FSI > 0$	-0.735 (0.000) ***	-0.734 (0.326)	-0.000 (0.999)

Source: Author. The p-values are in the brackets. Other parameter estimates are not reported in the table. Full results can be found in Appendix B. The significance levels are denoted as ***, ** and * for 1%, 5% and 10% significance levels in the same order.

In our results, almost all of the estimated coefficients of transparency indices and squared transparency indices are insignificant. In the case of $MPTI$ we found the only significant coefficient of transparency index, particularly for *linear specification* in the times of high financial stress; however, this result is based on very small number of observations. This regression has only 17 degrees of freedom which means that this result is not reliable, especially in the context of no significant results in other regressions for the long-term interest rates.

We have found no evidence that $FSTI$ influences nominal long-term interest rates, controlling for macroeconomic conditions. Considering that for the short-term interest rates and $FSTI$ we found weaker relationship (and none in the

case of financially good times) than in the case of $MPTI$, this result for long-term interest rates is not completely surprising. For $MPTI$ we have found no evidence of the relationship between monetary policy transparency and long-term interest rates either. A possible explanation for these findings is that the financial markets do not think that the central bank's policy (including the degree of its transparency) is influential and able to change long-term interest rates. However, our results are in contradiction with the findings of Geraats, et al. (2006). A possible reason for this difference is that it has been caused by the specific selection of the data in our dataset. The findings of Geraats, et al. (2006) are based on the data from 1998 to 2002, whereas our dataset contains data from 2000 to 2010, which includes a long period of high growth and abnormally low interest rates preceding the financial crisis and only the beginning of the crisis. The discrepancy in the results suggests that the true effect of monetary policy transparency on the long-term interest rates is a subject for further research.

Chapter 5

Conclusion

Increasing central bank transparency has become a worldwide trend in the last decades. There is a growing number of papers describing both theoretically and empirically effects of monetary policy transparency on inflation bias and persistence, volatility of output, interest rates, or volatility of stock returns. The literature focused on transparency regarding framework to promote financial stability is emerging, collaterally with the increasing importance of financial stability promotion linked to the financial crisis. Using financial stability transparency index developed by Horváth and Vaško (2012), this paper fills the missing link between financial stability transparency and interest rates. Moreover, we use monetary policy transparency index developed by Eijffinger and Geraats (2006) to examine the same relationship for monetary policy and we compare the results.

Our findings based on the dataset with 64 countries from 2000 to 2010 show negative relationship between financial stability transparency and nominal short-term interest rates, controlling for macroeconomic conditions. We find negative relationship also for monetary policy transparency, which is in accordance with the results of Geraats, et al. (2006). However, using alternative specification of the model we find that especially in the case of monetary policy transparency this relationship is non-linear, suggesting existence of the optimal level of transparency, which is in line with the recent theoretical and empirical literature (e.g. van der Cruijsen, et al., 2010; Gick and Pausch, 2012; Goldstein and Leitner, 2013). Dividing the data based on the level of financial stress, we find no evidence that financial stability transparency affects short-term interest rates in financially good times, whereas for monetary policy transparency we find positive relationship, which is, however, in discrepancy with the literature.

For financially bad times our results suggest that there is a negative effect of financial stability transparency on short-term interest rates, whereas the effects of monetary policy transparency are similar with those on the whole dataset (i.e. non-linear relationship suggesting optimal level of transparency). Generally, we find that the influence of financial stability transparency is weaker than that of monetary policy transparency.

Using the panel of 51 countries, we find no evidence that neither monetary policy transparency nor financial stability transparency have effect on nominal long-term interest rates, controlling for macroeconomic conditions, which is in discrepancy with the findings of Geraats, et al. (2006). Dividing the dataset based on the level of financial stress, our findings remain the same. The possible explanation may be that the financial markets do not think that central banks are able to influence long-term interest rates or it may be a result of our data selection, which includes long pre-crisis period of abnormally low interest rates. Nevertheless, it is necessary to point out that our results should be interpreted with care, since our model can suffer from endogenity. Moreover, our dataset for the financially bad times is relatively small, which reduces the reliability of these results.

To conclude, this paper provides findings of negative and non-linear relationship between central bank transparency and short-term interest rates, in accordance with the theoretical and empirical literature. In several cases, we find relationship different to the suggestions of the literature. Moreover, we find no evidence between central bank transparency and long-term interest rates.

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Appendix A

Table of Interest Rates Indices

Table A.1: Table of Interest Rates Indices

ID	*Country*	*Short-term IR Index*	*Long-term IR Index*
1	Argentina	Money Market Rate	
2	Armenia	Money Market Rate	Government Bond Yield
3	Australia	Average Rate on Money Market	Treasury Bonds: 15 Years
4	Austria	Money Market Rate	Government Bond Yield
5	Bahrain	Money Market (Interbank) Rate	
6	Brazil	Money Market Rate	
7	Bulgaria	Interbank Rate	Government Bond Yeild
8	Canada	Overnight Money Market Rate	Government Bond Yield ¿ 10 Yrs.
9	Chile	Money Market Rate	
10	Colombia	Interbancaria (Tbs)	
11	Croatia	Money Market Rate	
12	Cyprus	Money Market Rate	Govt. Bond Yield
13	Czech Republic	Money Market Rate	Government Bond Yield
14	Denmark	Call Money Rate	Government Bond Yield
15	El Salvador	Money Market Rate	
16	Estonia	Money Market Rate	Long-term Loan Rate
17	Ethiopia		Government Bond Yield
18	Fiji	Overnight Interbank Rate	Avg sht trm Govt Bonds Rate
19	Finland	Average Cost of cb Debt	Government Bond Yield
20	France	Call Money Rate	Government Bond Yield
21	Georgia	Money Market Rate	
22	Germany	Call Money Rate	Government Bond Yield
23	Ghana	Money Market Rate	Government Bond Yield
24	Greece	Money Market Rate (3 mth Interbank)	Government Bond Yield
25	Guatemala	Money Market Rate	Reconstruction Bonos(1976-77)
26	Hong Kong	Money Market Rate	
27	Hungary		Government Bond Yield
28	Iceland	Money Market Rate	Government Bond Yield - 10Y Ind.
29	India	Call Money Rate	Government Bond Yield
30	Indonesia	Call Money Rate	
31	Ireland	1 Month Fixed Rate	Government Bond Yield
32	Italy	Money Market Rate	Government Bond Yield
33	Jamaica	Money Market Rate	Government Bond Yield

34	Japan	Call Money Rate	Govenment Bond Yield
35	Jordan	Money Market Rate	
36	Korea	Money Market Rate	Yld.on Nat'l Housing Bonds,1&2
37	Kuwait	Interbank Deposit Rate (3 M)	
38	Kyrgyzstan	Money Market Rate	
39	Latvia	Money Market Rate	Government Bond Yield
40	Lithuania	Money Market Rate	Government Bond Yield
41	Luxembourg	Interbank Rate	Government Bond Yield
42	Malawi		Government Bond Yield
43	Malaysia	Interbank Overnight Money	Government Bonds 5 Years
44	Malta		Government Bond Yield
45	Mauritius	Money Market Rate	
46	Mexico	Bankers' Acceptances	Government Bond Yield
47	Namibia	Money Market Rate	Government Bond Yield
48	Netherlands	Call Money Rate	Government Bond Yield
49	New Zealand	Money Market Rate	Government Bond Yield
50	Norway	Call Money Rate	Government Bond Yield
51	Oman	Overnight Interbank Lending Rate Nc	
52	Pakistan	Call Money Rate	Government Bond Yield
53	Papua New Guinea	Interbank Rate Average	Inscribed Stock
54	Peru	Interbank Rate Nc	
55	Philippines	Money Market Rate	Government Bond Yield
56	Poland	Money Market Rate	Government Bond Yield
57	Portugal		Government Bond Yield
58	Qatar	Money Market Rate	
59	Romania	Money Market Rate	Government Bond Yield
60	Russian Federation	Money Market Rate	Government Bond Yield
61	Rwanda	Interbank Market	
62	Saudi Arabia	Money Market Rate	
63	Singapore	3 Month Interbank Rate	10-year Bond Yield
64	Slovak Republic	Money Market Rate	Govt.bond Yield
65	Slovenia	Money Market Rate	Government Bond Yield
66	Solomon Islands		Coupon Rate on L.t.develpt Bonds
67	South Africa	Money Market Rate	Government Bond Yield
68	Spain	Call Money Rate	Government Bond Yield
69	Sri Lanka	Interbank Call Loans	Govt Bond Yield
70	Sweden	Call Money Rate	Government Bond Yield
71	Switzerland	Money Market Rate	Government Bond Yield
72	Tajikistan	Money Market Rate	
73	Thailand	Money Market Rate	Government Bond Yield
74	Trinidad and Tobago		Government Bond Yield
75	Tunisia	Money Market Rate	
76	Uganda		Government Stocks to 10 Years
77	Ukraine	Money Market Rate	
78	United Kingdom	Overnight Interbank Min	Govt Bond Yield: Long-term
79	USA	Federal Funds Rate	Govt Bond Yield: 10 Year

Appendix B

Full Results

B.1 Short-term Interest Rates

This section presents full results of regressions with short-term interest rate.

1) $FSTI$, whole dataset

```
Fixed-effects (within) regression               Number of obs      =       582
Group variable: country_nu~r                    Number of groups   =        64
R-sq:  within  = 0.3217
                                                F(6,63)            =     34.73
corr(u_i, Xb)  = -0.0136                        Prob > F           =    0.0000
------------------------------------------------------------------------------
             |               Robust
    ir_short |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpi |   46.43706   23.97615     1.94   0.057    -1.475463    94.34958
       cpi_1 |   51.41647   17.15094     3.00   0.004     17.14305    85.68988
gdp_gap_curr |   .0428356    .032466     1.32   0.192    -.0220426    .1077137
gdp_gap_cu~1 |   .0591002   .0622759     0.95   0.346    -.0653483    .1835488
  ir_short_1 |    .452574   .0665652     6.80   0.000     .3195542    .5855939
        fsti |   -.391394   .1680098    -2.33   0.023    -.7271349   -.0556531
       _cons |   2.149077   .7452888     2.88   0.005     .6597359    3.638417
-------------+----------------------------------------------------------------
AIC = 3001.759                                  BIC = 3027.957
```

2) $FSTI$, $FSTI^2$, whole dataset

```
Fixed-effects (within) regression               Number of obs      =       582
Group variable: country_nu~r                    Number of groups   =        64
R-sq:  within  = 0.3247
                                                F(7,63)            =     34.06
corr(u_i, Xb)  = -0.0227                        Prob > F           =    0.0000
------------------------------------------------------------------------------
             |               Robust
    ir_short |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpi |   46.59705   23.90814     1.95   0.056    -1.179553    94.37365
       cpi_1 |   53.23218   17.15187     3.10   0.003      18.9569    87.50747
gdp_gap_curr |   .0423681   .0324129     1.31   0.196    -.0224039    .1071402
gdp_gap_cu~1 |   .0571187   .0619869     0.92   0.360    -.0667522    .1809896
  ir_short_1 |   .4454714   .0692458     6.43   0.000     .3070947     .583848
        fsti |  -.7970217   .2894937    -2.75   0.008    -1.375529   -.2185147
       fsti2 |   .0553802    .031004     1.79   0.079    -.0065764    .1173368
       _cons |   2.486338   .7943177     3.13   0.003     .8990211    4.073655
-------------+----------------------------------------------------------------
AIC = 3001.165                                  BIC = 3031.73
```

3) $FSTI$, financially good times ($FSI < 0$)

```
Fixed-effects (within) regression               Number of obs      =       156
Group variable: country_nu~r                    Number of groups   =        29
R-sq:  within  = 0.3482
                                                F(6,28)            =     20.35
corr(u_i, Xb)  = 0.5606                         Prob > F           =    0.0000
------------------------------------------------------------------------------
             |               Robust
    ir_short |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpi |   8.704928   20.16177     0.43   0.669    -32.59458    50.00444
       cpi_1 |   57.55114   41.12846     1.40   0.173     -26.6967     141.799
gdp_gap_curr |   .0543438   .0381525     1.42   0.165    -.0238081    .1324957
gdp_gap_cu~1 |   .0334793   .0257925     1.30   0.205    -.0193543    .0863129
  ir_short_1 |   .4096777   .0539171     7.60   0.000     .2992335     .520122
        fsti |  -.1203107   .1286075    -0.94   0.358    -.3837512    .1431297
       _cons |   2.244764   1.221467     1.84   0.077    -.2572984    4.746827
-------------+----------------------------------------------------------------
```

4) $FSTI$, $FSTI^2$, financially good times ($FSI < 0$)

```
Fixed-effects (within) regression               Number of obs      =       156
Group variable: country_nu~r                    Number of groups   =        29
R-sq:  within  = 0.3482
                                                F(7,28)            =     17.57
corr(u_i, Xb)  = 0.5619                         Prob > F           =    0.0000
------------------------------------------------------------------------------
             |               Robust
    ir_short |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpi |   8.763983   20.15492     0.43   0.667     -32.5215    50.04946
       cpi_1 |     57.487   41.27956     1.39   0.175    -27.07036    142.0444
gdp_gap_curr |    .054261   .0378453     1.43   0.163    -.0232616    .1317836
gdp_gap_cu~1 |   .0333383   .0274689     1.21   0.235    -.0229291    .0896057
  ir_short_1 |   .4096454   .0541032     7.57   0.000       .29882    .5204709
        fsti |   -.130042   .3107039    -0.42   0.679    -.7664902    .5064061
       fsti2 |   .0013785   .0429899     0.03   0.975    -.0866824    .0894394
       _cons |   2.251965   1.237303     1.82   0.079    -.2825364    4.786465
-------------+----------------------------------------------------------------
```

5) $FSTI$, financially bad times ($FSI > 0$)

```
Fixed-effects (within) regression               Number of obs      =        58
Group variable: country_nu~r                    Number of groups   =        29
R-sq:  within  = 0.8290
                                                F(6,28)            =    427.82
corr(u_i, Xb)  = -0.4871                        Prob > F           =    0.0000
------------------------------------------------------------------------------
             |               Robust
    ir_short |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpi |   213.0964   34.66744     6.15   0.000     142.0833    284.1094
       cpi_1 |   175.2705   106.4095     1.65   0.111    -42.69947    393.2405
gdp_gap_curr |  -.0400862   .0797377    -0.50   0.619    -.2034215    .1232492
gdp_gap_cu~1 |   .2670786   .0795889     3.36   0.002      .104048    .4301091
  ir_short_1 |    .165823   .1737091     0.95   0.348    -.1900039    .5216499
        fsti |  -.3856099   .2782497    -1.39   0.177    -.9555785    .1843586
       _cons |  -.2615285   1.118024    -0.23   0.817    -2.551698    2.028641
-------------+----------------------------------------------------------------
AIC = 252.3128                                  BIC = 264.6755
```

6) $FSTI$, $FSTI^2$, financially bad times ($FSI > 0$)

```
Fixed-effects (within) regression               Number of obs      =        58
Group variable: country_nu~r                    Number of groups   =        29
R-sq:  within  = 0.8345
                                                F(7,28)            =    505.40
corr(u_i, Xb)  = -0.5619                        Prob > F           =    0.0000
------------------------------------------------------------------------------
             |               Robust
    ir_short |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpi |   209.0967   34.11788     6.13   0.000     139.2094     278.984
       cpi_1 |   174.3309   106.3275     1.64   0.112    -43.47113    392.1329
gdp_gap_curr |  -.0270325   .0830977    -0.33   0.747    -.1972505    .1431855
gdp_gap_cu~1 |   .2826545   .0723751     3.91   0.001     .1344008    .4309082
  ir_short_1 |   .1987753   .1716106     1.16   0.257    -.1527531    .5503038
        fsti |   .4486013    .376266     1.19   0.243    -.3221446    1.219347
       fsti2 |  -.1290436   .0523758    -2.46   0.020    -.2363304   -.0217567
       _cons |  -.7388618   1.020301    -0.72   0.475    -2.828854     1.35113
-------------+----------------------------------------------------------------
AIC = 252.4059                                  BIC = 266.829
```

7) $MPTI$, whole dataset

```
Fixed-effects (within) regression               Number of obs      =       582
Group variable: country_nu~r                    Number of groups   =        64
R-sq:  within  = 0.3234
                                                F(6,63)            =     42.95
corr(u_i, Xb)  = -0.4533                        Prob > F           =    0.0000
------------------------------------------------------------------------------
             |               Robust
    ir_short |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpi |   43.08314      22.73     1.90   0.063    -2.339141    88.50541
       cpi_1 |   50.99814   16.89564     3.02   0.004     17.23491    84.76138
gdp_gap_curr |    .041962   .0316678     1.33   0.190    -.0213209     .105245
gdp_gap_cu~1 |   .0528528   .0592512     0.89   0.376    -.0655513    .1712569
  ir_short_1 |   .4359985   .0706825     6.17   0.000     .2947508    .5772462
        mpti |   -.671708   .3708224    -1.81   0.075    -1.412737    .0693215
       _cons |   5.728261   2.704697     2.12   0.038     .3233551    11.13317
-------------+----------------------------------------------------------------
AIC = 3000.326                                  BIC = 3026.525
```

8) $MPTI$, $MPTI^2$, whole dataset

```
Fixed-effects (within) regression               Number of obs      =       582
Group variable: country_nu~r                    Number of groups   =        64
R-sq:  within  = 0.3574
                                                F(7,63)            =     41.17
corr(u_i, Xb)  = -0.4157                        Prob > F           =    0.0000
------------------------------------------------------------------------------
             |               Robust
    ir_short |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpi |   43.71994   20.14119     2.17   0.034     3.470986    83.96889
       cpi_1 |    54.8644   17.56099     3.12   0.003     19.77157    89.95723
gdp_gap_curr |   .0441818   .0314536     1.40   0.165    -.0186733    .1070368
gdp_gap_cu~1 |   .0520058   .0532137     0.98   0.332    -.0543333     .158345
  ir_short_1 |   .4048578   .0759621     5.33   0.000     .2530597     .556656
        mpti |  -2.938248   1.114702    -2.64   0.011    -5.165802   -.7106939
       mpti2 |   .1706206   .0659255     2.59   0.012      .038879    .3023622
       _cons |   11.53096   4.181094     2.76   0.008      3.17571    19.88621
-------------+----------------------------------------------------------------
AIC = 2972.273                                  BIC = 3002.838
```

9) $MPTI$, financially good times ($FSI < 0$)

```
Fixed-effects (within) regression               Number of obs      =       156
Group variable: country_nu~r                    Number of groups   =        29
R-sq:  within  = 0.3677

                                                F(6,28)            =     13.60
corr(u_i, Xb)  = 0.1346                         Prob > F           =    0.0000
------------------------------------------------------------------------------
             |               Robust
    ir_short |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpi |   4.263283   22.21636     0.19   0.849    -41.24487    49.77144
       cpi_1 |   62.92899   34.18276     1.84   0.076    -7.091216    132.9492
gdp_gap_curr |   .0233436   .0327179     0.71   0.481     -.043676    .0903632
gdp_gap_cu~1 |   .0356544   .0192398     1.85   0.074    -.0037566    .0750655
  ir_short_1 |   .4600418   .0625916     7.35   0.000     .3318288    .5882548
        mpti |   .5052347   .1597112     3.16   0.004     .1780811    .8323882
       _cons |  -2.654429   1.598954    -1.66   0.108    -5.929738    .6208793
-------------+----------------------------------------------------------------
AIC = 549.4954                                  BIC = 567.7945
```

10) $MPTI$, $MPTI^2$, financially good times ($FSI < 0$)

```
Fixed-effects (within) regression               Number of obs      =       156
Group variable: country_nu~r                    Number of groups   =        29
R-sq:  within  = 0.3808

                                                F(7,28)            =     14.16
corr(u_i, Xb)  = -0.0199                        Prob > F           =    0.0000
------------------------------------------------------------------------------
             |               Robust
    ir_short |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpi |  -.8851155   24.15988    -0.04   0.971    -50.37439    48.60416
       cpi_1 |   70.95333   32.62657     2.17   0.038     4.120836    137.7858
gdp_gap_curr |   .0249523    .032021     0.78   0.442    -.0406398    .0905443
gdp_gap_cu~1 |   .0381659   .0183717     2.08   0.047     .0005331    .0757986
  ir_short_1 |   .4645034    .064156     7.24   0.000     .3330859     .595921
        mpti |   1.447628   .7612041     1.90   0.068    -.1116283    3.006883
       mpti2 |  -.0577138   .0438673    -1.32   0.199     -.147572    .0321444
       _cons |  -6.013157   3.318789    -1.81   0.081    -12.81139    .7850731
-------------+----------------------------------------------------------------
AIC = 548.2519                                  BIC = 569.6009
```

11) $MPTI$, financially bad times ($FSI > 0$)

```
Fixed-effects (within) regression               Number of obs      =        58
Group variable: country_nu~r                    Number of groups   =        29
R-sq:  within  = 0.8234

                                                F(6,28)            =    554.93
corr(u_i, Xb)  = -0.5950                        Prob > F           =    0.0000
------------------------------------------------------------------------------
             |               Robust
    ir_short |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpi |   226.3134     38.327     5.90   0.000     147.8041    304.8227
       cpi_1 |   171.1032   99.81609     1.71   0.098    -33.36078    375.5672
gdp_gap_curr |  -.0573594     .06787    -0.85   0.405    -.1963848    .0816661
gdp_gap_cu~1 |   .2498662   .0902947     2.77   0.010     .0649058    .4348265
  ir_short_1 |   .1801523   .1603459     1.12   0.271    -.1483013    .5086058
        mpti |  -.3449979    .352601    -0.98   0.336    -1.067268    .3772726
       _cons |   1.103765   2.280261     0.48   0.632    -3.567138    5.774667
-------------+----------------------------------------------------------------
AIC = 254.1646                                  BIC = 266.5272
```

12) $MPTI$, $MPTI^2$, **financially bad times** ($FSI > 0$)

```
Fixed-effects (within) regression               Number of obs      =        58
Group variable: country_nu~r                    Number of groups   =        29
R-sq:  within  = 0.8432
                                                F(7,28)            =    320.27
corr(u_i, Xb)  = -0.4826                        Prob > F           =    0.0000
------------------------------------------------------------------------------
             |               Robust
    ir_short |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpi |   164.9106   51.74294     3.19   0.004     58.91995    270.9012
       cpi_1 |   166.9077   90.73331     1.84   0.076    -18.95108    352.7664
gdp_gap_curr |  -.0639974   .0616981    -1.04   0.308    -.1903804    .0623855
gdp_gap_cu~1 |   .1717767   .0960985     1.79   0.085    -.0250721    .3686256
  ir_short_1 |   .0398377   .1277166     0.31   0.757     -.221778    .3014534
        mpti |  -4.846459   2.060603    -2.35   0.026    -9.067413   -.6255049
       mpti2 |   .2964973   .1369598     2.16   0.039     .0159479    .5770467
       _cons |   17.89105   8.465511     2.11   0.044     .5502342    35.23186
-------------+----------------------------------------------------------------
AIC = 249.2776                                  BIC = 263.7007
```

B.2 Long-term Interest Rates

This section presents full results of regressions with long-term interest rate.

13) $FSTI$, **whole dataset**

```
Fixed-effects (within) regression               Number of obs      =       430
Group variable: country_nu~r                    Number of groups   =        51
R-sq:  within  = 0.3094
                                                F(6,50)            =      8.66
corr(u_i, Xb)  = 0.6823                         Prob > F           =    0.0000
------------------------------------------------------------------------------
             |               Robust
     ir_long |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpi |    .831538   9.069221     0.09   0.927    -17.38453     19.0476
       cpi_1 |    7.59781   11.70959     0.65   0.519    -15.92159    31.11721
gdp_gap_curr |   .0037899   .0135212     0.28   0.780    -.0233683    .0309481
gdp_gap_cu~1 |    .017694   .0184742     0.96   0.343    -.0194125    .0548005
   ir_long_1 |   .5570368   .1060054     5.25   0.000     .3441188    .7699549
        fsti |   .0293904   .0858102     0.34   0.733    -.1429645    .2017453
       _cons |   2.103197   .9101364     2.31   0.025     .2751344     3.93126
-------------+----------------------------------------------------------------
```

14) $FSTI$, $FSTI^2$, whole dataset

```
Fixed-effects (within) regression               Number of obs      =       430
Group variable: country_nu~r                    Number of groups   =        51
R-sq:  within  = 0.3094
                                                F(7,50)            =      7.60
corr(u_i, Xb)  = 0.6803                         Prob > F           =    0.0000
------------------------------------------------------------------------------
             |               Robust
     ir_long |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpi |   .7600078   9.064458     0.08   0.934    -17.44649    18.96651
       cpi_1 |   7.582227   11.63339     0.65   0.518    -15.78413    30.94858
gdp_gap_curr |   .0037011   .0136711     0.27   0.788    -.0237581    .0311602
gdp_gap_cu~1 |   .0177523   .0183943     0.97   0.339    -.0191938    .0546984
   ir_long_1 |   .5565123   .1064935     5.23   0.000     .3426139    .7704108
        fsti |    .051444   .1883514     0.27   0.786    -.3268709    .4297589
       fsti2 |  -.0027416   .0176827    -0.16   0.877    -.0382583    .0327751
       _cons |   2.084328    .952292     2.19   0.033     .1715929    3.997063
-------------+----------------------------------------------------------------
```

15) $FSTI$, financially good times ($FSI < 0$)

```
Fixed-effects (within) regression               Number of obs      =       152
Group variable: country_nu~r                    Number of groups   =        27
R-sq:  within  = 0.4515
                                                F(6,26)            =     21.90
corr(u_i, Xb)  = 0.0041                         Prob > F           =    0.0000
------------------------------------------------------------------------------
             |               Robust
     ir_long |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpi |   25.26563   7.441346     3.40   0.002     9.969729    40.56154
       cpi_1 |   82.62247   21.75496     3.80   0.001     37.90451    127.3404
gdp_gap_curr |  -.0113079   .0099071    -1.14   0.264    -.0316723    .0090565
gdp_gap_cu~1 |  -.0108687    .009743    -1.12   0.275    -.0308958    .0091585
   ir_long_1 |   .4817757   .0953957     5.05   0.000     .2856871    .6778644
        fsti |   .1022253   .0864023     1.18   0.247    -.0753773    .2798278
       _cons |   .7426818   .9405107     0.79   0.437    -1.190566    2.675929
-------------+----------------------------------------------------------------
```

16) $FSTI$, $FSTI^2$, financially good times ($FSI < 0$)

```
Fixed-effects (within) regression               Number of obs      =       152
Group variable: country_nu~r                    Number of groups   =        27
R-sq:  within  = 0.4578
                                                F(7,26)            =     28.95
corr(u_i, Xb)  = 0.0784                         Prob > F           =    0.0000
------------------------------------------------------------------------------
             |               Robust
     ir_long |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpi |   24.35418   8.091006     3.01   0.006     7.722876    40.98548
       cpi_1 |   80.61888   20.64964     3.90   0.001     38.17293    123.0648
gdp_gap_curr |  -.0124581   .0103559    -1.20   0.240    -.0337448    .0088287
gdp_gap_cu~1 |  -.0077957   .0110188    -0.71   0.486    -.0304451    .0148537
   ir_long_1 |   .4806547   .0860841     5.58   0.000     .3037062    .6576032
        fsti |   .2408117   .1892209     1.27   0.214    -.1481374    .6297608
       fsti2 |  -.0177228   .0170438    -1.04   0.308    -.0527569    .0173112
       _cons |   .6533373   .9344394     0.70   0.491    -1.267431    2.574105
-------------+----------------------------------------------------------------
```

17) $FSTI$, financially bad times ($FSI > 0$)

```
Fixed-effects (within) regression               Number of obs      =        49
Group variable: country_nu~r                    Number of groups   =        26
R-sq:  within  = 0.5223
                                                F(6,25)            =     20.27
corr(u_i, Xb)  = -0.5807                        Prob > F           =    0.0000
------------------------------------------------------------------------------
             |               Robust
     ir_long |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpi |   76.72464   31.34866     2.45   0.022     12.16086    141.2884
       cpi_1 |   115.1269   78.18893     1.47   0.153    -45.90625      276.16
gdp_gap_curr |  -.0337748   .0456579    -0.74   0.466    -.1278089    .0602594
gdp_gap_cu~1 |   .0405521   .0401011     1.01   0.322    -.0420377    .1231419
   ir_long_1 |    .254901   .0847389     3.01   0.006     .0803781    .4294239
        fsti |  -.1265743   .1059893    -1.19   0.244    -.3448633    .0917147
       _cons |   1.860843   2.118503     0.88   0.388    -2.502296    6.223981
-------------+----------------------------------------------------------------
```

18) $FSTI$, $FSTI^2$, financially bad times ($FSI > 0$)

```
Fixed-effects (within) regression               Number of obs      =        49
Group variable: country_nu~r                    Number of groups   =        26
R-sq:  within  = 0.5293
                                                F(7,25)            =     14.97
corr(u_i, Xb)  = -0.5167                        Prob > F           =    0.0000
------------------------------------------------------------------------------
             |               Robust
     ir_long |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpi |   70.34603   34.72343     2.03   0.054    -1.168213    141.8603
       cpi_1 |   118.8552   77.47384     1.53   0.138    -40.70514    278.4156
gdp_gap_curr |  -.0453824   .0444739    -1.02   0.317    -.1369782    .0462134
gdp_gap_cu~1 |   .0252288   .0385918     0.65   0.519    -.0542525      .10471
   ir_long_1 |   .2309309   .0947088     2.44   0.022     .0358744    .4259874
        fsti |  -.2680868   .2258755    -1.19   0.246     -.733286    .1971125
       fsti2 |   .0265276   .0301121     0.88   0.387    -.0354893    .0885446
       _cons |   1.937577   2.184587     0.89   0.384    -2.561664    6.436817
-------------+----------------------------------------------------------------
```

19) $MPTI$, whole dataset

```
Fixed-effects (within) regression               Number of obs      =       430
Group variable: country_nu~r                    Number of groups   =        51
R-sq:  within  = 0.3103
                                                F(6,50)            =      8.71
corr(u_i, Xb)  = 0.6218                         Prob > F           =    0.0000
------------------------------------------------------------------------------
             |               Robust
     ir_long |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpi |   1.247098   9.005094     0.14   0.890    -16.84016    19.33436
       cpi_1 |   8.255651   11.98498     0.69   0.494    -15.81688    32.32818
gdp_gap_curr |    .003336   .0124341     0.27   0.790    -.0216386    .0283105
gdp_gap_cu~1 |   .0169643   .0164478     1.03   0.307     -.016072    .0500006
   ir_long_1 |   .5622949   .1081096     5.20   0.000     .3451504    .7794395
        mpti |   .0840093   .0986338     0.85   0.398    -.1141025    .2821211
       _cons |   1.444912   1.307937     1.10   0.275    -1.182157    4.071981
-------------+----------------------------------------------------------------
```

20) $MPTI$, $MPTI^2$, whole dataset

```
Fixed-effects (within) regression               Number of obs      =       430
Group variable: country_nu~r                    Number of groups   =        51
R-sq:  within  = 0.3108
                                                F(7,50)            =      7.63
corr(u_i, Xb)  = 0.6467                         Prob > F           =    0.0000
------------------------------------------------------------------------------
             |               Robust
     ir_long |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpi |   2.101504   8.841328     0.24   0.813    -15.65683    19.85983
       cpi_1 |   8.636404   11.63895     0.74   0.462    -14.74111    32.01391
gdp_gap_curr |   .0032105   .0123308     0.26   0.796    -.0215566    .0279775
gdp_gap_cu~1 |    .017311   .0166633     1.04   0.304    -.0161583    .0507802
   ir_long_1 |   .5574087   .1087573     5.13   0.000     .3389634    .7758541
        mpti |  -.1252407   .4197015    -0.30   0.767     -.968236    .7177546
       mpti2 |   .0122932   .0218627     0.56   0.576    -.0316192    .0562057
       _cons |   2.224442    2.32392     0.96   0.343    -2.443288    6.892173
-------------+----------------------------------------------------------------
```

21) $MPTI$, financially good times ($FSI < 0$)

```
Fixed-effects (within) regression               Number of obs      =       152
Group variable: country_nu~r                    Number of groups   =        27
R-sq:  within  = 0.4412
                                                F(6,26)            =     32.17
corr(u_i, Xb)  = 0.2369                         Prob > F           =    0.0000
------------------------------------------------------------------------------
             |               Robust
     ir_long |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpi |   28.62136    5.51346     5.19   0.000     17.28828    39.95444
       cpi_1 |   78.63718   19.24596     4.09   0.000     39.07655    118.1978
gdp_gap_curr |  -.0133603   .0122961    -1.09   0.287    -.0386354    .0119148
gdp_gap_cu~1 |  -.0056023   .0122581    -0.46   0.651    -.0307992    .0195945
   ir_long_1 |   .4536507   .0901881     5.03   0.000     .2682664     .639035
        mpti |   .0848798   .1558905     0.54   0.591    -.2355576    .4053172
       _cons |   .5219381   1.892742     0.28   0.785    -3.368648    4.412524
-------------+----------------------------------------------------------------
```

22) $MPTI$, $MPTI^2$, financially good times ($FSI < 0$)

```
Fixed-effects (within) regression               Number of obs      =       152
Group variable: country_nu~r                    Number of groups   =        27
R-sq:  within  = 0.4616
                                                F(7,26)            =     31.19
corr(u_i, Xb)  = 0.3232                         Prob > F           =    0.0000
------------------------------------------------------------------------------
             |               Robust
     ir_long |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpi |   24.23026   9.216861     2.63   0.014     5.284736    43.17579
       cpi_1 |   78.31163   18.06054     4.34   0.000     41.18766    115.4356
gdp_gap_curr |  -.0103119   .0126781    -0.81   0.423    -.0363721    .0157484
gdp_gap_cu~1 |  -.0050044    .012618    -0.40   0.695     -.030941    .0209321
   ir_long_1 |   .4607588   .0802876     5.74   0.000     .2957253    .6257923
        mpti |   .8395774   .6335621     1.33   0.197    -.4627281    2.141883
       mpti2 |  -.0409096   .0331171    -1.24   0.228    -.1089827    .0271635
       _cons |  -2.653476   3.307553    -0.80   0.430    -9.452249    4.145296
-------------+----------------------------------------------------------------
```

23) $MPTI$, financially bad times ($FSI > 0$)

```
Fixed-effects (within) regression               Number of obs      =        49
Group variable: country_nu~r                    Number of groups   =        26
R-sq:  within  = 0.8244
                                                F(6,25)            =     15.79
corr(u_i, Xb)  = -0.5735                        Prob > F           =    0.0000
------------------------------------------------------------------------------
             |               Robust
     ir_long |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpi |   5.652514   33.31443     0.17   0.867    -62.95985    74.26487
       cpi_1 |   62.62757   28.92859     2.16   0.040      3.04802    122.2071
gdp_gap_curr |  -.0109492   .0136117    -0.80   0.429    -.0389831    .0170847
gdp_gap_cu~1 |   .0083124   .0249223     0.33   0.742     -.043016    .0596409
   ir_long_1 |   .1306505   .1518498     0.86   0.398      -.18209     .443391
        mpti |  -.7350498   .1830992    -4.01   0.000     -1.11215   -.3579499
       _cons |   10.50813   2.762816     3.80   0.001        4.818    16.19825
-------------+----------------------------------------------------------------
```

24) $MPTI$, $MPTI^2$, financially bad times ($FSI > 0$)

```
Fixed-effects (within) regression               Number of obs      =        49
Group variable: country_nu~r                    Number of groups   =        26
R-sq:  within  = 0.8244
                                                F(7,25)            =     41.22
corr(u_i, Xb)  = -0.5734                        Prob > F           =    0.0000
------------------------------------------------------------------------------
             |               Robust
     ir_long |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpi |   5.627023   33.48164     0.17   0.868    -63.32971    74.58376
       cpi_1 |   62.62565   29.26814     2.14   0.042     2.346787    122.9045
gdp_gap_curr |  -.0109453   .0146724    -0.75   0.463    -.0411636     .019273
gdp_gap_cu~1 |   .0083078   .0251606     0.33   0.744    -.0435114    .0601269
   ir_long_1 |   .1306247   .1517789     0.86   0.398    -.1819698    .4432192
        mpti |  -.7340145   .7322691    -1.00   0.326    -2.242151    .7741219
       mpti2 |  -.0000623   .0370919    -0.00   0.999    -.0764545    .0763299
       _cons |   10.50468   4.115639     2.55   0.017     2.028368     18.981
-------------+----------------------------------------------------------------
```