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MASTER THESIS

**Central bank communication on financial
stability**

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Declaration of Authorship

Hereby, I declare that this thesis was compiled independently, using only the listed resources and literature. Further, this thesis was not used to get any other academic degree.

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Prague, May 15, 2012

Signature

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Abstract

This research analyses central bank communication on financial stability. First, most important international comparable features of the communication are identified, such as Financial Stability Reports, Stress tests, Financial soundness indicators, etc. These are then used for the construction of Financial stability transparency index (FST index) for 110 countries from 2000 to 2011.

FST index is used to determine the most important drivers of central bank communication. In particular, the level of transparency towards financial stability depends most on monetary policy transparency, size and development of the economy.

Finally, the impact of financial stability transparency on financial stability is under investigation. Using two proxies for financial stress, for the first time, evidence of the influence of central bank communication on financial soundness was found. It is concluded that the communication still has not reached its steady state and markets have only limited experience using it. However, the communication has a strong potential to influence financial stability in the future.

JEL Classification E6, G1

Keywords Financial Stability, Central bank communication, Financial Stability Reports

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Abstrakt

Práce zkoumá komunikaci centrálních bank ohledně finanční stability. Nejdříve byly identifikovány nejdůležitější prvky a komunikační nástroje jako např. Zprávy o finanční stabilitě, zátěžové testy finančního sektoru, indikátory finanční stability atd. Poté byly vybrané prvky použity pro konstrukci indexu transparentnosti centrálních bank vůči finanční stabilitě (FST index) pro 110 zemí v období 2000 až 2011.

Tento index byl dále využit pro zjištění nejdůležitějších determinant transparentnosti centrálních bank. Z výsledků vyplývá, že transparentnost vůči finanční stabilitě je ovlivněna nejvíce transparentností bank vůči monetární politice, dále velikostí a vyspělostí dané země.

V poslední části práce zkoumá vliv komunikace centrálních bank na finanční stabilitu v dané zemi. Podařilo se ukázat, že komunikace má pozitivní vliv na finanční stabilitu v následujícím roce. Celkově se komunikace hodnotí jako ještě relativně nevyspělá, nicméně s velkým potenciálem ovlivňovat finanční stabilitu v budoucnosti.

Klasifikace JEL	E6, G1
Klíčová slova	Finanční stabilita, Transparentnost centrálních bank, Zprávy o finanční stabilitě
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Acronyms

AE-FSI Advanced countries financial stress index

BoE Bank of England

CB Central Bank

ECB European Central Bank

EM-FSI Emerging countries financial stress index

FE Fixed effects model

FED Federal Reserve

FSI Financial Soundness Indicator

FSOC Financial Stability Oversight Council

FSR Financial Stability Report

FST Financial Stability Transparency

IMF International Monetary Fund

LOLR Lender of last resort

MC Market capitalization

NPL Non-performing loans

SI Financial stress index

RE Random effects model

TL Total loans

WB World Bank

Master Thesis Proposal

Author	Ing. Dan Vaško
Supervisor	Roman Horvath, Ph.D.
Proposed topic	Central bank communication on financial stability

Topic characteristics One of the objectives of central bank (CB) is to maintain financial stability, even though it does not have to be explicitly stated. Publishing of a Financial Stability Review (FSR) can provide the market with important information, increase accountability of the CB and thereby contribute to financial stability. My thesis will focus on the key factors that influence publishing of FSR. In other words, an analysis of which determinants and circumstances made the CB publish this document will be done. In particular, especially the relationship between the level of monetary policy transparency and FSR publication will be researched for the first time.

The output should be the common characteristics of the countries publishing FSR. Further, the relationship of monetary policy transparency and number of indicators published in the FSR will be under investigation. For this purpose, the sample of OECD countries (34) were chosen as they are rather developed and provide all data needed.

Hypotheses

1. Higher level of monetary policy transparency leads to FSR publication
2. Past banking crisis makes the CB focus more on financial stability and publish the FSR
3. Size and openness of the economy (financial industry) can have an impact of the CB's decision whether or not to publish FSR
4. Being member of an economic integration (EU) can be correlated with FSR publishing

5. Higher level of monetary policy transparency will lead to publishing more indicators proposed by IMF in the FSR

Methodology For the estimation of common characteristics of countries publishing FSR, a cross-country probit model will be used. The probit model is a binary response model (endogenous variable is a dummy - either publishing FSR or not). The coefficients from this regression can be interpreted as marginal effects. Further, I will employ some additional OLS regressions to find out the link between monetary policy transparency and the number of indicators published in the particular FSR. For this purpose I will use the monetary policy transparency measures used in Eichengreen (2009) as exogenous variable and the percentage of published indicators by particular country as endogenous variable. The percentage will be expressed from the base of all financial soundness indicators (FSI) proposed by IMF.

Outline

1. Introduction
2. The Role of FSR
3. Factors influencing FSR publishing
4. Relationship between transparency and number of indicators published
5. Conclusion

Core bibliography

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Chapter 1

Introduction

Financial stability has become a key objective for economic policy in the new millennium and especially after the recent global financial crisis. This is so as financial stress causes high costs to the public by incurring a crisis of the real economy or also by the necessity to bail-out some banks. Therefore, there has been an increased incentive to prevent financial instability and avoid prospective costs.

Financial system stability is influenced by two factors: micro- and macro-prudential. The microprudential factors can be thought of as the individual responsibility of each institution participating in the financial market, their attitude to collective responsibility and moral hazard. On the other hand, macroprudential factors are in general reflected in banking regulation and supervision. Banking regulation builds and enforces incorporated rules that the institutions must hold, whereas the role of supervision is to monitor the current condition of individual institutions, financial markets and evaluate possible risks.

According to the current institutional order, quite often, independent authorities are responsible for the supervision of financial markets. However, central banks are also interested in keeping financial stability. This is so because for central bank, financial stability is a necessary assumption for fulfilling other targets given by law (typically price stability). A feasible instrument to strengthen financial soundness ex ante is the communication on financial stability by central bank. This communication should alleviate asymmetric information and co-ordination problems in financial markets.

The objective of this research is to provide a complex evaluation of the central bank communication on financial stability. In particular, a financial stabil-

ity transparency (FST) index will be built. This index will be constructed for 110 countries in the period of 2000-2011. By regressing it on selected variables (such as monetary policy transparency, size and development of the country, membership of the country in EU and OECD and monetary policy regimes), we will try to identify key drivers for the central bank to become transparent. Further, the effect of central bank communication on financial soundness will be under investigation. The assumptions to be confirmed is that FSR publishing and higher level of FST index lead to better financial soundness. For this purpose, two proxies for financial soundness will be used - financial stress index proposed by Cardarelli *et al.* (2009) for advanced countries and by Balakrishnan *et al.* (2009) for emerging countries and a simple ratio of non-performing loans over total loans.

The thesis is structured as follows: Chapter 2 describes the concept of financial stability, role of micro- and macroprudential supervision and discusses the institutional order for the regulation. Further, general features and ways of communication on financial stability by central banks is presented. This chapter is concluded by an overview of current literature about the topic.

Chapter 3 identifies the most important aspects of central bank communication on financial stability, including Financial Stability Reports and uses these for the FST index construction. In second part, statistics, trends and division of the index by multiple criteria are presented.

Chapter 4 researches the key drivers for the central bank to become more transparent by regressing the FST index on selected variables including monetary policy transparency index proposed by Eichengreen & Dincer (2009) and updated for the purpose of this research. Moreover, using the same explanatory variables, another set of models of key drivers for the FSR publishing is conducted.

Chapter 5 presents the analysis of the relationship between FST index and financial soundness, assuming that profound central bank transparency represented by high levels of FST index should lead to higher financial stability. This chapter also discusses drawbacks of the data used and models. Finally, recommendations for future central bank communication on financial stability are proposed. Conclusions are made in the last chapter.

Chapter 2

Financial stability and its communicating

Financial stability itself is a rather vague and general term. The definition of financial stability is important for both better orientation of the market participants in many indicators and increasing accountability of the responsible institution. Schinasi (2011) defines it as maintaining the smooth functioning of financial system and its ability to facilitate and support the efficient functioning and performance of the economy. Also, every central bank uses its own definition. ECB's understanding of financial stability is as follows: "Financial stability is a condition in which the financial system – which comprises financial intermediaries, markets and market infrastructures – is capable of withstanding shocks and unraveling of financial imbalances. This mitigates the likelihood of disruptions in the financial intermediation process that are severe enough to significantly impair the allocation of savings to profitable investment opportunities." Cihak (2006) developed a framework for understanding the terms of stability, fragility and crisis (figure 2.1).

In this simple matrix of combinations of shocks and exposures to the financial system, different levels of threat to the system are shown. The borderline between these situations is not specified, yet, the matrix implies that there must be low exposures and shocks to obtain financial stability.

We suggest that when trying to construct a definition in order to differentiate stability and instability, two dimensions should be taken into account. First, one should measure the condition and importance of the individual financial institutions to draw consequences about possible failures and defaults that could mean a plausible risk for the whole system or even cause a domino

Figure 2.1: Definitions of Financial Stability

		Significant Exposures?	
		Not apparent	Apparent
Significant shocks?	No	Financial stability	Financial stability
	Not now, but plausible	Financial stability	Financial fragility
	Yes	Volatility (turbulences, bubbles)	Financial crisis

Source: Cihak (2006)

effect of defaults. Second, the markets should be evaluated in terms of their ability to allocate the resources in an efficient way.

To maintain financial stability, macroprudential policy is the most important instrument. Born *et al.* (2010) describes its aim as to limit the risk of episodes of financial distress with significant losses in terms of the real output for the economy as a whole. This raises the question which institutions should bear the responsibility and accountability for supervision of financial stability.

2.1 Discussion of institutional order for macroprudential supervision

Financial stability can be considered as a public good which suggests that it should be provided by public sector. Nowadays, in most of countries, this responsibility together with accountability is shared by the central bank (CB), Ministry of finance and other authorities¹.

If the responsibility is fully delegated to some institution, e.g. CB, the whole framework - definition, accountability and evaluation of performance of the institution should be created. However, this is often not the case in reality. The task of CB to keep financial stability is directly incorporated in law only in some countries. It is clear that this leads to harder evaluation of performance of the CBs.

Central bank seems to be in general a suitable candidate for the mandate of macroprudential supervision as it has several useful instruments. It can influence the financial system by different types of communication (ex ante)

¹Central bank is usually playing the most important role. There are also some exceptions, e.g. USA

and it can also react to possible financial instability by providing liquidity to the financial system (ex post). Born *et al.* (2010) mentions that combining financial supervision with monetary policy can lead to synergies and suggests thereby that CB should be in charge of financial stability.

In contrast, we believe that this delegation also has several disadvantages. First, conflict of interest could arise when the central bank wants to tighten monetary policy but it is at the same time worried about the liquidity in financial sector, see Bean (2003). Second, if CB is accountable for keeping financial stability, a failure in this role might cause a severe drop in reputation of the CB which would be harmful for its primary function of keeping low and stable inflation².

Yet, even if it is not explicitly stated in the CB's objectives, the role of keeping financial stability is firmly connected to its remaining functions and therefore, CBs should care about stability of financial industry and foster its soundness since it affects price stability. In particular, direct links are to the functions of banking supervision and regulation, securing smooth payment system and also monetary policy.

Financial sector plays a crucial role in the transmission channels of monetary policy. Any instability leads to decreased ability of the central bank to influence the economy. Severe financial instability also directly harms the economy via contraction of credit and monetary aggregates which might cause liquidity problems resulting in decline of economic activity. Resulting lower demand threatens fulfilling of inflation target. Mishkin (2007) highlights the importance of the stability of the financial sector: "The better the financial system ensures the efficient allocation of resources via different investment opportunities, the more efficiently credit can flow and the more efficiently economy works". Empirical analysis also confirms his statement and shows evidence that central bank reacts to increased financial stress by decreasing interest rate in order to keep the inflation target; the scope of interest rate cutting depends on the particular situation, see Baxa *et al.* (2011).

Further, central bank is responsible for the smooth payment system which would be disrupted in case of financial stress or bankruptcy of several banks. Last but not least, the usage of the lender of last resort role is highly correlated with financial instability. In order to decrease moral hazard, central banks communicate so that the commercial banks would not expect to be bailed-out (even though they will be bailed-out in reality).

²Assuming inflation targeting regime of monetary policy

It is obvious that central bank plays a major role in the supervision of financial stability, still it is not the only institution in charge. Usually, Ministry of Finance and in some cases some other authority closely co-operate. Especially in times of distress, all authorities should follow a predetermined decision making process. However, such framework was explicitly given before the recent global financial crisis just in few countries, Great Britain being one of them (De Haan & Oosterloo (2004)). Both the incorporation in law of accountability for financial stability of the central bank and decision making process in case of financial distress were frequent topics of discussion during and after the financial crisis.

The microprudential approach addresses the role of individual financial institutions. If all of them would behave in a responsible way, the role of macroprudential supervision would not be that important. This shared responsibility for financial stability is increasing with the size of the institution and its importance to the financial sector.

Nevertheless, it can also be the banking regulation that leads to moral hazard on the micro level. Relying on the too-big-to-fail rule or deposit insurance, the institution might take up to much risk leading to significant fragility. Therefore, it is extremely important that the banking regulation would create such rules that would not lead to any distortions and moral hazard on the micro level.

2.2 Communication of central banks on financial stability

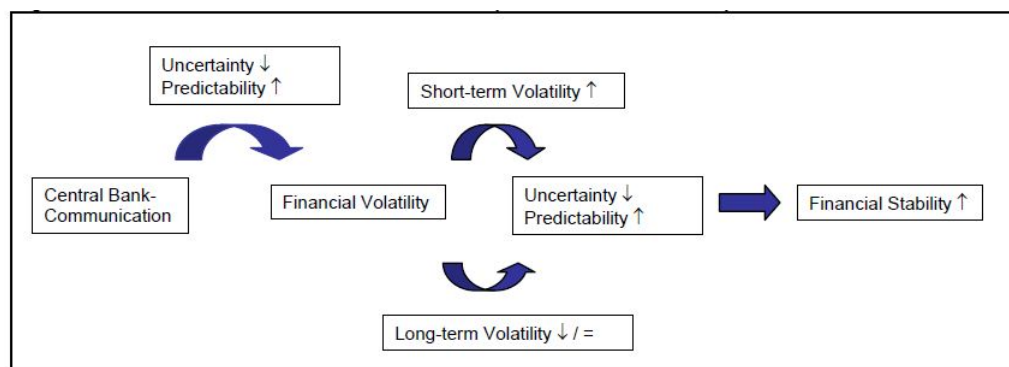
There are several purposes of the communication of central banks on financial stability. The most important aim is accountability since some view central bank lacking democratic elements. Further, it is education and providing information to the financial market and thereby reducing the extent of asymmetric information³ and co-ordination problems⁴. Knutter *et al.* (2011) adds that when financial markets are better informed and more homogeneous in their formation of expectations, a higher degree of transparency can ensure - by reducing uncertainty - a faster adjustment of private sector expectations and hence decrease of financial market volatility. He obviously refers to the

³Asymmetric information might increase the volatility and thus cause instability

⁴One example of co-ordination problems might be a bank run

long-term volatility which is usually associated with financial market instability.

Figure 2.2: Purpose of CB's communication



Source: Knutter *et al.* (2011)

The flow in figure (2.2) shows that central bank's communication helps decreasing uncertainty and increasing predictability⁵ by publishing new information. Decreased long-term volatility of financial markets should *ceteris paribus* mean higher financial stability.

Central bank has many ways of communication, including minutes and voting records, statements and press conferences, speeches and interviews and written reports (Financial Stability Reports); each of them having different purpose and efficiency. Born *et al.* (2010) shows that Financial Stability Reports reduce market volatility whereas speeches and interviews increase volatility during tranquil times but have a substantially larger effect of volatility decreasing during periods of financial stress. This different effects of communication should be reflected in designing the best communication strategy by the central bank.

2.3 Literature review

There have been several reviews of the central bank communication on financial stability. In Sweden, one of the pioneers of FSRs, Andersson (2008) evaluated the factors that made the Riksbank publish the first separate FSR, its improving in quality in time and also impact on financial stability. Knutter *et al.* (2011) researched the impact of central bank communication on financial

⁵Predictability is higher when volatility is lower

stability. In the case of FSRs, he concluded that the publishing moves asset prices, reduces volatility of financial markets and thus contributes to financial stability. Cihak (2006) provides general facts about all FSRs published so far and a general framework for evaluation of quality of these reports.

De Haan & Oosterloo (2007) conducted the first empirical analysis of FSRs, describing the drivers for the central bank to publish this document, analysis of quality of FSRs and their impact on financial soundness. They found that an occurrence of a banking crisis in the past, income per capita and EU membership increased the probability that an FSR is published. However, they were not able to find a strong relationship between the quality of the FSR (measured by how many FSIs are published) and financial soundness.

Krzysztofik-Sotomska & Szczepanska (2006) tried to construct the first financial stability transparency index using a restricted data sample of 35 central banks. However, we believe that the structure of the index is not balanced; some of the variables taken into account are of secondary importance whereas there have been not enough attention devoted to the main communication instrument - FSRs.

This paper will try to develop a broader index of central bank communication on financial stability, identify the key factors that make the central bank transparent and research the effect of the transparency on the financial soundness.

Chapter 3

Financial Stability Transparency index

Choosing the right structure for the transparency index, we considered the variables included in the only FS transparency index built so far by Krzysztofik-Sotomska & Szczepanska (2006). Some of the variables will be used also in our index (the legal dummy whether the goal of financial stability is specified in the central bank acts, the dummy of publishing FSR and the dummy whether financial stability has a separate page on the central bank's website). However, unlike Krzysztofik-Sotomska & Szczepanska (2006), we want to focus rather on the usual communication on financial stability, excluding the times of financial crisis. Thus, we do not include variables like lender of last resort information (LOLR). Instead of that, we focus more on the main communication tool - the FSRs and information published on central banks' websites.

3.1 Financial stability reports

Financial Stability Report (FSR) is part of CB's communication on financial stability and it should contribute to the general function of CB in supervising banks and monitoring the risks. Almost all of the general reasons why to communicate could be also used in the case of an FSR. It should be mainly educating the market participants and contributing to financial stability.

3.1.1 Why to publish an FSR

FSR has two positive externalities on the central bank. The publication has a positive impact on the level of analysis¹ and it might also improve the reputation of the central bank². Besides, FSR also provides useful insights by aggregating a lot of dispersed information which would be otherwise too time-consuming or costly to collect for private sector companies. Further, it decreases speculations about risks that are not present in fact. Another valuable factor for the users of the report is that it does not solely rely on publicly available information, unlike e.g. ratings of banks.³ Born *et al.* (2010) summarizes these arguments by writing that the aim of FSRs is to "create news" and "reduce noise".

Usually, central banks mentions the aim of publishing FSRs in prefaces or introduction of the document. Bank of England characterizes the purpose of its FSR as to identify the major downside risks to the UK financial system and thereby help financial firms, authorities and the wider public in managing and preparing for these risks. Definition of Swedish Riksbank is that: "FSRs present the overall assessment of risks and threats to the financial system and an evaluation of the capacity for coping with them [...] By making the analysis available to financial market participants and other interested parties we can share our viewpoints and contribute to the debate on this subject."

On the other hand, there are several reasons why not to publish an FSR. First, it requires extra resources which mean extra costs. This could be the deciding condition for small or poor countries. Second, it might have some contraproductive effects on financial stability in case of negative signals from the FSR. In such scenario, it could cause liquidity problems and escalate the crisis. Further, some central banks just do not believe that it will have significant contribution to financial stability.

3.1.2 Countries publishing FSRs

First countries to publish FSRs were UK and Nordic countries, especially Sweden and Norway. In 1997, Sweden became the first country that published a

¹If the report is published, it is watched closely and any imprecise or false contents could harm the reputation of central bank

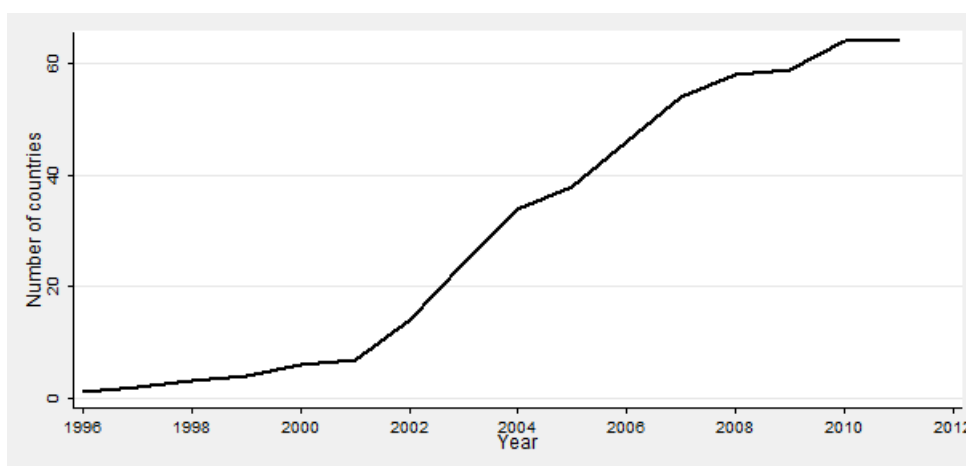
²If the report is positively evaluated, market participants consider the central bank as more trustful and adjust their inflation expectations accordingly

³Ratings also provides information only about individual institutions, not the the financial system

separate document about financial stability, later called FSR. Andersson (2008) identified the main driving point for the FSR publication as the financial crisis from early 1990ies, commenting that it took several years to prepare it. Similar pattern can be seen in the case of UK, where the FSR could have been a reaction on financial turmoil and recession from 1990-92.

In the last 15 years, especially after year 2000, there was a rapid growth of countries publishing FSRs. In 2011, according to our research, 64 countries were publishing FSRs.

Figure 3.1: Growing number of countries publishing FSR in time, source: own data collection



In figure 3.1, we can see that the rapid growth after new millennium is slowing down in the recent years. Table A.1 shows the whole list of countries that publish FSR or did publish it in the past. Out of 30 OECD countries, only Ireland, Greece and USA do not publish FSRs. On the examples of Ireland and Greece, it looks like that if the country has severe instability of financial system, it rather stops publishing the FSR not to worsen the crisis by a negative assessment. Cihak (2006) confirms this phenomenon by stating that most of the overall assessments in recent FSRs have been positive (96% of FSR assess the financial sector as "in good shape", "solid shape", or "improving"). It evokes the idea that countries having instability in financial sector tend not to publish an FSR ⁴.

In the case of USA, it is given by institutional order. FED is not responsible for financial stability, therefore it does not communicate on it at all. This role is delegated to Financial Stability Oversight Council (FSOC) working under

⁴Or at least they do not publish it temporarily in times of financial turmoil, e.g. Ireland

the Treasury. It also publishes an annual report with almost identical contents as FSRs. However, this report is not taken into account in our research as we focus on central bank communication on financial stability.

3.1.3 Evaluating the quality of FSRs

Financial stability report is for the purpose of the analysis of this paper defined as a separate document published regularly by central bank⁵. It may have different names (Financial Stability Report, Financial Stability Review, Financial Market Report etc.), but it has to deal with financial stability. Some central banks publish other documents with one chapter devoted to financial stability. This type of communication is considered to be insufficient as it does not have the needed structure and content.

We can identify some good practices in the structure and contents of FSRs. Usually, the report starts with summary of the general assessment of stability and potential risks, continues with the core analytical part which covers macroeconomic environment and risks and contains also information about various type of institution (such as deposit takers) and markets important for financial stability. Some FSRs publish also selected articles about financial stability. There are some CBs that cover only the analytical part (e.g. Norway), some publish only articles (e.g. France). However, most of the CBs are somewhere in between but closer to the analytical approach. Typically, the central bank started with an FSR covering just the banking sector and later on added also the analysis of non-bank financial sector, real estates, corporates and households.

As for the analytical part, there can be three types of indicators in the FSR: soundness indicators, stress tests and market based indicators. Using these indicators, the report should cover all possible risk (credit risk, contagion risk, interest rate risk, liquidity risk, exchange rate risk, payment and settlement risk).

The soundness indicators are a set of macro-prudential indicators, describing financial health of the system by aggregating indicators from individual financial institutions. Usually, the set of financial soundness indicators proposed by the IMF is used.

⁵Other types of documents published by global institutions (IMF) or private sector trying to describe financial stability are not considered in this paper.

There is an increasing number of countries publishing also a stress test in the FSRs.

Figure 3.2: Growing number of countries publishing Stress tests, FSIs and FSRs in time, source: own data collection

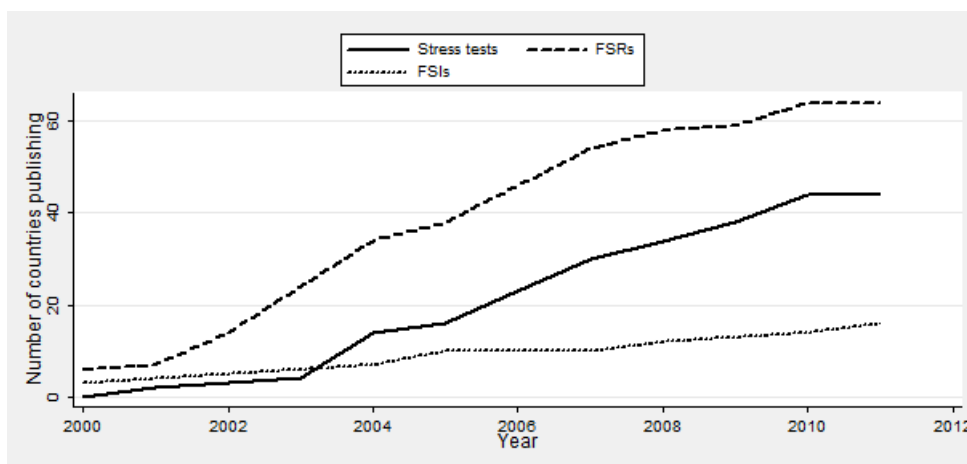


Figure 3.2 shows the development in time of countries publishing FSR, their own stress test and FSIs. Stress tests are usually conducted for credit risk, interest rate risk, exchange rate risk, sometimes also for equity price risk⁶. Nevertheless, the tests focus more on solvency issues than on liquidity problems. From our point of view, lack of liquidity should be considered a more serious threat, especially in times when banks have to adjust their ratios and develop capital buffers according to new Basel III rules. We suggest that in the future, more countries should perform and publish a contagion analysis, ideally based on the net uncollateralized interbank exposures as the financial system is globalized and most of shocks are coming from abroad.

The third group, market based indicators, should provide information about condition of individual banks. Its advantage is the ability of early warning. This group comprises especially relative stock market prices of financial institutions, volatility in share prices, distance to default, probability of default, distance to insolvency and ratings. On top of that, sometimes, the prices of bonds and options are watched too as they carry important information about the expectations of market participants. Rarely, the central banks publish also early warning system. Example of such system could be found in the FSR published by Deutsche Bundesbank.

Generally speaking, the quality of FSRs can be evaluated from three points of view - clarity, consistency and coverage (Cihak (2006)). It would be ex-

⁶The computation is based on the sensitivity analysis of the interbank market exposures.

tremely hard to develop a fair framework for measuring the clarity and consistency of the FSRs. Further, it would be also very time consuming with a low value added. Therefore, we decided to focus only on the main important element - the coverage of the FSRs.

3.2 Building the FST index

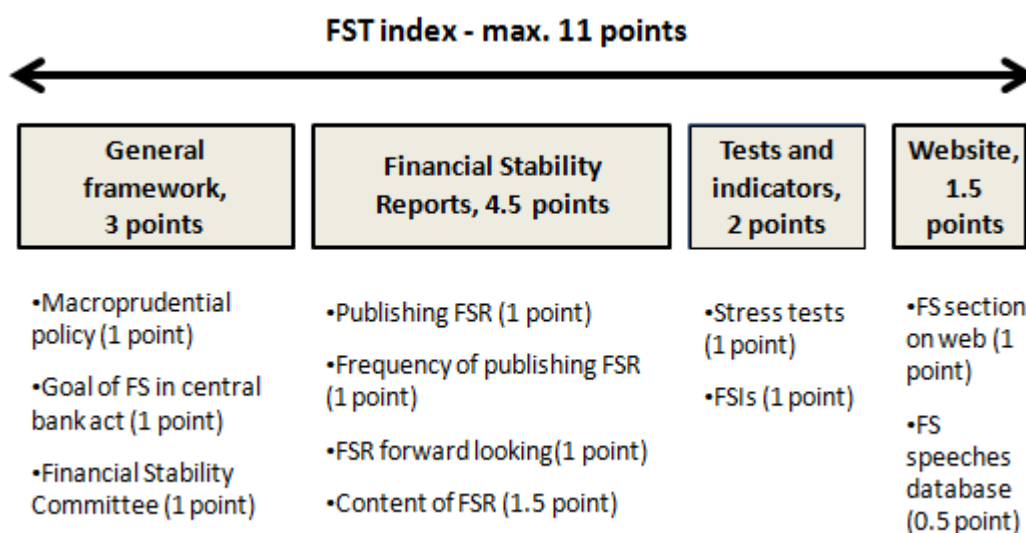
The newly constructed Financial Stability Transparency index will be the sum of following (number of points granted for each category are in parenthesis):

1. Macroprudential policy transparency (0 - not described, 1/2 general strategy and co-operation described, 1 - detailed policy and crisis management description)
2. FSR publishing (0 - not publishing, 1 - publishing)
3. Frequency of publishing FSR (0 - not publishing, 1/2 publishing annually, 1 - publishing semi-annually)
4. FSR forward looking (0 - not forward looking, 1 - includes outlooks, forecasts of risks)
5. Coverage of FSR (in total max. 1.5 points)
 - Macroeconomic environment and its risks (1/2 if included)
 - Deposit takers information and its risks (1/2 if included)
 - Other subjects or markets information and risks (1/2 if included)
6. Dummy variable whether the goal of financial stability is explicitly stated in central bank act (0 - not stated, 1 - explicitly stated)
7. Stress test publishing (0 - stress test not published, 1/2 published annually, 1 - published more often)
8. FSIs publishing (0 - not published, 1/2 - core set of FSIs published, 1 - both core and encouraged set published)
9. Having a Financial Stability (Policy) Committee (0 - no committee, 1 - committee with regular meetings and clear strategy)
10. Separate section on financial stability on the central bank's website (0 - no separate page (section) on web, 1 - separate page on web)

11. Separate section (database) on speeches about financial stability (0 - not separate section, 1/2 separate section)

Graphically, the construction of the FST index can be summed up by the figure 3.3.

Figure 3.3: FST construction scheme, source: own scheme



Macroprudential policy transparency was regarded as the information about macroprudential policy and central bank's role on the central bank's website. If such policy was described on the central bank's website, the particular country earned 0.5 points. To earn 1 point, the policy had to contain information about crisis management with precise roles of all participating institutions. The score of the countries was very low with an average of 0.17 in 2011.

The most important component in our transparency index are the Financial stability reports (items 2-5). We are aware of the fact that countries publishing FSR get automatically some points on the other three variables (frequency, forward looking FSR, coverage). However, we consider the fact of publishing an FSR as the most important in central bank communication on financial stability and thus the weights appropriate. The country can earn on the FSR a maximum of 4.5 points (almost half of the maximum total score)⁷.

Regarding the frequency of publishing (item 3), there have been some exceptions that the report was published more often than two times a year. In this

⁷Stress test and FSIs can and sometimes are published separately, not just in the FSRs, therefore the points are not considered to be connected with FSRs.

case, central banks scored also 1 point as we do not consider this to be such advantage and the reports were usually more concise. As for the forward looking feature of the report (item 4), the country scored one point only in case it has forecasts about the most important risks towards financial stability. Coverage of FSRs (item 5) was evaluated only according to the contents of the particular report. Half points were awarded if the FSR contained separate chapter about macroeconomic environment and risks, deposit takers information and its risks and other subjects information and its risks (such as households, corporates etc.). In total, 64 countries published FSRs in 2011, out of which 31 countries published FSRs annually and 33 semi-annually or more often. The average score in 2011 for the contents of the report was 0.72 out of 1.5 points maximum.

Further, as for goal of financial stability in central bank act (item 6) - country was given one point only in the case that it was clearly stated in such way that the central bank was made responsible and therefore accountable. Surprisingly, 48 countries fulfilled this criterion in 2011.

Stress tests (item 7) are considered to be a supplement to the FSIs, showing the resilience of the financial sector to possible risks. Publishing the stress tests and usually using more scenarios, the central bank passes over useful information to the markets based on which they can elaborate their own risk models and adjust their portfolios. 33 countries scored one point in 2011 by publishing their own stress test.

Financial soundness indicators (item 8) are more a measure of financial health than financial stability. Although it does not contain any information about risks to the system, we consider its publishing as important due to the fact that it is a unique standardised measure of current condition of the financial institutions. On the other hand, De Haan & Oosterloo (2007) use solely the FSIs for the evaluation of the quality of individual FSRs. We argue that this approach results in imprecise results as the FSIs contain just a part of the information about financial stability and therefore are not suitable measures. There are more sets of indicators, we will use the range of techniques proposed by IMF for macroprudential analysis of financial stability⁸. There are two groups of indicators in the IMF set. The core set which was awarded by half point when published and encouraged set was awarded by additional half point. Only 12 countries published the core set in 2011, half of them published also the encourage set on the central bank website.

⁸One of possible alternatives are the macro-prudential indicators set up by the ESCB

Having a stand-alone financial stability committee (item 9) is of significant importance as we believe that it will continuously develop the whole system of financial system supervision and communication. Further, such committee could evolve increased trustworthiness of the markets in central bank. However, we have to state that only UK, Ireland and Portugal scored in this criterion by having a separate committee with regular meetings. On top of that, only the financial stability committee in UK seems to be well-functional and a contribution to the regulation system.

Including the dummy of separate page on website devoted to financial stability (item 10), the central bank provides general information about the importance of keeping financial stability, writes about its attitude to financial stability and places there reports. Last but not least, the legal dummy is a pledge of the central bank and therefore works as an indicator of the commitment towards financial stability. Even though this seems to be a very simple task for the central banks, only 38 countries have such section on their web-pages.

Last but not least, it is very useful for the user when the central bank has a database of speeches (item 11) divided according to topic, including financial stability. Such section earned the country half point. However the effect of this criterion was almost negligible on the FST index as only 5 countries earned the half point.

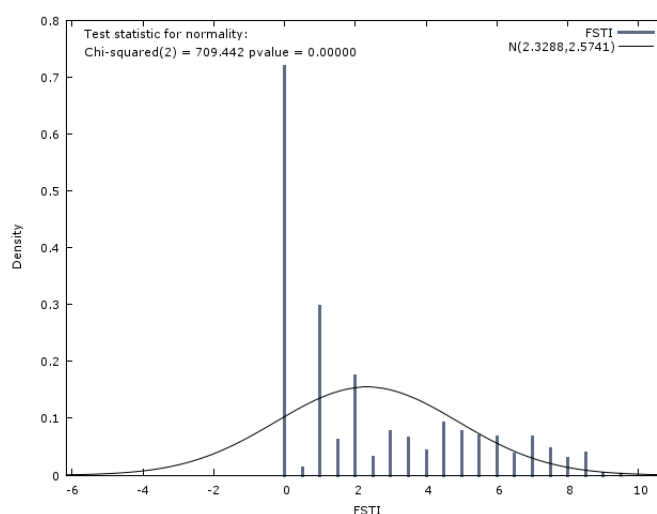
3.3 Data used and results

In the selection of countries, we were restricted by the data in Eichengreen & Dincer (2009) as we want to research the correlation between monetary policy transparency and financial stability transparency. Therefore, we collected the data for the same 110 countries as Eichengreen for the period from 2000 to 2011, forming a panel. Having collected the data, we built the FST index as described in 3.2.

Complete results (values of index for all countries over whole time period) can be found in appendix B. Summary statistics and the distribution of the FST index are presented below. It can be seen, that on average, the FST index is very low. The statistic has also pretty high variance (resp. standard deviation) which means that there are big differences in the central bank communication on financial stability. The high frequency of no communication of central bank on financial stability should be also noticed (usually in developing countries).

Summary Statistics of FST index			
Mean	Median	Minimum	Maximum
2.32879	1.00000	0.000000	9.50000
Std. Dev.	C.V.	Skewness	Ex. kurtosis
2.57412	1.10535	0.875502	-0.506386

Figure 3.4: FST Index distribution, source: own data collection



3.3.1 Statistics of FST index

There are several important findings when looking at the trends of the FST index. First, as we can see in figure 3.5, there is a steady growth from the beginning of the millennium, almost from zero level. Thus, it is clear that communication on financial stability is a new phenomenon rising on importance in the last decade. Further, one should notice that even the global financial crisis did not have any significant impact on the steady growth of transparency of central banks on financial stability.

Figure 3.6 shows the Kernel density (distribution) of the FST index. In 2000, there were only few countries with an elaborated communication strategy. There is a trend which shapes two groups of countries (visible in 2010) - countries not considering communication of financial stability important or those that do not have resources needed (mostly emerging countries) and countries with a developed communication strategy (mostly OECD countries).

Comparing the world average in figure 3.5 with the averages in time for groups of countries in figure 3.7, we can see an accelerated growth in the years

Figure 3.5: FST Index average, time series, source: own calculation

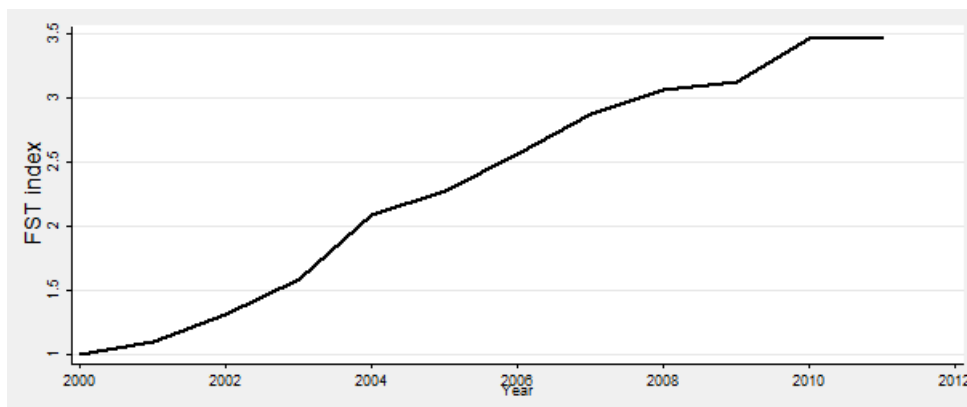
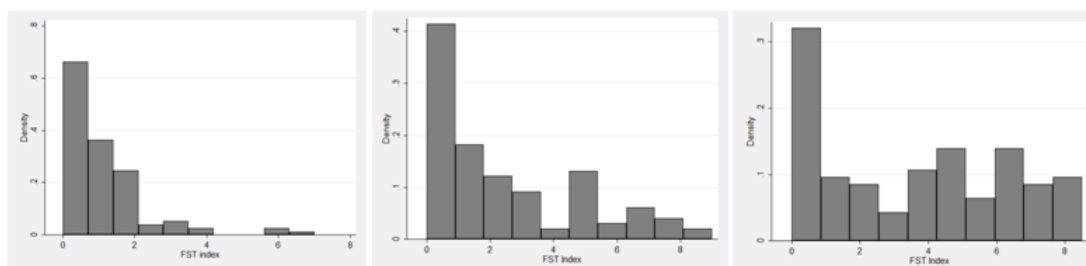


Figure 3.6: FST Index distribution 2000,2005,2010, source: own calculation



2002-2004 for all EU, OECD and inflation targeting countries⁹. However, it seems that the growth is saturated now as there was almost no growth in the index in 2011 in either of the groups. Naturally, the levels of the index for the EU, OECD and inflation targeting countries are higher than the world average¹⁰.

The regional analysis of the FST index is depicted in figure 3.8. Surprisingly, the index level is higher for all european countries than for eurozone countries, which implies higher transparency of european countries with their own currency. Still, by far, Europe is the leader in communication on financial stability. Africa is on the opposite side, but was catching up the rest of the world in the years of financial crisis.

When researching the impact of the legal origin on the FST index, we noticed the leading position of countries with Nordic legal origin (table 3.1)¹¹.

⁹There is a significant overlap between these groups - many countries are included in two or even all three groups, which contributes to the similarity of the growth trend

¹⁰The impact of membership in these groups on the index level will be tested in chapter 4

¹¹This statistics might not be very robust as there are only five countries with this legal origin

Figure 3.7: FST Index average OECD, EU and non-OECD countries, time series, source: own calculation

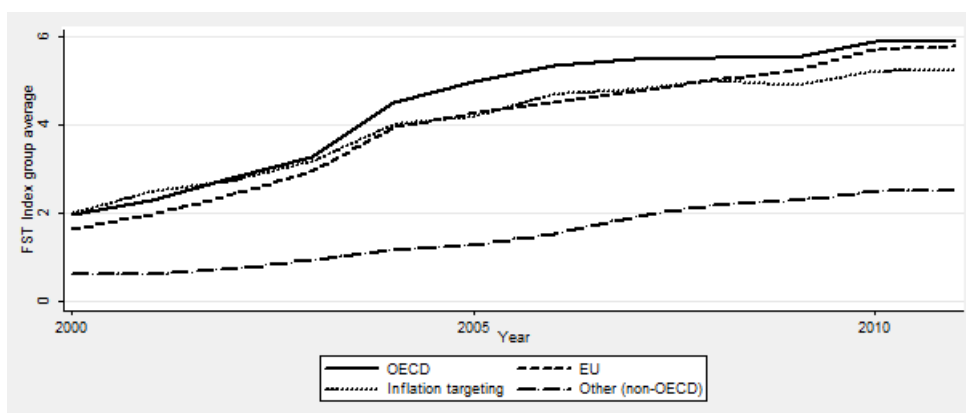
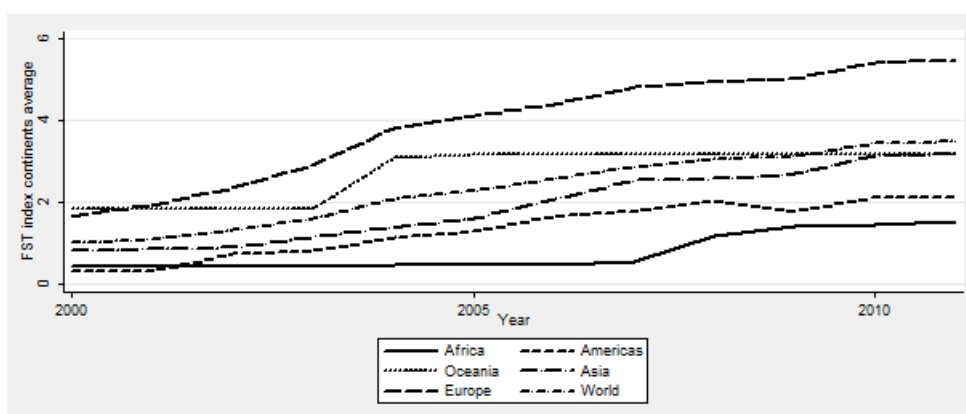


Figure 3.8: FST Index regional analysis, time series, source: own calculation



Further, a significant positive impact of the German legal origin on the central bank communication on financial stability is shown.

Table 3.1: FST index 2011 average according to legal origin, source: own calculation

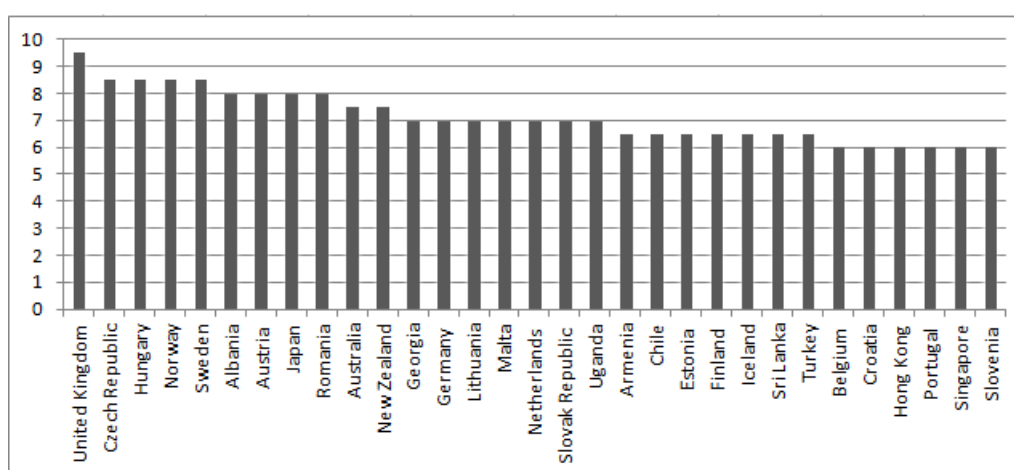
	French	German	English	Nordic	Socialist
FST index	2.04	4.35	2.02	5.87	2.67

A complete ordered overview of FST index leaders is presented in figure 3.9. The strong position of European countries should be noticed. Beside that, it can be seen that the pioneers of FSRs (UK, Sweden, Norway) are on top of the transparency ranking. This is probably not a coincidence as the development of the communication takes a pretty long time - therefore countries that started first have certain advantage.

United Kingdom is according to our research the most transparent country.

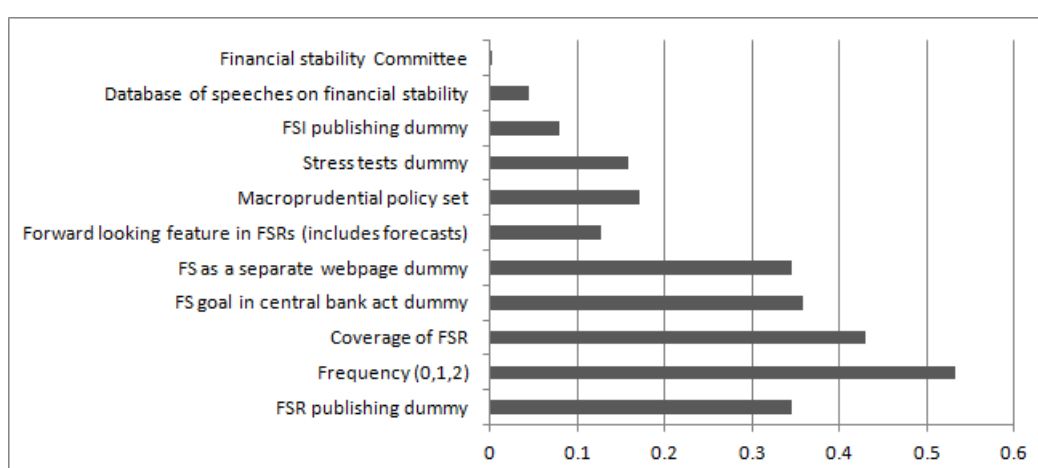
Out of all criteria in the FST index construction, it lacks only publishing of FSIs and a separate database of FS related speeches. It is followed by central Europe countries (Czech Republic and Hungary) and northern Europe countries (Sweden, Norway). Surprisingly, there are also several developing countries such as Albania, Georgia, Uganda, Armenia and Sri Lanka in the top 30 of most transparent countries.

Figure 3.9: Overview of countries with highest FST index



Note: In USA, FED is not responsible maintaining financial stability, Buitier (2012), therefore it has scored zero points

Figure 3.10: Overview of average scores on FST index components



Finally, we performed an analysis of how did the countries score in the individual components of the FST index. Results are shown in figure 3.10. Average scores of the 1320 observations are depicted - all 110 countries from 2000 to

2011, maximum of all variables is 1, except from contents of FSRs with maximum of 1,5.

UK, Ireland and Portugal are the only countries with an established Financial Stability Committee. Further, the countries lack a separate database of speeches on financial stability and usually do not publish FSIs (only in less than 10% of the observations). Significant improvements could be also made in the macroprudential policy setting and communicating, stress test publishing and including forecasts in FSRs.

Chapter 4

Factors influencing communication on financial stability

In this chapter, we will investigate the drivers for the central bank to communicate on financial stability. De Haan & Oosterloo (2007) was researching the factors that make the CB publish an FSR and concluded that an occurrence of a banking crisis in the past, higher income per capita and EU membership increase the likelihood of the FSR being published.

We will use a broader set of regressors. In particular, we will add monetary policy transparency, assuming that a well established strategy on communicating on monetary policy can lead to increased communication on financial stability. In this respect, Born *et al.* (2010) adds that it might not be a coincidence that the frontrunners of FSRs - BoE, Swedish Riksbank and Norges Bank are also listed in the group of the most transparent central banks as for monetary policy issues. Further, as a proxy of the importance of the financial sector in the economy, we use ratio of market capitalization on GDP published by World Bank. Clearly, our assumption is that the higher this ratio (higher the importance of the financial sector), the higher the FST index. We also expect a relation between FST index and the broad financial stress index proposed by Balakrishnan *et al.* (2009), described in section 4.1. Lag of this stress index will be used in the model (we assume that the reaction of central bank in the form of communication is delayed). Beside that, we add more general variables to find out the common characteristics of several group of countries (EU, OECD, inflation targeting countries) and also the relation between FST index and size of the economy (measured by GDP) and development (GDP p.c.).

Therefore, in our model, following explanatory variables were included:

- Monetary policy transparency, as developed by Eichengreen & Dincer (2007), updates for 2007-2011 were done by us according to their methodology; described in section 4.2
- GDP (size of the economy)
- GDP per capita (development of the economy)
- EU membership or candidacy dummy
- OECD membership dummy
- Inflation targeting regime dummy
- Stock market capitalization on GDP (importance of financial sector)
- Financial Stress (measured by Financial stress index described in section 4.1)

4.1 Introducing financial stress index

The financial stress index was proposed by Cardarelli *et al.* (2009) for advanced countries and by Balakrishnan *et al.* (2009) for emerging countries. Advanced countries financial stress index (AE-FSI) comprises seven variables that reflect the stress in three financial market sectors: banking, securities markets and exchange market. The overall index is a sum of the following seven components:

- Banking sector beta (standard beta from capital asset pricing model)
- TED spread (3-month LIBOR minus the government short term rate)
- Inverted term spread (government short term rate minus government long term rate)
- Corporate debt spreads (corporate bond yields minus long term government bond yields)
- Stock market change (month-over-month change multiplied by minus one¹)

¹Decrease in equity prices corresponds with increase in financial stress

- Stock market volatility (6 month moving average of the squared month-on-month returns)
- Exchange market volatility (6 month moving average of the squared month-on-month growth rate of the exchange rate)

The seven sub-indices are standardized², therefore positive values are values above average. In the overall AE-FSI index, positive values imply certain stress in financial sector and values greater than 1 (one standard deviation from average conditions) were connected with a crisis in the past.

The emerging countries financial stress index (EM-FSI) is constructed in the same way with the only difference in its components. These five sub-indices are adjusted to characterize better the financial strain in emerging countries:

- Banking sector beta (standard capital asset pricing model beta)
- Stock market return (year-over-year change multiplied by minus one)
- Stock market volatility (6 month moving average of the squared month-on-month returns)
- Sovereign debt spread (bond yield minus the 10-year US Treasury yield)
- Exchange rate market pressure index (captures exchange rate depreciations and declines in international reserves)

Stress index is available for 43 countries (17 advanced and 26 emerging countries) until 2009. Usually, the index values are balanced, sometimes positive, sometimes negative. However, during the years of global financial crisis, the values in advanced countries were far above one, sometimes reaching also double digit numbers.

4.2 Monetary policy transparency and its relation to financial stability transparency

Before modeling all factors influencing FST index, we would like to draw special attention to the relation of monetary policy transparency and financial stability transparency. As already mentioned, we use the monetary policy

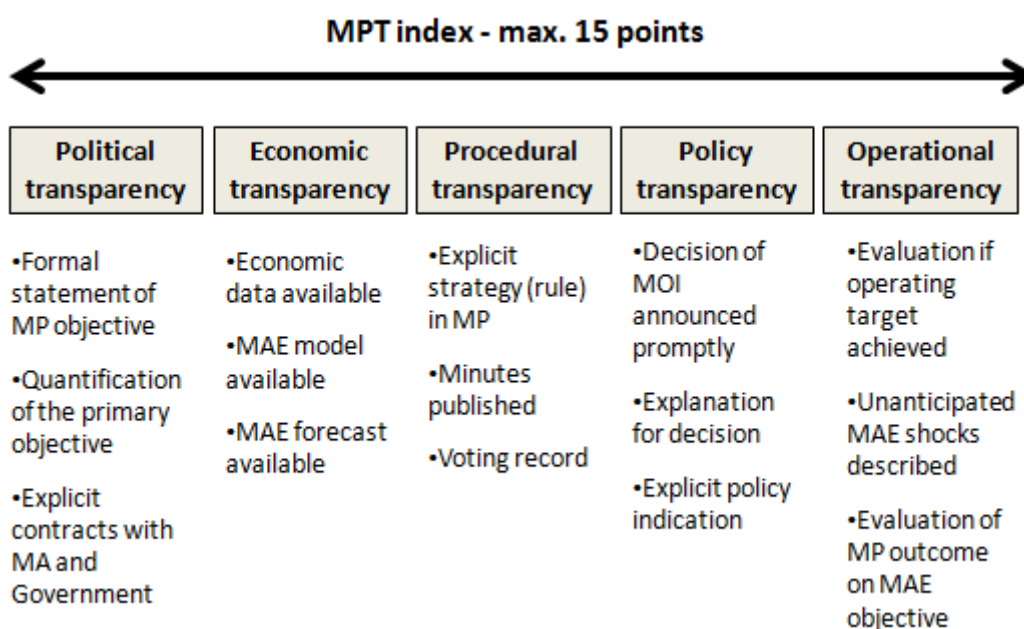
²Demeaned and divided by standard deviation

transparency index (MPT index) from Eichengreen & Dincer (2009). However, this index was available only until 2006. Therefore, we used the same methodology and constructed this index for the same country sample for 2007-2011. Overview of the original data from Eichengreen & Dincer (2009) and our updates are presented in appendix B. We devote the following subsection to explain the basic methodology of MPT index construction and describe its statistics.

4.2.1 Introducing monetary policy transparency index

Monetary policy transparency is of great importance for the central bank, especially in the regime of inflation targeting. High level of transparency should contribute in a large amount to policy credibility. Further, Eichengreen & Dincer (2009) argues that it also enhances the effectiveness of monetary policy. The index developed by Eichengreen & Dincer (2007) serves as an international comparison of central banks transparency on monetary policy. Figure 4.1 reveals the construction of the index.

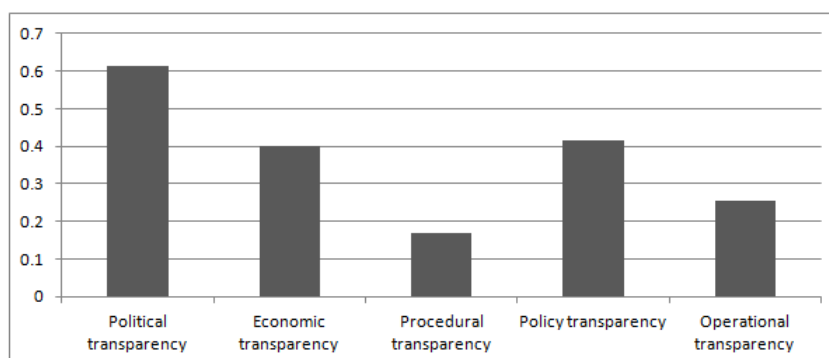
Figure 4.1: MPT index construction: Eichengreen & Dincer (2009), own scheme



There are five core components, each of them divided into three elements. Political transparency shows openness about institutional order, accountability,

objectives and their prioritization. Economic transparency refers to the data and models that are published and connected to monetary policy. Procedural transparency measures how much information is published about the monetary policy decision during the whole process. Policy transparency, probably the most important component, focuses on the decisions, their implications and actions taken by the central bank. Operational transparency measures the openness about the bank's evaluation of past monetary policy and errors and also the holistic outcome of monetary policy. Detailed description of the individual elements is presented in Eichengreen & Dincer (2009). Figure 4.2 shows the average score in time of all 110 countries in the above mentioned components. As we can see, countries are pretty transparent about the institutional order and objectives (political transparency) as well as in the case of decisions (policy transparency). On the other hand, on average, central banks do not like to make the decision making process public.

Figure 4.2: MPT index scores by category: Eichengreen & Dincer (2009) and own updates

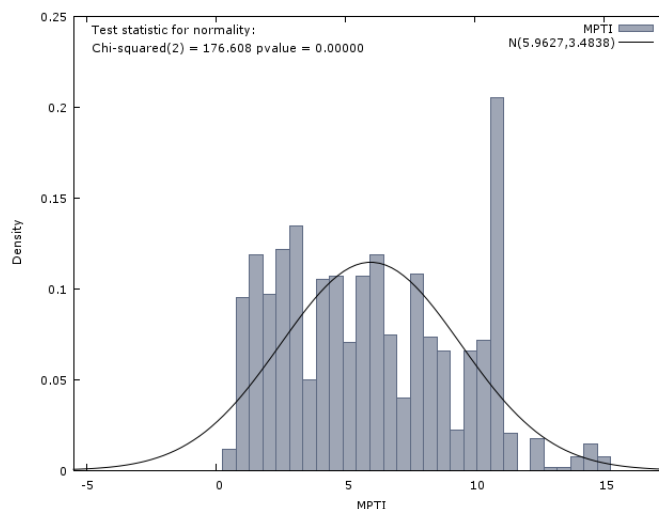


Summary statistics and distribution of the MPT index (figure 4.3) are shown below. Very high frequency of the value 11 in MPT index is because this is the value for all eurozone countries.

Summary Statistics of MPT index			
Mean	Median	Minimum	Maximum
5.96273	5.50000	0.500000	15.0000
Std. Dev.	C.V.	Skewness	Ex. kurtosis
3.48380	0.584263	0.358745	-0.956704

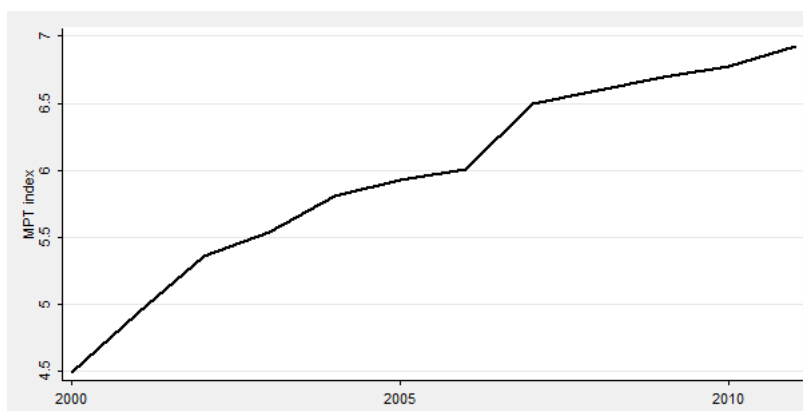
Regarding the development in time, Eichengreen & Dincer (2009) states that there have been a significant movement towards greater transparency,

Figure 4.3: MPT Index distribution, source of data: Eichengreen & Dincer (2009) and own updates



transparent policy arrangements being likely in countries with strong institutions. Figure 4.4 shows the development of the index average from 2000 till 2011. Continuing steady increase with acceleration right before the global crisis can be seen. This increase is nowadays driven more by developing countries as the monetary policy transparency in the developed countries seems to be decelerating in the last years.

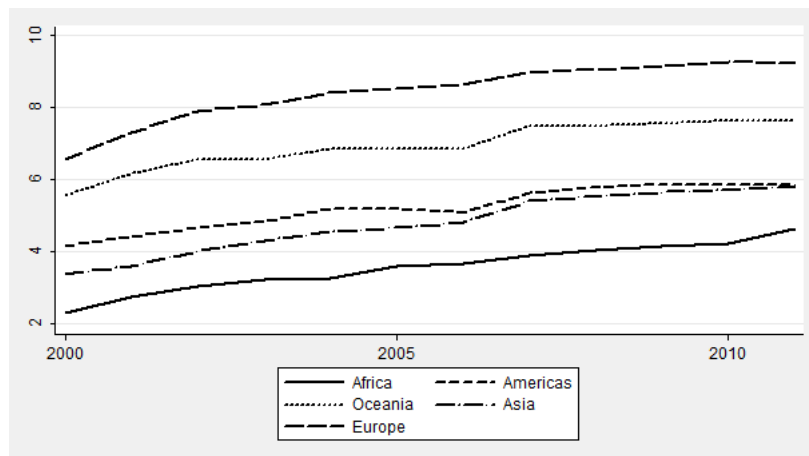
Figure 4.4: MPT index development in time: Eichengreen & Dincer (2009) and own updates



Differences in the developments in time between continents are presented in figure 4.5. In most of the continents, growth of index is slowing down in the last years. The only exception in this trend is Africa with accelerated growth since 2010. As in the case of FST index, Europe is most transparent.

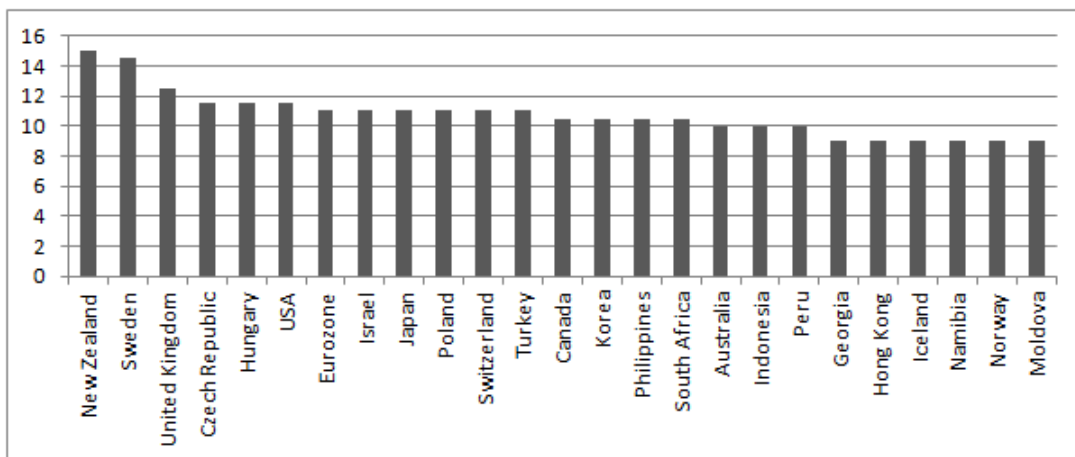
Regarding the MPT leaders (figure 4.6), there are most of the countries as

Figure 4.5: MPT index development in time by continents: Eichen-
green & Dincer (2009) and own updates



in the case of FST index on the top (Sweden, UK, Czech Republic, Hungary). FED is quite transparent with the overall score of 11.5, followed by European central bank with the index value of 11. The score of European central bank will be used for each Eurozone member in our analysis to compare with the national level of transparency on financial stability.

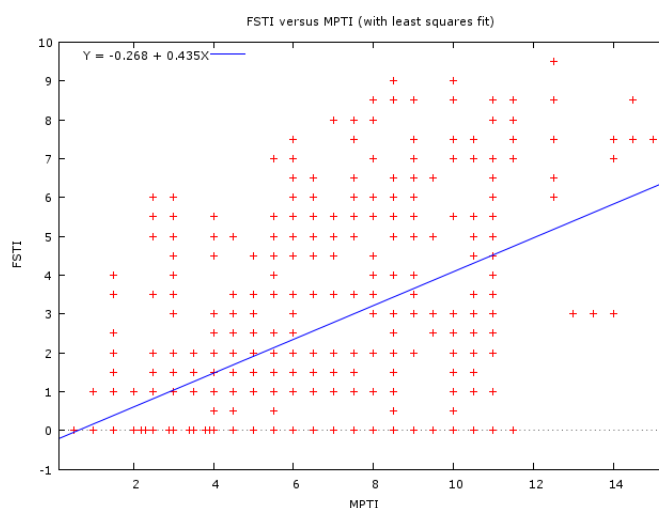
Figure 4.6: MPT index leaders in 2011: Eichengreen & Dincer (2009)
and own updates



4.2.2 Relation of monetary policy transparency and financial stability transparency

Correlation of the MPT index and FST index is 0.5893. As expected it is a rather high positive number. The causality of this relation not straightforward. However, it is expected that both values are driven by same variables (mostly variables that we include in our model when determining drivers for FST index) and also the overall quality of the central bank. The relation of these two indices is also depicted in figure 4.7.

Figure 4.7: Relation of MPT and FST index, source of data: Eichen-green & Dincer (2009) and own collection



It can be seen that for low values of FST index, MPT index is very volatile (from 0 to 12). However, high values of FST index are connected with high values of MPT index (banks with FST index higher than 8 have MPT index in the range between 7 and 15). This might be related to the development of transparency in central banks. Usually, the bank starts with low MPT and FST indices. Over time, MPT index is increasing first (as central banks often consider communication on monetary policy as more important). Once it reaches certain level, central bank also focuses on the communication on financial stability.

4.3 Modeling factors influencing FST index

Finally, the drivers of FST index will be modeled. All the variables mentioned in chapter 4 were used and positive relations are expected (with the

exception of financial stress index, where higher values mean lower stability). As our data set is a panel, we have to consider both random effects (GLS) and fixed effects models. The decision which model is more precise will be done according to Hausman test. Null hypothesis of the test is that GLS (random effects) are consistent. Scheme 4.8 shows the possible outcomes of the test.

Figure 4.8: Hausman test outcomes, source: own scheme

	H ₀	H ₁
RE (GLS)	Consistent and efficient estimator	Inconsistent estimator
FE	Consistent and inefficient estimator	Consistent and inefficient estimator

The p-value of Hausman test was very low in all cases - GLS estimates (random effects) are inconsistent. Therefore, we decided to present only fixed effects models.

Table 4.1: Factor determining FST index, fixed effects

Expl. var.	(I)	(II)	(III)	(IV)
FST index				
MPT index	0,57*** (-11, 16)	0,64*** (15, 58)	0,47*** (6, 7)	0,46*** (6, 24)
GDP p.c.	0,068*** (16, 03)	0,06*** (9, 30)	0,08*** (7, 45)	0,08*** (7, 43)
GDP	0,0002* (1, 76)	0,0002 (1, 32)	0,0002 (1, 13)	-0,0002*** (1, 13)
MC/GDP		0,0005 (0, 56)	0,004 (1, 56)	0,004 (1, 56)
FS _{t-1}			-0,01 (-0, 42)	-0,01 (-0, 40)
OECD				0,016 (0, 02)
IT				0,1 (0, 17)
Obs.	1186	955	386	386
R ² _{adj.}	0,78	0,78	0,78	0,84
FE test p-v.	2,23e - 214	5,48e - 178	1,11e - 093	3,03e - 088

Note: t-statistics are shown in parentheses; *** significant at 1% level, ** at 5% level, * at 1% level

In table 4.1, we can see four scenarios of the estimation of FST drivers. In all cases, EU variable was omitted due to exact collinearity (probably too high correlation with OECD and inflation targeting dummy). The null hypothesis of common intercepts in all three scenarios in the fixed effects test was strongly rejected, which was in line with our expectations that there will be different intercepts for the 110 countries and that fixed effects is an appropriate model. Further, all scenarios have a quite high R squared adjusted which implies a good quality of the models. Therefore, we choose the simplest model - scenario (I) as the best model to describe the factors influencing FST index. The regression equation of the model is presented below.

$$\widehat{\text{FSTI}} = -2.20511 + 0.570782 \text{MPTI} + 0.0683258 \text{GDP_PC} + 0.000235717 \text{GDP}$$

$$\begin{matrix} (0.19758) & (0.035602) & (0.0064719) & (0.00013385) \end{matrix}$$

$$T = 1186 \quad \bar{R}^2 = 0.7891 \quad F(112, 1073) = 40.591 \quad \hat{\sigma} = 1.1531$$

(standard errors in parentheses)

The equation implies that on average, an increase of one point in MPT index causes an increase of 0,57 in the FST index, growth of GDP p.c. by 1000 USD means increase in FST index by 0,06 and finally growth of GDP by 1 billion USD causes increase in the FST by 0,0002 (resp. 1 trillion USD growth results into increase in FST index by 0,2).

In addition, one year lags of all explanatory variables can be considered. This might be more realistic as the central bank communication could be thought of as the result of the combination of the factors (variables) from the past. It is obvious that the decision making process about the publication of individual elements of the FST index takes some time. We consider one year to be the most accurate estimate of this lag. The very same regressions with all one year lagged variables are presented in table 4.2.

It can be seen that the one year lagged variables explain better the FST index (higher R sq. adj.). This time, also the OECD dummy was omitted due to exact collinearity. Further, in this case, one should note that the lagged financial soundness is significant, meaning that lower stability of financial sector (higher values) in the past leads to lower transparency of central bank towards financial stability in the consecutive year. This is out of line with our assumption about the relation and should be regarded more as an side effect caused by the fact that usually in developing countries, both financial soundness and FST

Table 4.2: Factor determining FST index, Fixed effects, one year lags

Expl. var.	(I)	(II)	(III)
FST index			
MPT index t-1	0,43*** (7,28)	0,47*** (7,34)	0,46*** (7,0)
GDP p.c. t-1	0,072*** (6,77)	0,072*** (6,73)	0,07*** (6,09)
GDP t-1			0,0002 (1,047)
MC/GDP t-1			9,9e-05 (0,04)
FS t-1	(-0,06)* (-1,89)	(-0,06)** (-2,05)	-0,06*** (-1,98)
OECD t-1	-	-	-
IT t-1		(-0.65) (-1,60)	(-0.63) (-1,53)
Obs.	387	387	387
R ² adj.	0,84	0,84	0,84
FE test p-v.	2,73e-99	1,33e-097	7,26e-088

Note: t-statistics are shown in parentheses; *** significant at 1% level, OECD omitted due to collinearity

index are low (and vice versa for developed countries). Because of parsimony, model (I) describes the FST index best:

$$\widehat{\text{FSTI}} = -1.18924 + 0.436730 \text{MPTI}_1 + 0.0723269 \text{GDP_PC}_1 - 0.0525696 \text{FS}_1$$

(0.45022) (0.059984) (0.010698) (0.027781)

$$T = 387 \quad \bar{R}^2 = 0.8359 \quad F(45, 341) = 44.692 \quad \hat{\sigma} = 1.1164$$

(standard errors in parentheses)

The equation suggests that increase in the MPT index by one point will cause an increase of the FST index by 0,43; GDP p.c. growth by 1000 USD implies an increase in the FST index by 0,072 and finally an increase in financial stress by one point (meaning a financial crisis) is connected with a decrease of FST index by 0,05.

We conclude that the FST index is influenced mainly by the MPT index (transparency of central bank on monetary policy), GDP p.c. (development of

the economy) and GDP (size of the economy). On the other hand, according to our results, previous stress in the financial sectors does not influence the central bank communication in the right direction and neither does the relative size of the financial sector in the economy (measured by market capitalization over GDP). Further, we did not find any significant relation between membership in OECD, EU or being an inflation targeting country and the FST index.

4.4 Factors influencing FSR publishing

In this section, we will model the factors that influence publishing of Financial Stability Reports (FSRs). The same variables as in the previous section will be used. As the publishing of the FSR has binary outcome, limited dependent variables model will be applied. In particular, PROBIT model will be used as we expect normal distribution of the FSR publishing outcome (rather than logistic distribution with flatter tails).

4.4.1 PROBIT model

PROBIT is a limited dependent variables model, with dummy as dependent variable (0 - not publishing, 1 - publishing). The functional form of the model is not linear, therefore, it can not be estimated by OLS. In case of PROBIT, the cumulative distribution function is normal³.

If we use the conventional notation from Baltagi (2008), the cumulative distribution function is

$$\Phi(z) = \int_{-\infty}^z \phi(u) du \quad (4.1)$$

where

$$\phi(z) = \frac{e^{-\frac{z^2}{2}}}{\sqrt{2\pi}} \quad \text{for } -\infty < z < \infty \quad (4.2)$$

Therefore, the marginal effects are

$$\frac{\partial \Phi(x_i' \beta)}{\partial x_k} = \phi_i \beta_k \quad (4.3)$$

where

$$\phi_i = \phi(x_i' \beta) \quad (4.4)$$

³LOGIT differs just in tails and therefore it gives similar prediction unless there are some extreme values

In the model, we need to realize that the marginal effects will be changing with the absolute values of explanatory variables. We will use the marginal effects equation for interpreting the coefficient of the estimated model. Let us suppose the estimated probability of publishing an FSR is:

$$\hat{\pi}_i = \Phi(\alpha + a \times MPT + b \times GDP + c \times EU) \quad (4.5)$$

where MPT is the monetary policy transparency from Eichengreen & Dincer (2009), GDP is a measure of the size of economy and EU is dummy reflecting EU membership and candidacy. From (4.5), the marginal effect of one extra point in monetary policy transparency is given by:

$$a\phi(\alpha + a \times MPT + b \times GDP + c \times EU) \quad (4.6)$$

Alternatively, the marginal effect of one extra point in GDP is given by:

$$b\phi(\alpha + a \times MPT + b \times GDP + c \times EU) \quad (4.7)$$

We will use this framework to interpret the marginal effects of all variables included in the model on the probability whether the FSR is published or not.

4.4.2 Model outline and results

As in the previous sections, we will compare more scenarios. First set of models will be with explanatory variables in the same year as the explained variable. Second set of models will be with explanatory variables lagged by one year. Tables 4.3 and 4.4 show the results of these models.

This time, the models with lagged variables do not explain the FSR publishing better than the models without this lag. Therefore we choose the model (I) without lagged variables to be the most suitable (see equation below).

$$\widehat{\text{FSR}} = -1.87031 + 0.196843 \text{ MPTI} + 0.00659798 \text{ GDP_PC} - 6.15847\text{e-}005 \text{ GDP} \\ + 0.317080 \text{ IT}$$

(0.10166)

(0.017214)

(0.0026274)

(2.9959e-005)

(0.10968)

$$T = 1186 \quad \bar{R}^2 = 0.2301 \quad \hat{\sigma} = 0.39896$$

(standard errors in parentheses)

From equation (4.7) and table 4.3, we can see, that the marginal effect of

Table 4.3: PROBIT model results

Expl. var.	(I)	(II)	(III)	(IV)
FST index				
MPT index	0,20*** (11,43)	0,17*** (9,635)	0,17*** (8,4)	0,08** (2,21)
GDP p.c.	0,007** (2,51)	0,007* (1,68)	0,004 (-2,13)	0,04*** (5,02)
GDP	$-6,15e - 05^{**}$ (-2,05)	$-6,46e - 05^{**}$ (-2,13)	$-6,55e - 05^{**}$ (-2,13)	$-0,0002^{***}$ (-4,09)
MC/GDP		0,0008 (1,34)	0,0008 (1,34)	$-0,003^*$ (-1,86)
FS				$-0,02$ (-0,72)
OECD			0,02 (0,18)	$-0,36^*$ (-1,80)
IT	0,31*** (2,89)	0,31*** (2,79)	0,30*** (2,72)	0,35** (2,03)
Obs.	1186	955	387	387
R ² adj.	0,23	0,17	0,16	0,16
Corr. pr.	75,3%	70,8%	70,3%	66,7%

Note: z-statistics are shown in parentheses; *** significant at 1% level, ** at 5% level, * at 10% level

one extra point in MPT index on the probability of publishing FSR is

$$0,2\phi(-1,87+0,2\times MPTI-6,15e-05\times GDP+0,0066\times GDPp.c.+0,31\times IT) \quad (4.8)$$

Therefore it is different for various levels of GDP, GDP p.c. and depends on whether the country is in regime inflation targeting or not. For example, in the case of UK (inflation targeting country, GDP in 2010 was 2246 bilion USD and GDP p.c. 36,14 ths. USD, MPT index 12,5), the marginal effect of one extra point in MPT index on the probability of FSR publishing would be:

$$0,2\times\phi(-1,87+0,2\times 12,5-6,15e-005\times 2246+0,0066\times 36,14+0,31) \quad (4.9)$$

when simplified

$$0,20\times\phi(3,182)=0,20\times 0,59=\mathbf{0,118} \quad (4.10)$$

Table 4.4: PROBIT model results, lagged explanatory variables

Expl. var.	(I)	(II)	(III)	(IV)
FST index				
MPT index t-1	0,20*** (13, 53)	0,20*** (12, 42)	0,06* (1, 76)	0,06* (1, 77)
GDP p.c. t-1		0,001*** (0, 54)	0,037*** (4, 89)	0,038*** (4, 23)
GDP t-1	$-8,2e - 05^{***}$ (-2, 80)	$-8,4e - 05^{***}$ (-2, 84)	$-0,0002^{***}$ (-4, 52)	$-0,0002^{***}$ (-4, 52)
MC/GDP t-1	$-0,001^*$ (1, 74)	$-0,001$ (1, 50)	$-0,002^*$ (-1, 65)	$-0,002^*$ (-1, 66)
FS t-1			$-0,03$ (-1, 03)	$-0,03$ (-1, 05)
OECD t-1				$-0,04$ (-0, 23)
IT t-1			$-0,17$ (1, 02)	$-0,05$ (1, 04)
Obs.	955	955	387	387
R ² adj.	0,17	0,17	0,15	0,15
Corr. pr.	69,7%	69,6%	69,3%	69,8%

Note: z-statistics are shown in parentheses; *** significant at 1% level, ** at 5% level, * at 10% level

Thus, the marginal effects of one point increase of MPT index in this specific case increases the probability of FSR publishing by 0,118. The marginal effects for GDP, GDP p.c. and IT would be computed similarly.

Total number of correctly predicted cases of this model is 900, which makes a ratio of 75,9% of correct predictions. Complete overview of the predicted and actual cases are shown in table 4.5.

Table 4.5: Prediction power of PROBIT model

		Predicted	
		0	1
Actual	0	694	105
	1	181	206

Chapter 5

The influence of FST index on financial soundness

In this chapter, an empirical analysis of the impact of FST index and FSR publishing on the soundness of the financial sector will be performed¹. So far, there has been only limited cross-country research of the central bank communication on financial stability. Knutter *et al.* (2011) states that researching the impact of the communication on financial stability is a complicated task since it has a rather indirect influence.

The only relevant empirical researches were conducted by De Haan & Oosterloo (2007) and Born *et al.* (2010). In particular, De Haan & Oosterloo (2007) investigated the relationship between FSR publishing and financial soundness, using the Moody's weighted average bank financial strength index and the financial system soundness indicator proposed by Das & Chenard (2004). They did not find any relationship between FSR publishing and either of these proxies for financial soundness.

Born *et al.* (2010) researched the effect of different types central bank communication on financial markets. In the case of FSRs, he concludes that they have a potentially long-lasting effect on stock market returns (in up to two thirds of cases, they move equity markets upwards) and also tend to reduce market volatility. Lower volatility in financial markets can be thought of an indicator of better financial stability.

¹Unlike chapter 4, we research here the opposite relation between central bank transparency and financial stability - the impact of central bank communication on financial stability

5.1 Relationship of FST index and financial soundness

Some central banks have set the objective of increasing financial soundness by its communication explicitly (e.g. Bank of Canada). However, for majority of central banks, this is rather an implicit target. In order to assess the fulfilling of this target, we will perform an analysis of the relationship between FST index and financial soundness for a panel of 110 countries in the period from 2000 to 2011.

Two measures of financial soundness will be used - financial stress index proposed by Cardarelli *et al.* (2009) for advanced countries and by Balakrishnan *et al.* (2009) for emerging economies² and the ratio of non-performing loans (NPL) on total loans in the banking sector. Unlike the complex financial stress index described in section 4.1, this ratio is a simple rule of thumb showing the stress in the banking sector.

5.1.1 Model outline and results

Putting the indicators of central bank communication and financial stability into a correlation matrix (figure 5.1), we can see rather low and moderate correlations between the level of communication and financial stability indicators. Naturally, a high correlation is between FST index and FSR publishing³. It can be seen that the Financial stress index (SI) has lower correlation with both FST index and FSR publishing than the second, much more simple, indicator of financial stability - non-performing loans on total loans (NPL/TL)⁴.

Table 5.1: Correlation coefficients, using the observations of 110 countries from 2000-2011

FSR publishing	FST index	Stress index	NPL/TL	
1.0000	0.8695	0.0117	-0.3345	FSR publishing
	1.0000	0.0922	-0.3461	FST index
		1.0000	0.0824	Stress index
			1.0000	NPL/TL

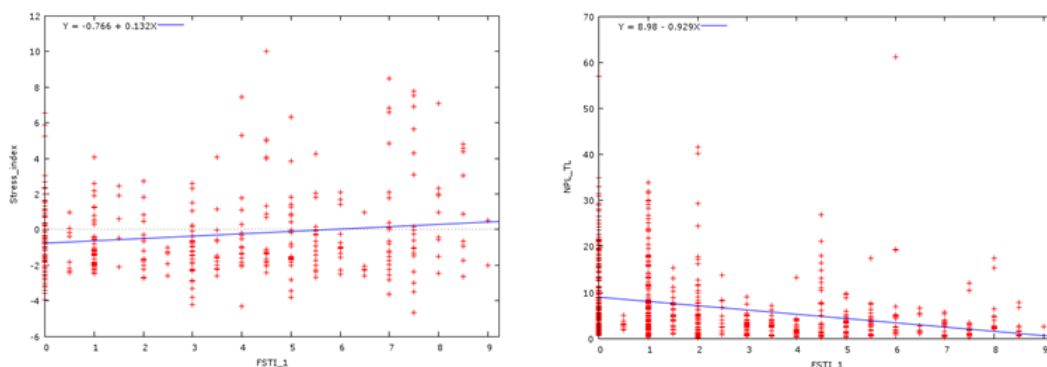
²Source of data: IMF, World Economic Outlook

³FSR publishing creates a significant part of FST index, further if central bank publishes an FSR, it usually has high level of transparency in general

⁴The negative correlation between NPL/TL and FST index is intuitive - higher level of NPL/TL implies lower financial stability

The relation of FST index and Stress index, resp. NPL/TL ratio is presented in figure 5.1. Again, more significant negative relation of FST index and NPL/TL can be seen.

Figure 5.1: Dependence of lagged FST index and both Stress index and NPL/TL



The very low correlation in the case of FST index and SI (0,09) shows that there is no strong relation between the central bank communication on financial stability and the financial stress in the same year (table 5.1), neither in the consecutive year (figure 5.1).

Reformulating our assumption, it is more likely that central bank communication will have a significant impact on financial soundness only as a result of long-term consistent communication. Thus, long-term averages of the communication (FST indices) will be constructed and used to find out the impact on financial soundness. Two reference years were chosen: the first without any severe adverse shock to financial sector to filter out as many other effects as possible (year 2006), the second is during the global financial crisis to research whether the previous communication had a positive impact on the magnitude of the financial stress (year 2009)⁵. For the purpose of comparison, we constructed the averages of financial stress index and NPL/TL ratio in 2000-2006, resp. 2000-2009

The correlation of the original and new variables for 2006 are depicted in figure 5.2, respectively in figure 5.3 for 2009.

Slightly increased correlation between FST index average and stress index, especially in 2006, can be seen. This correlation is even greater than the correlation of FST index average and stress index average. However, this correlation

⁵Note that the data for Financial stress index is available at the time of writing this paper only until 2009

Table 5.2: Correlation coefficients 2006

SI	FSTI_average	SI_average	NPL_TL_average	
1.0000	0.3666	0.3221	-0.0880	SI
	1.0000	-0.1219	-0.4584	FSTI_average
		1.0000	0.2810	SI_average
			1.0000	NPL_TL_average

Note: FSTI average is for the period 2000-2005 whereas SI and NPL/TL averages are from 2000-2006

Table 5.3: Correlation coefficients 2009

SI	FSTI average	SI average	NPL_TL average	
1.0000	0.2720	0.7446	-0.3345	SI
	1.0000	0.2046	-0.4622	FSTI average
		1.0000	-0.1526	SI average
			1.0000	NPL_TL average

Note: FSTI average is for the period 2000-2008 whereas SI and NPL/TL averages are from 2000-2009

is positive which is out of the line with our assumptions⁶. The cause would probably be that both variables are driven by same factors (e.g. development of the economy). Thus, so far, no evidence of the communication of central bank on financial stability was detected.

Therefore, we decided to run proper regressions using also other variables in the model that could have impact on financial stability. Such models should lower the omitted variable bias significantly and thus show better the impact of central bank communication.

In the set of regressions (table 5.4), one year lags of the FST index and all other variables were used as explanatory variables. The reason for using the one year lag is following. Large part of the communication is in the form of FSRs. When the central bank publishes FSR annually (usually in December), it is obvious that it can influence the markets only in the following year. Even if it publishes FSRs semi-annually, we believe that it takes some time for the users of central bank communication to process the materials and adjust their behavior that might contribute to the financial soundness; they same holding for publishing stress tests and financial soundness indicators.

⁶Lower values of financial stress index are connected with higher financial stability

To lower significantly the omitted variable bias in this model, we use additional control variables - GDP, GDP p.c., inflation, market capitalization over GDP, and all three dummies - EU, OECD and inflation targeting⁷. Regression results are presented in table 5.4. Again, according to Hausman test, fixed effects models were used⁸.

Table 5.4: Impact of central bank communication on financial stability, fixed effects

	Dependent			
	Stress index		NPL/TL	
	(I)	(II)	(I)	(II)
FST index t-1	-0,26*** (-2,93)	-0,22** (-2,5)	-0,22 (-1,58)	-0,22 (-1,54)
GDP t-1	0,001*** (3,35)	0,0001** (3,36)	-0,002*** (-2,79)	-0,0002*** (-2,81)
Inflation t-1		0,049* (1,87)		-0,006 (-0,16)
GPD p.c. t-1	0,17*** (7,48)	0,17*** (7,57)	0,09*** (2,65)	0,09*** (2,63)
MC/GDP t-1	0,016*** (3,96)	0,017*** (4,14)	-0,04*** (-6,37)	-0,04*** (-6,30)
EU t-1				-1,40 (-0,44)
OECD t-1				-4,99 (-1,00)
IT t-1		-1,23** (-1,81)	-3,10** (-2,58)	-3,00** (-2,43)
Observations	354	354	668	667
R ² <i>adj.</i>	0,27	0,28	0,57	0,57
FE test p-value	1,7e - 010	1,58e - 010	8,47e - 055	5,48e - 047

Note: t-statistics are shown in parentheses; *** significant at 1% level, ** at 5% level, * at 10% level

Using the best model to explain the stress index (SI), we choose scenario (I) which is represented by following equation:

⁷GDP in USD billion and inflation measured as GDP deflator, source of data: World Bank

⁸We reject the null hypothesis of consistent GLS estimators in Hausman test - therefore, Random effects (FGLS) are not consistent; Fixed effects are inefficient, but consistent, thus better estimators (it is in line with logical presumptions about the data that the countries have their specifics)

$$\widehat{SI} = -5.01592 - 0.26696 \text{FSTI}_1 + 0.00109 \text{GDP}_1 + 0.17416 \text{GDP_PC}_1 \\ + 0.01688 \text{MC_GDP}_1 \\ (0.48264) \quad (0.09109) \quad (0.00032) \quad (0.02326) \\ (0.00426) \\ T = 354 \quad \bar{R}^2 = 0.2651 \quad F(46, 307) = 3.7681 \quad \hat{\sigma} = 2.0084 \\ \text{(standard errors in parentheses)}$$

This time, negative significant relation between FST index and stress index was found. Interpreting the coefficient of central bank communication, increase by one point in FST index will cause a decrease of $-0,26$ in the stress index in the consecutive year. As the stress index, defined in 4.1, is usually between zero and one (values higher than one were connected with financial crisis), this would mean a great contribution to financial stability from central bank. This is the first evidence that central bank communication has some effect on financial stability. However, we have to add that the variables in the model explain only 26,5% of variation in the stress index, which is a rather poor quality of model.

Further, we chose also scenario (I) as the best model to explain the NPL/TL ratio:

$$\widehat{\text{NPL_TL}} = 9.97832 - 0.22747 \text{FSTI}_1 - 0.00188 \text{GDP}_1 + 0.08996 \text{GDP_PC}_1 \\ - 0.03940 \text{MC_GDP}_1 - 3.10474 \text{IT}_1 \\ (0.69660) \quad (0.14379) \quad (0.00067) \quad (0.03387) \\ (0.00617) \quad (1.2033) \\ T = 668 \quad \bar{R}^2 = 0.5706 \quad F(79, 588) = 12.220 \quad \hat{\sigma} = 4.6385 \\ \text{(standard errors in parentheses)}$$

Again, similar negative relation of FST index and the NPL/TL ratio was found. The coefficient shows that an increase by one point in FST index is connected with a decrease by 0,22%⁹ in the NPL/TL ratio in the consecutive year. Thus, this model also suggests that central bank communication contributes to financial stability. The model quality is better as the R. sq. adj. reaches 57%.

5.1.2 Drawbacks of data and models used

It is quite difficult to find a good measure for financial stability. The used financial stress index is a widely used measure, developed by Cardarelli *et al.*

⁹The variable NPL/TL is expressed in percent

(2009) and Balakrishnan *et al.* (2009) and proposed by IMF. When looking at the construction of this complex index, described in section 4.1, it is focused on short-term market based indicators with high frequency. However, from our point of view, it does not focus enough on the real condition of the banking sector¹⁰, including the past and possible future defaults and therefore it does not capture the whole situation. Further, different construction for advanced and emerging countries could cause incomparability of these indices and therefore troubles in econometric models applied.

Further, the objective of the central bank communication on financial stability is less clear than in the case of monetary policy. Most of the banks do not state explicitly that they communicate to enhance financial stability. Often, the goal of the bank might be just increasing credibility of the bank and thus help to fulfill the primary target. However, this does not harm the assumption that the communication should have positive effects on financial stability. Alternatively, the central bank wants just to educate market participants and make them understand the risks (Wilkinson *et al.* (2010)), which does not have to lead to increased stability.

As for the econometric methods applied, it might be extremely difficult to filter out the effect of FST index on financial stability among many others factors.¹¹

5.2 Policy implications and recommendations

Having analyzed central bank communication on financial stability of 110 countries, we dare to propose several recommendations for future improvement.

Regarding the FSRs, most of the countries lack a operational definition of financial stability (with some benchmarks, intervals and explanations) and also the purpose of publishing the FSR. This is crucial as it would explicitly reveal the objectives and also increase the accountability of central bank for the goals stated.

Further, we would encourage the countries to publish the FSIs as proposed by IMF. As already stated, stability of the financial system is given by both

¹⁰The financial stress index is focused much more on risk than on the health of the banking sector; for evaluating the stress in the financial sector, both risk and the current health are important

¹¹If there are many other variables that would explain the Stress index well, but they are not included in the model, our estimates could still be biased even though we used enough control variables.

the health of the system and the risks. Nowadays, central banks focus much more on the risks, giving too little attention to the current condition of the financial system (which is described closely by FSIs). On the other hand, we would like to stress the fact that considering only the information from FSIs might be misleading because of data aggregation¹². Moreover, we believe that inclusion of statistical appendix with underlying data (e.g. Excel spreadsheet) would be also appreciated by the users of FSRs. So far, this is done only by few central banks, e.g. New Zealand, Sweden, Norway.

On the other hand, most of the FSRs were well structured, containing both general overview of the macroeconomic situation and developments of risks to financial and also other sectors of the economy. Still, the information would be much more useful for the users in case the report would be forward-looking which is not the case at the moment for majority of the reports.

As for other website organization, still in the majority of cases, the information about financial stability is fragmented. It would be much user friendly to gather all information in one section (explaining Macroprudential policy, database of FSRs, FSIs, Stress tests, articles and research on financial stability). Finally, dividing the database of speeches according to topics rather than speakers would be also helpful for the users.

Last but not least, we would like to add one insight about the methodology used in the MPT index. Updating the data, we used the same methodology as Eichengreen & Dincer (2009) to be consistent. However, we believe that countries with Sharia legal system¹³ should not be compared with other countries. Since there is no conventional monetary policy in such countries, comparing the transparency has no sense. In particular, when doing monetary policy under the Sharia law, different instruments are used. Most common tools to control the money markets and thus stable price levels are intervening in the banks' profits, setting credit ceilings or adjusting the reserve requirement ratio. First of all, such regime does not need transparency as much as inflation targeting regime for its success. However, even if the countries are transparent within the scope of their regime, they score less points, especially in the procedural and policy transparency. In other words, in the Eichengreen & Dincer (2009) methodology, there are certain tailor-made elements for inflation target-

¹²Aggregated data are not the best measure of the distribution of risk among the financial sector - e.g. if there would be two banks in trouble and others in great condition, it would not be revealed by the aggregated data

¹³Interest rates are forbidden in the whole economy; central bank cannot apply any interest rates, only some fees for services

ing regime (e.g. decision on main operating instrument announced promptly). In other words, the statistics is biased - countries under the Sharia law having lower score.

Chapter 6

Conclusion

Financial stability has gained attention in the last few years. There is an increased pressure to build functional macroprudential policies - central bank having usually the main role. In this sense, central bank communication on financial stability is the most efficient ex ante instrument to maintain financial stability. There has been a steady increase in the central bank transparency since late nineties. Nowadays, a large number of banks has a developed strategy of the communication on financial stability.

The aim of this thesis was to analyze the central bank communication towards financial stability, identify the tools and methods used and build an international comparable measure of this transparency - FST index. For this purpose, we used the sample of 110 countries, same as Eichengreen & Dincer (2009) in the time period 2000-2011. The complete list of components of this index is presented in 3.2.

The results of this index revealed a steady increase in the communication. As expected, the most transparent countries are usually OECD members with the pioneers of this communication (UK, Sweden and Norway) on top. Beside that, the results showed that most of the contemporary communication is in the form of Financial Stability Reports (FSRs). Majority of central banks still do not publish Financial soundness indicators (FSIs) and their own Stress tests. Dividing the countries according to legal origin, countries with German and Nordic system had much better overall scores in the FST index. Moreover, the research revealed that a large part of banks still does not have any framework of macroprudential policy and the goal of financial stability is not incorporated in the central bank act. Last but not least, UK, Ireland and Portugal are the only countries with an well established Financial stability committee.

Further, we researched the drivers of the central bank communication. The results of the regressions using the complete panel data of 1320 observations was that monetary policy transparency (data used from Eichengreen & Dincer (2009) with own updates), followed by the size of the economy (GDP) and development (GDP p.c.) are the most important factors determining FST index. On the other hand, previous stress in the financial markets (measured by financial stress index from Cardarelli *et al.* (2009)) or significance of the financial sector in the economy (proxy was market capitalization over GDP) were not significant in our model.

The same model determining the drivers was conducted also for the FSRs. As the outcome of the FSRs publications is binary, we used PROBIT model for the estimation. Similarly, monetary policy transparency, GDP and GDP p.c. were the most important determinants of the probability whether central bank published the FSR or not.

Significance of the monetary policy transparency (measured by the MPT index) is not a coincidence as, from our experience, central bank usually develops first fully the communication strategy on monetary policy and only after focuses on the financial stability communication. Further, both FST and MPT indices are driven by similar factors.

In the last part of our research, we used the FST index to determine the impact of the central bank transparency on the financial stability itself. Two proxies for financial soundness were used - financial stress index by Cardarelli *et al.* (2009) and the ratio of non-performing loans on total loans as a single rule of thumb of the financial situation in the economy. Both proxies of financial stress had very low correlation with FST index. To verify this findings, we constructed long-term averages of FST indices to determine the effect of the long-term systematic level of communication on the financial stability. Nevertheless, the correlation improved only partially. Finally, using set of regressions on panel data and adding control variables to lower omitted variable bias, we found negative relation between FST index and financial stress index in the consecutive year (table 5.4). This is the first evidence of the impact of central bank communication on the financial stability as De Haan & Oosterloo (2007) did not find any relation between publishing FSR and financial stability and Born *et al.* (2010) found only limited influence of FSR publishing on stock market volatility.

Overall, financial stability communication is still in most of the countries in developing phase. Therefore, measuring its impact would be more precise once

this communication reaches its steady state. Moreover, so far, even market participants are not fully used to taking advantage of this communication.

However, we believe that the communication has huge potential in reducing noise and providing information about the current shape and possible future developments in the financial sector which should be reflected in better stability in the long run.

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Appendix A

Overview of FSRs

A.1 FSR publishing countries

Table A.1: List of countries publishing Financial Stability Reports, source: own data collection

	Country	Region	First FSR	Frequency
1	Albania	Europe	2007	Semi-Annual
2	Argentina	Americas	2004	Semi-Annual
3	Armenia	Asia	2007	Semi-Annual
4	Australia	Oceania	2004	Semi-Annual
5	Austria	Eurozone	2001	Semi-Annual
6	Bahrain	Asia	2007	Semi-Annual
7	Bangladesh	Oceania	2006	Annual
8	Belarus	Europe	2007	Annual
9	Belgium	Eurozone	2003	Annual
10	Brazil	Americas	2002	Semi-Annual
11	Canada	Americas	2002	Semi-Annual
12	Chile	Americas	2004	Semi-Annual
13	China	Oceania	2011	Annual
14	Colombia	Americas	2002	Semi-Annual
15	Croatia	Europe	2008	Semi-Annual
16	Czech Republic	Europe	2004	Annual
17	Denmark	Europe	2002	Annual
18	El Salvador	Americas	2007	Annual
19	Estonia	Eurozone	2003	Semi-Annual

	Country	Region	First FSR	Frequency
20	Finland	Eurozone	2003	Annual
21	France	Eurozone	2002	Semi-Annual
22	Georgia	Asia	2006	Annual
23	Germany	Eurozone	2003	Annual
24	Greece	Eurozone	2009	Annual
25	Hong Kong	Oceania	2003	Semi-Annual
26	Hungary	Europe	2000	Semi-Annual
27	Iceland	Europe	2005	Annual
28	India	Oceania	2010	Semi-Annual
29	Indonesia	Asia	2003	Semi-Annual
30	Italy	Eurozone	2010	Annual
31	Jamaica	Americas	2006	Annual
32	Japan	Oceania	2005	Semi-Annual
33	Jordan	Asia	2010	Annual
34	Kazakhstan	Oceania	2006	Annual
35	Korea	Oceania	2005	Semi-Annual
36	Kyrgyzstan	Asia	2004	Annual
37	Latvia	Europe	2003	Annual
38	Lithuania	Europe	2007	Annual
39	Malta	Eurozone	2008	Semi-Annual
40	Mauritius	Africa	2009	Semi-Annual
41	Mexico	Americas	2006	Annual
42	Namibia	Africa	2008	Semi-Annual
43	Netherlands	Eurozone	2004	Semi-Annual
44	New Zealand	Oceania	2004	Semi-Annual
45	Nigeria	Africa	2009	Annual
46	Norway	Europe	2000	Semi-Annual
47	Pakistan	Oceania	2006	Annual
48	Poland	Europe	2003	Semi-Annual
49	Portugal	Eurozone	2004	Semi-Annual
50	Qatar	Asia	2009	Annual
51	Romania	Europe	2006	Annual
52	Russian Federation	Europe	2002	Annual
53	Singapore	Asia	2004	Annual
54	Slovak Republic	Eurozone	2003	Semi-Annual

	Country	Region	First FSR	Frequency
55	Slovenia	Eurozone	2004	Annual
56	South Africa	Africa	2000	Annual
57	Spain	Eurozone	2002	Semi-Annual
58	Sri Lanka	Oceania	2007	Annual
59	Sweden	Europe	1997	Semi-Annual
60	Switzerland	Europe	2003	Annual
61	Trinidad and Tobago	Americas	2008	Annual
62	Turkey	Asia	2005	Annual
63	Uganda	Africa	2009	Annual
64	United Kingdom	Europe	1996	Semi-Annual

Appendix B

FST and MPT indices overview

Table B.3: Overview of FST index by region

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Oceania	1.83	1.83	1.83	1.83	3.08	3.17	3.17	3.17	3.17	3.17	3.17	3.17
Australia and New Zealand	3.5	3.5	3.5	3.5	7.25	7.5	7.5	7.5	7.5	7.5	7.5	7.5
Australia	4	4	4	4	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
New Zealand	3	3	3	3	7	7.5	7.5	7.5	7.5	7.5	7.5	7.5
Melanesia	1	1	1	1	1	1	1	1	1	1	1	1
Fiji	0	0	0	0	0	0	0	0	0	0	0	0
Papua New Guinea	1	1	1	1	1	1	1	1	1	1	1	1
Solomon Islands	1	1	1	1	1	1	1	1	1	1	1	1
Vanuatu	2	2	2	2	2	2	2	2	2	2	2	2
Asia	0.82	0.85	0.88	1.15	1.39	1.59	2.07	2.54	2.57	2.70	3.15	3.17
Central Asia	0.67	0.67	0.67	0.67	1.33	1.50	2.33	2.17	2.33	2.33	2.33	2.33
Kazakhstan	2	2	2	2	2	2	4.5	4.5	4.5	4.5	5	5
Kyrgyzstan	0	0	0	0	2	2.5	2.5	2	2.5	2.5	2	2
Tajikistan	0	0	0	0	0	0	0	0	0	0	0	0
Eastern Asia	1.6	1.8	1.8	2.5	2.6	3.1	3.8	5	5	4.5	5	4.9
China	1	1	1	1	1	3.5	3.5	3.5	3.5	2	3.5	3.5
Hong Kong	1	1	1	4.5	5	5	5	6	6	5	6	6
Japan	2	3	3	3	3	3	6.5	8.5	8.5	8.5	8.5	8
Korea	2	2	2	2	2	2	2	5	5	5	5	5
Mongolia	2	2	2	2	2	2	2	2	2	2	2	2
Southern Asia	0.5	0.5	0.5	0.6	0.6	0.6	1.3	2	2	2.2	3.4	3.4
Bangladesh	0	0	0	0	0	0	0	0	0	0	3	3
Bhutan	0	0	0	0	0	0	0	0	0	0	0	0
India	0	0	0	0	0	0	0	0	0	0	3	3
Pakistan	1	1	1	1	1	1	4.5	4.5	4.5	4.5	4.5	4.5
Sri Lanka	1.5	1.5	1.5	2	2	2	2	5.5	5.5	6.5	6.5	6.5

Table B.5: Overview of FST index by region

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Europe	1.66	1.93	2.35	2.91	3.81	4.12	4.41	4.82	4.96	5.04	5.44	5.46
Central and Eastern Europe	1.75	2.50	2.75	3.42	4.67	5.0	5.83	5.75	6.33	6.33	6.42	6.42
Bulgaria	1	1	1	1	1	1	1	1	1	1	1	1
Czech Republic	2.5	2.5	2.5	2.5	7	7	7	7	8	8	8.5	8.5
Hungary	3	7.5	9	8.5	8.5	9	7.5	7.5	8.5	8.5	8.5	8.5
Poland	0	0	0	4.5	4.5	4.5	6	5	5.5	5.5	5.5	5.5
Romania	2.5	2.5	2.5	2.5	3.5	3.5	8	8	8	8	8	8
Slovakia	1.5	1.5	1.5	1.5	3.5	5	5.5	6	7	7	7	7
FSU^a	1.0	1.0	1.62	1.75	2.0	2.25	2.75	3.62	2.75	2.75	2.75	2.75
Belarus	0	0	0	0	0	0	0	2	2	2	2	2
Republic of Moldova	2	2	2	2	2	2	2	2	2	2	2	2
Russian Federation	1	1	3.5	4	5	5	5	5	5	5	5	5
Ukraine	1	1	1	1	1	2	4	5.5	2	2	2	2
Northern Europe	2.85	2.9	3.25	4.15	5.25	5.6	5.8	6.45	6.1	6.2	6.4	6.4
Denmark	1	1	4.5	4.5	4.5	4.5	4.5	4.5	5.5	4.5	4.5	4.5
Estonia	1	1	1	4	4.5	4.5	4.5	5.5	6.5	6.5	6.5	6.5
Finland	3	3	3	5.5	7	7	7	7	7	7	6.5	6.5
Iceland	1.5	1.5	1.5	1.5	1.5	5	6	6	6	6	6.5	6.5
Ireland	2	2	2	2	7	7	7	7	2	2	3	3
Latvia	0	0	0	2.5	3.5	3.5	3.5	5	4.5	4.5	4.5	4.5
Lithuania	1	1	1	1	2	2	2	6	6	6	7	7
Norway	6	6	6	6.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5
Sweden	7	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	8.5	8.5	8.5
United Kingdom	6	6	6	6.5	6.5	6.5	7.5	7.5	7.5	8.5	8.5	9.5

^aFormer Soviet Union countries in Eastern Europe excl. new EU members

Table B.8: Overview of MPT index by region

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Americas	4.18	4.43	4.68	4.85	5.20	5.20	5.10	5.63	5.80	5.88	5.88	5.88
Latin America and the Caribbean	5.07	5.29	5.57	5.93	6.07	6.07	5.71	6.79	7.00	7.14	7.14	7.14
East Caribbean	2.83	3.08	3.58	3.67	3.92	3.92	3.75	4.08	4.25	4.25	4.25	4.25
Aruba	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1.5	1.5	1.5	1.5	1.5
Bahamas	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Barbados	3	3	4	4	4	4	4	4.5	4.5	4.5	4.5	4.5
Cuba	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2	2	2	2	2
Jamaica	3	4.5	6.5	6.5	6.5	6.5	5.5	6	7	7	7	7
Trinidad and Tobago	3.5	3.5	3.5	4	5.5	5.5	5.5	6	6	6	6	6
Central America	2.38	2.88	2.88	3.00	4.00	4.00	4.38	3.75	3.75	3.88	3.88	3.88
Belize	2	3	3	3	3	3	3	3	3	3	3	3
El Salvador	2	3	3	3	3	3	3	3	3	3	3	3
Guatemala	1.5	1.5	1.5	1.5	4.5	4.5	6	7	7	7	7	7
Mexico	4	4	4	4.5	5.5	5.5	5.5	5.5	5.5	6	6	6
South America	5.07	5.29	5.57	5.93	6.07	6.07	5.71	6.79	7.00	7.14	7.14	7.14
Argentina	2	2	2	4.5	5.5	5.5	5.5	6.5	6.5	6.5	6.5	6.5
Brazil	9	9	9	9	9	9	7.5	8	8	8	8	8
Chile	7.5	7.5	7.5	7.5	7.5	7.5	7.5	8.5	8.5	8.5	8.5	8.5
Colombia	5.5	5.5	6	6	6	6	5	8.5	8.5	8.5	8.5	8.5
Guyana	1.5	1.5	1.5	1.5	1.5	1.5	1.5	2	2	2	2	2
Peru	5	6.5	8	8	8	8	8	8	9.5	10	10	10
Uruguay	5	5	5	5	5	5	5	6	6	6.5	6.5	6.5
Northern America	7.17	7.17	7.17	7.17	7.33	7.33	7.33	7.33	7.67	7.67	7.67	7.67
Bermuda	1	1	1	1	1	1	1	1	1	1	1	1
Canada	10.5	10.5	10.5	10.5	11	11	11	10.5	10.5	10.5	10.5	10.5
United States of America	10	10	10	10	10	10	10	10.5	11.5	11.5	11.5	11.5

Table B.9: Overview of MPT index by region

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Oceania	5.57	6.18	6.57	6.57	6.86	6.86	6.86	7.50	7.50	7.57	7.64	7.64
Australia and New Zealand	10.5	10.75	11.5	11.5	11.5	11.5	11.5	12.5	12.5	12.5	12.5	12.5
Australia	8	8	9	9	9	9	9	10	10	10	10	10
New Zealand	13	13.5	14	14	14	14	14	15	15	15	15	15
Melanesia	1.88	2.75	2.88	2.88	3.38	3.38	3.38	3.75	3.75	3.88	4.00	4.00
Fiji	3	3	3	3	4	4	4	5	5	5	5	5
Papua New Guinea	1	3.5	4	4	5	5	5	5	5	5	5.5	5.5
Solomon Islands	2	2	2	2	2	2	2	2	2	1.5	1.5	1.5
Vanuatu	1.5	2.5	2.5	2.5	2.5	2.5	2.5	3	3	4	4	4
Asia	3.39	3.61	4.03	4.32	4.56	4.68	4.82	5.42	5.55	5.66	5.73	5.81
Central Asia	2.67	3.00	3.00	2.67	3.33	4.00	4.00	4.67	4.83	5.00	5.00	5.00
Kazakhstan	3.5	3.5	3.5	3.5	3.5	5.5	5.5	6	6	6	6	6
Kyrgyzstan	3	4	4	3	5	5	5	5.5	5.5	6	6	6
Tajikistan	1.5	1.5	1.5	1.5	1.5	1.5	1.5	2.5	3	3	3	3
Eastern Asia	5.2	5.2	5.7	6.3	6.6	6.6	6.7	7.5	7.6	7.8	8	8
China	1	1	1.5	4.5	4.5	4.5	4.5	5	5	5	5	5
Hong Kong	6	6	7	7	7	7	7.5	8.5	9	9	9	9
Japan	8.5	8	8	8	9.5	9.5	9.5	10	10	11	11	11
Korea	8	8.5	8.5	8.5	8.5	8.5	8.5	9.5	9.5	9.5	10.5	10.5
Mongolia	2.5	2.5	3.5	3.5	3.5	3.5	3.5	4.5	4.5	4.5	4.5	4.5
Southern Asia	2.2	2.3	2.9	3.4	3.8	3.8	3.9	3.4	3.4	3.4	3.4	3.9
Bangladesh	0	0.5	0.5	3	3.5	3.5	3.5	4.5	4.5	4.5	4.5	4.5
Bhutan	1.5	1.5	3	3	3	3	3	3.5	3.5	3.5	3.5	3.5
India	2	2	2	2	2	2	2	3	3	3	3	3
Pakistan	2.5	2.5	2.5	2.5	3.5	3.5	4	4	4	4	4	4
Sri Lanka	5	5	6.5	6.5	7	7	7	6	6	6	6	8.5

Table B.10: Overview of MPT index by region

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
South-Eastern Asia	5	5.6	6.5	7.2	7.4	7.6	7.7	8.2	8.2	8.4	8.4	8.4
Indonesia	4.5	4.5	4.5	7	8	8	8.5	9	9	10	10	10
Malaysia	5.5	5.5	5.5	5.5	5.5	5.5	5.5	6.5	6.5	6.5	6.5	6.5
Philippines	5	6	10	10	10	10	10	10.5	10.5	10.5	10.5	10.5
Singapore	4	5.5	4.5	5.5	5.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
Thailand	6	6.5	8	8	8	8	8	8.5	8.5	8.5	8.5	8.5
Western Asia	3.5	3.5	3.5	3.5	3.5	3.5	3.5	4.75	4.75	4.75	4.75	4.75
Armenia	4	4	4	4	4	4	4	6.5	6.5	6.5	6.5	6.5
Bahrain	3	3	3	3	3	3	3	3	3	3	3	3
Georgia	3	3	3	4	4	4	4	6	9	9	9	9
Iraq	2	2	2	2	2.5	2.5	2.5	3	3	3	3	3
Israel	7.5	8.5	8.5	8.5	8.5	8.5	10	11	11	11	11	11
Jordan	1	1	1	1	1.5	2	2	2.5	2.5	2.5	2.5	2.5
Kuwait	2	2	2	2	2	2	2	2.5	2.5	2.5	2.5	2.5
Oman	1.5	1.5	1.5	1.5	1.5	1.5	1.5	2.5	2.5	2.5	2.5	2.5
Qatar	3	3	3	3	3	3	3	3	3	4	4	4
Saudi Arabia	1	1	1	1	1	1	1	1	1	1	1	1
Turkey	4	5.5	8.5	8.5	8.5	8.5	10	10	10	10	11	11
United Arab Emirates	2	2	2	2	2	2	2	2	2	2	2	2
Yemen	1	1	1	1	1	1	1	1.5	1.5	1.5	1.5	1.5

Table B.11: Overview of MPT index by region

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Europe	6.58	7.31	7.92	8.08	8.42	8.54	8.65	8.99	9.06	9.15	9.28	9.22
CEE^a	5.0	5.25	6.58	6.75	7.25	7.83	8.50	9.20	9.20	9.30	9.30	9.50
Bulgaria	4.5	4.5	4.5	4.5	5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Czech Republic	9.5	9.5	10	11	11	11	11	11	11	11.5	11.5	11.5
Hungary	5	6	8.5	8.5	8.5	10	10.5	11.5	11.5	11.5	11.5	11.5
Poland	5	6.5	6.5	6.5	7	8	9	10.5	10.5	10.5	10.5	11
Romania	1.5	1.5	4.5	4.5	6.5	6.5	7	7.5	7.5	7.5	7.5	8
Slovakia	4.5	3.5	5.5	5.5	5.5	6	8	Eurozone	Eurozone	Eurozone	Eurozone	Eurozone
FSU^b	3.25	3.50	3.87	3.87	4.12	4.12	4.12	4.25	4.37	4.37	5.12	5.37
Belarus	5	5	5	5	5	5	5	5	5	5	5	5
Republic of Moldova	4.5	5.5	6	6	6	6	6	6	6	6	8	9
Russian Federation	1.5	1.5	1.5	1.5	2.5	2.5	2.5	3	3	3	4.5	4.5
Ukraine	2	2	3	3	3	3	3	3	3.5	3.5	3	3
Northern Europe	7.19	7.44	7.88	8.00	8.00	8.13	8.25	8.56	8.56	8.69	8.69	9.07
Denmark	5	5	5	6	6	6	6	6	6	6	6	6
Estonia	5.5	5.5	5.5	5.5	5	6	6	6	6	6	6	Eurozone
Iceland	7	7	7.5	7.5	7.5	7.5	8	8	8	9	9	9
Latvia	6	6	6	6	6	6	6	6.5	6.5	6.5	6.5	6.5
Lithuania	4	4.5	4.5	4.5	4.5	4.5	5	6	6	6	6	6
Norway	6	7.5	7.5	7.5	8	8	8	9	9	9	9	9
Sweden	11.5	11.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5
United Kingdom	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5
Southern Europe	3.83	4.17	4.17	5.17	5.50	5.50	5.17	5.25	5.25	5.25	5.25	5.25
Albania	4.5	4.5	4.5	6	7	7	6	7.5	7.5	7.5	7.5	7.5
Croatia	1.5	2.5	2.5	2.5	2.5	2.5	2.5	3	3	3	3	3
Malta	5.5	5.5	5.5	7	7	7	7	Eurozone	Eurozone	Eurozone	Eurozone	Eurozone
Slovenia	5	5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
Western Europe	8.43	9.87	10.33	10.40	10.90	10.90	10.90	10.90	10.91	10.91	11.00	11.00
Eurozone	8.5	10	10.5	10.5	11	11	11	11	11	11	11	11
Switzerland	7.5	8	8	9	9.5	9.5	9.5	9.5	9.5	9.5	11	11

^aCentral and Eastern Europe^bFormer Soviet Union countries in Eastern Europe excl. new EU members