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# Credit Supply, Price and Financial Stability in Markets and Institutions

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# Credit Supply, Price and Financial Stability in Markets and Institutions

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**ABSTRACT**

In Chapter 1, the staggered nature of the adoption of interstate bank branching deregulation in the United States is utilized as an exogeneous shock to investigate the managerial incentives involved in corporate socially responsible (CSR) activities. Using Kinder, Lydenberg, and Domini Research & Analytics, Inc. for our CSR measures, we find a significant negative relation between the extent of deregulation and CSR practices, which implies that deregulation-led rising competition in product market makes the non-financial firms more concerned about protecting interests of shareholders than other stakeholders. Specifically, firms with low pricing power tend to significantly reduce their CSR activities. Our results are robust using alternative empirical specifications and CSR measures.

Chapter 2 investigates the interaction between price stability and financial stability for "Fragile Five" countries. In the first step, we investigate the causation linkage between price stability and financial stability indicators. In the second step, we analyze the effect of financial stability instruments, lending rate and required reserve ratio, on price stability. We then test the price stability instrument policy rate on financial stability. Empirical findings, in the first step, indicate that there is no meaningful relationship between policy objectives in the short run, while the relation between financial stability and price stability occurs in the longer time frequencies. However, the situation is not valid for all economies. In the second step, we measure the effects of monetary policy tools employed by the central bank of each of the Fragile Five countries. The findings from the analysis that investigates the effects of each policy instrument imply that the policy rate instrument implemented to achieve the inflation target does not affect the financial stability goal. Similarly, the reserve requirement ratio instrument to achieve the financial stability

goal does not affect the price stability goal. On the other hand, results give some implication about the negative effects of the lending rate instrument on the inflation targeting objective.

Keywords: Corporate Social Responsibility, Bank Deregulation, Product Market Competition, Financial Stability, Price Stability, Fragile Five, Schwartz Hypothesis.

## Chapter 1. Credit Supply and Corporate Social Responsibility

### 1. Introduction

U.S. bank deregulation, which occurred mainly from the late 1970s to the mid-1990s to remove the geographic expansion restrictions of banks within and across state lines, significantly affects the real economy. According to literature on the topic, there is evidence that deregulation increases the efficiency of the banking sector, lowers the cost of loans (Jayaratne and Strahan, 1998), encourages entrepreneurship and creative destruction in non-financial industry (Black and Strahan, 2002; Kerr and Nanda, 2009), increases the supply of credit and entry of new firms (Cetorelli and Strahan, 2006), and leads to more innovation (Amore, 2013). While deregulation profoundly changes the operating environment of the companies, how it affects corporate socially responsible (henceforth, CSR) activities of non-financial firms is an unexplored but important question. We address this issue in this paper.

CSR has recently become an important part of corporate practices in dealing with stakeholders. An increasing number of firms have become involved in social responsible activities by making available a sizable portion of corporate resources to cater to stakeholders even though it is not legally required. There are two opposing views regarding the merits of CSR activities. The classical view in finance suggests that the main objective of a firm should be maximizing the value of shareholders (Friedman, 1970), and therefore, any social responsible activities that cater to other stakeholders would lead to a reduction of shareholders' wealth (e.g., Vance 1975; Pagano and Volpin, 2005; Cronqvist et al., 2009). The opposing literature that favors CSR activities claims that CSR helps the firms build a reputation of quality stakeholder management, and consequently (e.g., Coase, 1937; Cornell and Shapiro, 1987), an increased long-term profitability (Freeman et al., 2004; Jensen, 2010). Exploring how bank deregulation might affect CSR, considering these views, is an empirical question.

Based on findings of relevant studies, we predict that bank deregulation would significantly decrease CSR activities of non-financial firms. First, since deregulation makes the credit market more accessible to non-financial firms, which leads to a more innovative and competitive product market with a higher threat of entry of rivals, firms would be more concerned about protecting shareholders' interests such as facing the threat of intense competition. Consequently, firms would be more likely to reduce their expenditure in activities related to the interests of non-shareholder stakeholders.[1] Second, deregulation, in fact, leads the banks to compete by making loans more affordable to existing and potential future clients. As a result, the incentive of non-financial firms to use CSR as a signal of quality stakeholder management to the creditors (Dhaliwal et al., 2011; El Ghoul et al., 2011; Cheng et al., 2014) will be lessened. Third, since CSR is a very costly strategy and requires a long-term window to generate meaningful returns, firms would be more inclined to reduce their involvement in CSR due to the immediate threat of increased competition in the product market brought on by a greater supply of credit.

However, empirically testing CSR activities is a challenging task because of possible endogeneity issues (e.g., Bénabou and Tirole, 2010, Hong, Kubik, and Scheinkman, 2012). In papers that look at the effects of CSR on profitability, the issue was the challenge of determining whether CSR causes increased profitability or was it the increased profitability that causes the firms to be steered toward more CSR investments. Furthermore, both CSR and firm profitability can be influenced by variables that could have been omitted from a model.

[1] Related to this argument, Fresard and Valta (2015) show that as a consequence of increased product market competition from the reduction of import tariffs, incumbent firms tend to significantly reduce their overall investments.

Employing bank deregulation events as an exogenous shock to both firm performance and CSR investments in the empirical setting allowed the studies to overcome the challenging task of finding out how CSR is influenced.[2]

The U.S. Congress passed the Interstate Banking and Branching Efficiency ACT (IBBEA) in 1994. The act made interstate branching across the U.S. legal beginning in 1997. The timing of the banking deregulation by states was irregular and unpredictable, which makes it possible to use deregulation as an exogeneous shock to the financial constraints faced by the non-financial firms and the resulting practices of CSR in this study. Following Krishnan (2014)'s adjustment of Rice and Strahan (2010), we use a *Deregulation Index* as our primary measure of deregulation.

We obtain data on a firm's CSR performance from the KLD Research & Analytics, Inc. (hereafter, KLD) STATS database. KLD rates U.S. companies based on seven broad categories of CSR practices that are used as the most comprehensive measure of CSR in the literature. We focus on five categories: Employee, Corporate Governance, Community, Environment, and Product Quality. For each category, KLD provides a score of strengths which refer to positive actions taken and of concerns which refer to negative actions taken. We use net score, the difference between strengths and concerns, as our primary measure of CSR.

In our empirical test, we use a sample of 14,037 observations with 4,792 unique firms for the period of 1991-2005. Confirming our prediction, we find that interstate branch deregulation significantly affects CSR practices of firms headquartered in the deregulated states. In our analyses on each category performed separately, we find that all categories of CSR, except environment,

[2] Some of the papers that took a similar approach of employing exogeneous shocks in finding out the determinants of CSR: Flammer (2015) uses reduction in import tariffs as an exogeneous variation to competition; Hong et al. (2012) use 1990s' internet bubble as an exogeneous shock to financial constraints; Masulis and Reza (2014) use 2003 dividend tax cut as a shock to managerial ownership. Each of these exogeneous shocks were employed in the empirical setting of testing socially responsible activities.

experience significant downward movement in response to the increase of the level of deregulation. Furthermore, for each category, we separately test strengths and concerns of CSR practices. If net score, measured as the difference between strengths and concerns, of CSR decreases, then we can predict to find a negative relation of strengths but a positive relation of concerns with deregulation. Three categories of which strengths are significantly and negatively related with deregulation are: Community, Environment, and Product Quality. On the other hand, we find that the concerns of Employee, Corporate Governance, Community, and Product Quality are significantly and positively related with deregulation.

Even though, on average, all firms in the sample experience significant reduction in CSR practices following deregulation, we argue that such reversal in the practices should be severe for the firms operating in a competitive environment. For an additional test, using the median pricing power in each industry as the benchmark, we divide the sample into the group of firms with low pricing power and the group of firms with high pricing power. We follow the methodology of Peress (2010) to measure the pricing power of each firm. We also construct a subsample of firms in industries with low profit margin, and a subsample of firms in industries with high profit margin. In our empirical test, we find a significantly negative relation between CSR practices and the interaction term of Deregulation Index and the dummy variable for low pricing power. This negative relationship turns out to have more statistical and economic significance for the subsample of firms operating in high profit margin industries.

In a further robustness test, we create separate dummy variables for each deregulation score. In the index, a higher score indicates more deregulation, where "five" as the highest score indicates the states as the most open to allowing interstate branching. We find that dummy variables capturing deregulation scores as 5, 4, 3, and 2 have a significantly negative relation with CSR activities. Not surprisingly, the dummy variable for the lowest level of deregulation shows a

positive relation with CSR practices. Finally, our results persist in the presence of the use of alternative way of calculating net CSR score.

Our results contribute to the literature in the areas of CSR, bank deregulation, and product market competition. First, most of the existing empirical papers in CSR focus on leadership, or firm-specific factors in explaining CSR practices (e.g., Johnson and Greening, 1999; McWilliams and Siegel, 2000; Marquis and Lee, 2013; Briscoe et al., 2014; Di Giuli and Kostovetsky, 2014; Tang et al., 2015). Among the very few studies that use shock in external environment as an exogenous catalyst of CSR (e.g., Hong et al., 2012; Masulis and Reza, 2014; Adhikari, 2016), ours is the first one to employ bank deregulation as an exogeneous shock in determining the CSR practices of non-financial firms.

Second, while existing literature comprehensively covers how U.S. bank deregulation affects real economic activities and policies (e.g., Jayaratne and Strahan,1996, 1998; Kerr and Nanda, 2009; Rice and Strahan, 2010; Amore et al., 2013), there is, to the authors' best knowledge to date, no paper that examines the deregulation effect on CSR of non-financial firms. Our results that interstate branch deregulation leads to a significant reduction of CSR activities imply that as a result of greater credit supply at a lower cost, the incumbent firms tend to reduce their expenditures in CSR activities and focus more on the interests of shareholders to compete with better financed rival firms.

Third, since deregulation leads to increased product market competition, and thereby affects managerial incentives of CSR activities, our paper contributes to the literature concerning product market competition. Related to our paper, Flammer (2014) shows how increased product market competition resulting from the reduction of tariffs affects CSR. Our paper significantly departs from that paper in multiple aspects. Flammer's paper focuses on tariff reduction and finds that firms employ more CSR activities in response to the increase in competition, as CSR helps domestic

companies differentiate their products from foreign rivals. While tariff reduction usually invites competition from existing foreign firms, bank deregulation leads to an increased level of product market competition arising mainly from existing domestic firms and an increased threat of entry of potential firms. Thereby, our measure of exogeneous shock to market competition, bank deregulation as the removal of financial barriers rather than tariff reduction as the removal of trade barrier, creates a different context. Furthermore, contrary to Flammer's findings, we find a significant reduction in CSR activities, supporting the view of shareholder value maximization.

The rest of the paper is organized as follows. Section 2 discusses background literature and presents the hypothesis. Section 3 discusses the results from empirical findings. Section 4 concludes the paper.

## 2. Background and hypothesis

### 2.1. Why do companies engage in CSR activities?

Existing literature offers two opposing views on why firms might employ CSR activities. We consider the arguments against CSR activities as the shareholder expense view, which suggests that shareholders lose value from socially responsible initiatives. Essentially, the classical view in finance suggests that corporations are responsible only for maximizing shareholders' value and are not responsible to serve other stakeholders' interests or improving the welfare of the society unless they are obliged by contracts (Friedman, 1970; Bénabou and Tirole, 2010). Literature, based on this argument, considers CSR as an unnecessary cost that could possibly create disadvantages for the firms when comparing them to their competitors that don't invest in CSR activities (e.g., Friedman, 1970; Jensen, 2010). Moreover, some studies argue that CSR could become an agency problem whereby managers could utilize CSR to benefit themselves instead of shareholders (e.g., Brammer and Millington, 2008).

Studies suggest that even though it is true that socially responsible activities could help other stakeholders, the benefit occurs at the expense of shareholders (Vance 1975; Pagano and Volpin, 2005; Cronqvist et al., 2009). For instance, if a firm adopts a socially responsible employee-friendly policy which is not adopted as a practice by its competitors, it may put itself in a disadvantageous competitive position by incurring more costs from resources being spent on activities that don't generate profits. As a result, the firm would be more likely to experience a decline in its profitability, at least in the short run. CSR, as a strategy, is very costly (Freeman, 1984) and would require a long-term time frame to generate suitable financial benefits (Berman et al., 1999; Hillman and Keim, 2001). Thus, at least in the short-term CSR could turn out to be a costly strategy. In fact, evidence from many studies suggest that CSR might deteriorate the short-term market value of a firm (e.g., Di Giuli and Kostovetsky, 2014).

Paradoxically, in practice, corporations often venture outside the boundaries of profit maximization by getting involved in activities that serve the welfare of other stakeholders. For example, corporations tend to offer employee benefits, adopt environment-friendly production technologies, provide community services, etc. These practices fall in line with the stakeholder value maximization view, which suggests that CSR, in fact, increases firm value. More specifically, it argues that CSR activities incentivize the stakeholders to support firm operations by serving their interests, and thereby increase firm value. This view is largely supported by the theory of the firm and contract theory (Coase, 1937; Alchian and Demsetz, 1972; Jensen and Meckling, 1976, Cornell and Shapiro, 1987). These theories argue that a firm stands upon contracts made between shareholders and other stakeholders, where each group of stakeholders provides much needed support or resources to the firms in exchange for claims in explicit contracts, such as wage contracts, and claims in implicit contracts, such as employee job security. Since the violation of implicit contracts does not imply legal violations, firms that honor implicit contracts tend to

enhance their reputation related to commitments to stakeholders, which leads to long-term benefits. Finally, high CSR firms are more likely to serve the interests of both shareholders and other stakeholders, and commit to firms' long-term value (Freeman et al., 2004; Jensen, 2010).[3]

### 2.2. Bank deregulation and CSR activities

Historically, the geographic outreach of U.S. banking activities within the U.S. has been constrained by several laws including the McFadden Act of 1927 and the Douglas Amendment to the Bank Holding Company Act of 1956. During the period of 1970-1990s, the U.S. started to allow the geographic expansion of the banks within and across states at different phases. Evidence in literature shows that deregulation of banking activities significantly affects real economic activities. For example, bank deregulation increases the rates of per capital income growth and output (Jayaratne and Strahan, 1996), increases bank efficiency and lowers the cost of loans (Jayaratne and Strahan, 1998), promotes entrepreneurship (Black and Strahan, 2002), allows more entry of firms and increases credit supply (Cetorelli and Strahan, 2006), encourages creative destruction in nonfinancial industry (Kerr and Nanda, 2009), and increases innovation activities (e.g., Amore et al., 2013).

Considering the significant impact of deregulation on the non-financial industry, how such deregulation might affect the corporate policy of CSR activities is an empirical question. It is evident from the literature as discussed above that bank deregulation significantly increases competition in the product market. Greater access to external credit market at a lower cost is likely

[3] Related to this argument, CSR helps firms differentiate themselves in the product market and provides a signal about their long-term strategy. For example, evidence from a number of empirical papers suggests that CSR initiatives enhance firm value by building loyalty and reputation among the stakeholders (e.g., List, 2006; Elfenbein et al., 2012; Servaes and Tamayo, 2014).

to increase entry of new firms, as well as make the rival firms more competitive. Since CSR has become an important and influential corporate policy in the recent decades, any significant change in product market could lead to a significant change in CSR activities. In response to more competition, firms can react in one of two ways; either devote more resources to CSR activities, or decrease investment in CSR activities.

There are a number of consequences of bank deregulation, which are closely related to the product market that can incentivize the firms headquartered in deregulated states to significantly cut down their expenditure on CSR activities. First, bank deregulation increases competition in the product market by making the debt market more accessible to rival firms (e.g., Black and Strahan, 2002 Cetorelli and Strahan, 2006). Specifically, through the force of creative destruction in non-financial industry (Kerr and Nanda, 2009) firms struggling with financial constraints but having the potential to compete would likely to be more competitive if armed with a greater supply of affordable credit. As a result, firms facing severe threats of competition would likely be more concerned about protecting the interests of shareholders than protecting the interests of other stakeholders.

Second, bank deregulation might lower the managerial incentives of using CSR as a signal of better stakeholder management to the debt market. Prior evidence suggests that involvement in CSR activities might help firms achieve a lower cost of capital (Dhaliwal et al., 2011; El Ghoul et al., 2011; Cheng et al., 2014). These studies argue that since CSR decreases information asymmetry and provides a signal of strong commitment to serving stakeholders' interests, external capital providers would consider the socially responsible firms as less risky and eventually would offer capital at a low cost to these firms. On the other hand, since following deregulation the banks compete by offering credit at low costs, firms can get access to the credit market with relatively less effort in the presence of a greater supply of credit. Consequently, firms would have less

pressure in attaining capital and thereby a decreased level of incentive to use CSR as a signal of better stakeholder management to the creditors.

Third, even if we consider the argument based on stakeholder management view that CSR helps a firm stand out from the rivals by showing its loyalty to other stakeholders, in the short run CSR as a strategy is very costly (Freeman, 1984; Berman et al., 1999; Hillman and Keim, 2001). Specifically, the increased level of competition following bank deregulation would likely create an immediacy among firms to compete with each other by adopting more short-term oriented strategies and by cutting expenditures in long-term based investments.

Therefore, based on our discussion above, we hypothesize that following bank deregulation, the non-financial firms, on average, are likely to decrease their CSR activities.

## 3. Methodology

### 3.1. Sample Selection

We start with the sample of firms included in the Compustat Annual database for the period of 1991 to 2005. Then we exclude firms that operate in financial industries (SIC between 6000 and 6999), utility industries (SIC between 4900 – 4999), and firms for which information on headquarter location is not available in Compustat. We require the firms to have available information on the measures of corporate social responsibility, which we collect from the KLD database. We also require the firms to have enough information to calculate control variables. Our final sample consists of 14,037 observations with 4,792 unique firms.

### 3.2. Measure of Corporate Social Responsibility

Our measure of corporate social responsibility (CSR) scores is based on a database originally developed by Kinder, Lydenberg, Domini Research & Analytics, Inc. (KLD), which is

now run by Morgan Stanley Capital International (MSCI). KLD provides CSR ratings from 1991 of approximately 650 US companies, consisting of S&P 500 and Domini 400 Social SM Index companies. Later, from 2001 to 2002, KLD increased its coverage by including the largest 1,000 U.S. companies, and since 2003 the coverage expanded to the largest 3,000 U.S. companies.

Our paper focuses on five key categories of CSR activities in the KLD: Employee, Corporate Governance, Community, Environment, and Product Quality (Appendix A). Each category has a list strengths and concerns. A firm gains one point if it performs positively on a strength and loses one point if it takes negative action on a concern indicator. Our main dependent variable is Net CSR Score, which is the difference between the sum of strengths and the sum of concerns across all five categories.

### 3.3. Measure of Bank Deregulation

Intrastate and interstate banking restrictions have existed in the United States since the 1900's. Interstate banking was restricted by the McFadden Act of 1927, whereas intra-state expansion was restricted by state-level regulations. The Douglas Amendment to the 1956 Bank Holding Company was adopted to prevent the expansion across state borders by banks that circumvented regulations by forming multi-bank holding companies in states where expansion was not permitted. By 1992, many states had begun relaxing the restrictions by allowing out-of-state banks to buy in-state banks, but the restrictions were lifted by the Interstate Banking and Branching Efficiency Act of 1994 (IBBEA). However, the IBBEA contained provisions that granted states the right to block branch expansions. The following are the provisions that states could use to set restrictions on interstate branching: (1) the minimum age of the target institution, (2) de novo interstate branching, (3) a statewide deposit cap of less than 30%, and (4) the acquisition of individual branches.

The first provision under the IBBEA allows states to set their own minimum age requirements with respect to how long a bank must have been in existence prior to its acquisition in an interstate bank merger with a requirement that the age can't be more than 5 years.

The second provision that can be used to block or stall interstate expansion is to only permit de novo interstate branching if a state expressly "opts-in."

The third provision states that an interstate merger transaction cannot involve the acquisition of a branch (or branches) of a bank without the acquisition of the entire bank, unless the state in which the branch is located "opts-in" such a purchase.

In the fourth provision, IBBEA specifies a statewide deposit concentration limitation that was initially set at 30% with respect to interstate mergers that constitute an initial entry of a bank within a state's boundaries. States have the discretion to increase or decrease the cap.

Some states took advantage of these provisions by forbidding out-of-state banks from opening new branches or acquiring existing ones within their state boundaries. This takes us to the work of Rice and Strahan (2010). The authors created a deregulation index that rates the level of interstate branching restrictions based on the IBBEA. We will follow a similar index used by Krishnan (2014). The index values range from five to one. Five is used for a state that hasn't placed any IBBEA restrictions to prevent expansion. Then one is subtracted for each implemented IBBEA restriction. Since there are four restrictions in a state's arsenal to prevent out-of-state expansion, the least restricted state scores a five (no restrictions), while the most restricted state scores a one (four restrictions). In other words, five represents the most deregulated level of restrictions for a state and one represents the least deregulated level. The level of deregulation is increasing with the

value of the index. Zero is reserved for all the years prior to interstate bank branching deregulation. Bank branching laws and implementation dates are reported in Appendix A.

## 4. Findings

### 4.1. Descriptive Statistics

Table 1 shows that mean and median value of Deregulation index is 2.07 and 2, respectively. Note that a state is more deregulated with a higher value of deregulation index. The mean of the Herfindahl-Hirshman Index (HHI) which measures market concentration is .057 and the standard deviation is .050. Return on assets (ROA), a measure of how efficiently a company can manage it assets to produce profits during a period, has a mean of .032 and a standard deviation of .112. We observe that the average value of net CSR score is -0.306. Since net CSR score is the difference between total strengths and total concerns across five categories considered in this study, a negative net score indicates that CSR concerns are more powerful as a culture in a company that CSR strengths. Although median value of net CSR score as 0.00 suggests that out sample is less likely to be biased by an overwhelming number of firms with high positive CSR score or firms with negative CSR score.

**Table 1: Descriptive Statistics**

This table provides descriptive statistics of key firm characteristics and CSR variables. Deregulation index is Rice and Strahan's (2010) index of IBBEA deregulation, where the value of the variable ranges from 1 to 5 with 1 indicating the least and 5 indicating the most deregulated state. HHI represents Hirschman-Herfindahl index of sales, Leverage is total debt over total assets, ROA is return on assets as net income over total assets, Sales Growth is annual sales growth of firm-year, Size is natural logarithm of total assets. Net CSR score is difference between total strengths and total concerns across five categories (Community, Corporate Governance, Employee, Environment, and Product Quality). Net Community Score is the difference between strengths and concerns of the category of community. Other individual categories' net scores are calculated the same way.

| Variable | N | Mean | Median | Std Dev | 1st Pctl | 99th Pctl |
|---|---|---|---|---|---|---|
| Deregulation index | 14,037 | 2.703 | 2.000 | 1.593 | 1.000 | 5.000 |
| HHI | 14,037 | 0.057 | 0.039 | 0.050 | 0.010 | 0.287 |
| leverage | 14,037 | 0.230 | 0.207 | 0.197 | 0.000 | 0.895 |
| ROA | 14,037 | 0.032 | 0.039 | 0.112 | -0.511 | 0.254 |
| Sales Growth | 14,037 | 0.146 | 0.091 | 0.304 | -0.535 | 1.766 |
| Size | 14,037 | 7.577 | 7.502 | 1.769 | 3.761 | 12.175 |
| Net CSR Score | 14,037 | -0.306 | 0.000 | 1.769 | -6.000 | 4.000 |
| Net Community Score | 14,037 | 0.149 | 0.000 | 0.623 | -1.000 | 2.000 |
| Net Corp. Gov. Score | 14,037 | -0.157 | 0.000 | 0.658 | -2.000 | 1.000 |
| Net Employee Score | 14,037 | -0.028 | 0.000 | 0.830 | -2.000 | 2.000 |
| Net Environment Score | 14,037 | -0.122 | 0.000 | 0.725 | -3.000 | 1.000 |
| Net Prod. Qual. Score | 14,037 | -0.147 | 0.000 | 0.636 | -2.000 | 1.000 |

Furthermore, among five categories of CSR activities, we find that only net community score shows an average value that is positive.

### 4.2 Regression Analysis

In our multivariate analysis, we first check how bank deregulation affects overall CSR activities of the firms. Using net CSR score as the dependent variable, in column 1 of Table 2, we find that the coefficient of *Deregulation index* is -0.073, which is significant at 1% level. The results suggest that an increase in deregulation significantly reduces a firm's CSR initiatives. Note that the model used in column 1 does not include any control variables. Next, in column 2, we examine the relationship between bank deregulation and CSR after controlling for HHI, Leverage, ROA, Sales

growth, and Size. We find that the coefficient of Deregulation index is negative and statistically significant at 5% level.

Finally, since practices of CSR could be influenced by local or state-wide business environment, and by industry affiliation, we control for both state and industry fixed effects in column 3. We find that the coefficient of Deregulation index is -0.195, which is statistically significant at 1% level. Nonetheless, compared to the results in columns 1 and 2, the result of column 3 seem highly economically significant, indicating a very strong negative relationship between financial market deregulation and CSR practices of nonfinancial firms.

Column (3) of Table 2 shows that the coefficient of IBBEA_Deregulation is highly negative and statistically significant at 1% level. The results imply that CSR activities decrease when banking market becomes more deregulated or more competitive. This is in line with our hypothesis. We argue that increased bank competition might reduce CSR because more product market competitive pressure from more accessible credit make firms more concerned about shareholder value maximization. This is in line with the shareholder theory. Friedman (1962) argues that social responsibility wasn't the duty of a corporation. He explains that in a free economy, "there is one and only one social responsibility of business—to use its resources and engage in activities designed to increase its profits so long as it stays within the rules of the game, which is to say, engages in open and free competition without deception or fraud."

**Table 2: Deregulation's Effect on CSR**

This table provides the regression results of the effect of interstate bank branching deregulation on CSR. The dependent variable is Net CSR score, which is the difference between total strengths and total concerns across five categories (Community, Corporate Governance, Employee, Environment, and Product Quality). Deregulation index is Rice and Strahan's (2010) index of IBBEA deregulation, where the value of the variable ranges from 1 to 5 with 1 indicating least and 5 indicating most deregulated state. HHI represents Hirschman-Herfindahl index of sales, Leverage is total debt over total assets, ROA is return on assets as net income over total assets, Sales Growth is annual sales growth of firm-year, Size is natural logarithm of total assets.

| | (1) | (2) | (3) |
|---|---|---|---|
| Deregulation index | -0.073*** | -0.070** | -0.195*** |
| | (0.021) | (0.025) | (0.033) |
| HHI | | -1.810*** | -2.419*** |
| | | (0.163) | (0.439) |
| Leverage | | -0.331*** | -0.055 |
| | | (0.072) | (0.065) |
| ROA | | 1.153*** | 1.218*** |
| | | (0.198) | (0.195) |
| Sales growth | | -0.002 | 0.077 |
| | | (0.063) | (0.055) |
| Size | | -0.198*** | -0.246*** |
| | | (0.017) | (0.019) |
| State fixed effects | No | No | Yes |
| Industry fixed effects | No | No | Yes |
| Observations | 14,037 | 14,037 | 14,037 |
| Adjusted R-squared | 0.004 | 0.052 | 0.168 |

In Table 3 we examine net score separately for each category. We find that except for Environment, the results of the other four categories confirm out main finding. With increased deregulation and in turn competition, we show negative relationships between IBBEA_Deregulaiton and the following CSR components: Employee (statistically significant at the 5% level), Corporate Governance (statistically significant at the 1% level), Community (statistically significant at the 1% level), and Product Quality (statistically significant at the 1% level) The Employee component of CSR.

**Table 3: Deregulation and Net Strength of Each Component of CSR**

This table provides the regression results of interstate bank branching deregulation's effect on CSR separately for each category (Employee, Corporate Governance, Community, Environment, and Product Quality). Deregulation index is Rice and Strahan's (2010) index of IBBEA deregulation, where the value of the variable ranges from 1 to 5 with 1 indicating least and 5 indicating most deregulated state. HHI represents Hirschman-Herfindahl index of sales, Leverage is total debt over total assets, ROA is return on assets as net income over total assets, Sales Growth is annual sales growth of firm-year, Size is natural logarithm of total assets.

| | Employee | Corporate Governance | Community | Environment | Product Quality |
|---|---|---|---|---|---|
| Deregulation index | -0.052** | -0.030*** | -0.069*** | 0.003 | -0.046*** |
| | (0.020) | (0.010) | (0.007) | (0.007) | (0.005) |
| HHI | -1.360*** | -0.186 | -0.086 | -0.301 | -0.487*** |
| | (0.422) | (0.268) | (0.108) | (0.238) | (0.129) |
| Leverage | -0.176*** | 0.059 | -0.123*** | 0.081*** | 0.104*** |
| | (0.048) | (0.051) | (0.023) | (0.021) | (0.024) |
| ROA | 0.750*** | 0.126* | 0.083 | 0.110 | 0.149*** |
| | (0.089) | (0.070) | (0.055) | (0.067) | (0.035) |
| Sales growth | -0.021 | -0.009 | 0.008 | 0.033* | 0.065*** |
| | (0.036) | (0.020) | (0.012) | (0.018) | (0.018) |
| Size | 0.076*** | -0.186*** | 0.087*** | -0.101*** | -0.121*** |
| | (0.011) | (0.017) | (0.007) | (0.014) | (0.007) |
| Observations | 14,037 | 14,037 | 14,037 | 14,037 | 14,037 |
| Adjusted R-squared | 0.0810 | 0.236 | 0.159 | 0.189 | 0.203 |

In Table 4 we examine strengths and concerns separately. The results in panel A and B suggest that it is the decrease of strengths and increase of concerns that result in the drop of net score following deregulation.

**Table 4: Strength Versus Concern of Each CSR Component**

This table separately examines the effect of deregulation on CSR for strengths in Panel A and concerns in Panel B of 5 CSR categories: Employee, Corporate Governance, Community, Environment, and Product Quality. Strengths are positive CSR actions and concerns are negative CSR actions. Deregulation index is Rice and Strahan's (2010) index of IBBEA deregulation, where the value of the variable ranges from 1 to 5 with 1 indicating least and 5 indicating most deregulated state. Control variables: HHI represents Hirschman-Herfindahl index of sales, Leverage is total debt over total assets, ROA is return on assets as net income over total assets, Sales Growth is annual sales growth of firm-year, Size is natural logarithm of total assets.

| Panel A: Strength | | | | | | |
|---|---|---|---|---|---|---|
| | Total Score | Employee | Corporate Governance | Community | Environment | Product Quality |
| Deregulation index | -0.091*** | -0.007 | 0.014*** | -0.054*** | -0.020*** | -0.024*** |
| | (0.023) | (0.011) | (0.004) | (0.006) | (0.004) | (0.003) |
| Control variables | Yes | Yes | Yes | Yes | Yes | Yes |
| State fixed effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Industry fixed effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 14,037 | 14,037 | 14,037 | 14,037 | 14,037 | 14,037 |
| Adjusted R-squared | 0.219 | 0.170 | 0.0809 | 0.238 | 0.182 | 0.124 |
| Panel B: Concern | | | | | | |
| | Total Score | Employee | Corporate Governance | Community | Environment | Product Quality |
| Deregulation index | 0.104*** | 0.045** | 0.045*** | 0.015*** | -0.022*** | 0.022*** |
| | (0.026) | (0.015) | (0.010) | (0.002) | (0.005) | (0.003) |
| Control variables | Yes | Yes | Yes | Yes | Yes | Yes |
| State fixed effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Industry fixed effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 14,037 | 14,037 | 14,037 | 14,037 | 14,037 | 14,037 |
| Adjusted R-squared | 0.379 | 0.0739 | 0.234 | 0.148 | 0.367 | 0.282 |

We argue that increased market competition, following a greater access to external financing through banking deregulation, would make the firms more concerned about shareholder value maximization and less concerned about stakeholder welfare. To examine it directly, in Table 5, we use firm level price-cost margin following the measure of Peress (2010) to observe the deregulation effect on CSR. We predict that negative effect of deregulation should be more prevalent for the firms with low price cost margin or low market power that operate in high profit margin industry or in industry that could attract more entry of firms. Low_PCM is a dummy variable for the firms that fall below the median of quintile ranking of firm level price cost margin.

In column (3) of Table 5, we find that interaction term between IBBEA_Deregulation and Low_PCM is negative and significant.

**Table 5: Market Structure**

This table uses firm level price-cost margin to observe the effect of deregulation on CSR. Low_PCM is a dummy variable for the firms that fall below the median quintile ranking of firm level price cost margin. IBBEA_Deregulation*Low PCM is an interaction term. Deregulation index is Rice and Strahan's (2010) index of IBBEA deregulation, where the value of the variable ranges from 1 to 5 with 1 indicating least and 5 indicating most deregulated state. HHI represents Hirschman-Herfindahl index of sales, Leverage is total debt over total assets, ROA is return on assets as net income over total assets, Sales Growth is annual sales growth of firm-year, Size is natural logarithm of total assets. Net CSR score is difference between total strengths and total concerns across five categories (Community, Corporate Governance, Employee, Environment, and Product Quality).

| | Whole Sample | Low Profit Margin Industry | High Profit Margin Industry |
|---|---|---|---|
| Deregulation index | -0.186*** | -0.167*** | -0.192*** |
| | (0.035) | (0.039) | (0.040) |
| Low PCM | -0.033 | 0.017 | 0.172 |
| | (0.047) | (0.087) | (0.130) |
| Deregulation index* Low PCM | -0.025* | -0.036 | -0.076** |
| | (0.013) | (0.026) | (0.027) |
| Control variables | Yes | Yes | Yes |
| State fixed effects | Yes | Yes | Yes |
| Industry fixed effects | Yes | Yes | Yes |
| Observations | 14,037 | 5,659 | 5,579 |
| Adjusted R-squared | 0.168 | 0.150 | 0.207 |

In Table 6 we create dummy variables for each level of deregulation and examine how the negative effect of deregulation on CSR varies across the different levels of restrictions. The biggest effect on CSR occurs when the deregulation index is equal to 4. The relation is a negative and statistically significant at the 1% confidence level. On the other hand, there is a positive relation, though insignificant, only when IBBEA_Deregulation is at the least deregulated level. Again, the results are in line with our hypothesis.

**Table 6: Level of Deregulation**

This table examines the effect of deregulation on CSR across the different levels of restrictions. Dummy variables are used for each level of deregulation expressed by IBBEA_Deregulation. Deregulation index is Rice and Strahan's (2010) index of IBBEA deregulation, where the value of the variable ranges from 1 to 5 with 1 indicating the least and 5 indicating the most deregulated state.

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Most deregulated | -0.577*** | | | | |
| | (0.125) | | | | |
| Deregulation index_4 | | -0.850*** | | | |
| | | (0.085) | | | |
| Deregulation index_3 | | | -0.491*** | | |
| | | | (0.162) | | |
| Deregulation index_2 | | | | -0.401*** | |
| | | | | (0.112) | |
| Least deregulated | | | | | 0.282 |
| | | | | | (0.179) |
| Control variables | Yes | Yes | Yes | Yes | Yes |
| State fixed effects | Yes | Yes | Yes | Yes | Yes |
| Industry fixed effects | Yes | Yes | Yes | Yes | Yes |
| Observations | 14,037 | 14,037 | 14,037 | 14,037 | 14,037 |
| Adjusted R-squared | 0.156 | 0.157 | 0.154 | 0.154 | 0.152 |

In Table 7 for further robustness tests, we use alternative measure of Net CSR Score. In column (1) we use raw net score reported, rather than actual net score calculated, and column (2) we use net score adjusted for available number of items in a particular year. The results still confirm our main findings.

**Table 7: Alternative Measure of CSR Net Score**

Raw Net Score: each dimension is associated with strengths (positive CSR actions) and concerns (negative CSR actions). If the firm conducts a positive deed (negative deed) listed as a strength (concern) indicator, it gains (losses) one point. The raw KLD CSR score is the sum of five major dimension scores based on strength and concern indicators, with a higher value indicating better social performance. Adjusted Net Score: we construct another CSR measure by dividing the strength and concern scores for each dimension by the respective number of strength and concern indicators to derive adjusted strength and concern scores for that dimension and then taking the difference between the adjusted total strength score and the adjusted total concern score ("adjusted CSR score"). The adjusted CSR score thus gives equal weight to the five dimensions rather than to the individual indictors, mitigating any bias caused by an indicator on the social performance of firms in relatively irrelevant industries.

| | Raw Net Score | Adjusted Net Score |
|---|---|---|
| | (1) | (2) |
| Deregulation index | -0.194*** | -0.045*** |
| | (0.033) | (0.007) |
| Control variables | Yes | Yes |
| State fixed effects | Yes | Yes |
| Industry fixed effects | Yes | Yes |
| Observations | 14,037 | 14,037 |
| Adjusted R-squared | 0.168 | 0.195 |

## 5. Conclusion

We exploit a natural experiment following interstate banking deregulations to analyze the effect of banking competition on CSR. We follow Krishnan's (2014) deregulation index for our competition measure and the database from Kinder, Lydenberg, Domini Research & Analytics, Inc. for our CSR measures. With increased banking deregulation and in turn competition, we show a significant negative relationship between competition and CSR. The results of our analysis suggest that increased bank competition reduces CSR because more product market competitive pressure from more accessible credit makes firms more concerned about the views representing the shareholder theory over the stakeholder theory.

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## Appendix A

## KLD Strength and Concern Items

| KLD category | Strength items | Concern items |
|---|---|---|
| Community | Generous giving<br>Innovative giving<br>Support for housing<br>Support for education<br>Indigenous peoples relations<br>Non-US charitable giving<br>Other strength | Investment controversies<br>Negative economic impact<br>Indigenous peoples relations<br>Other concern |
| Environment | Beneficial products and services<br>Pollution prevention<br>Recycling<br>Alternative fuels<br>Communications<br>Property, plant, and equipment<br>Other strength | Hazardous waste<br>Regulatory problems<br>Ozone depleting chemicals<br>Substantial emissions<br>Agricultural chemicals<br>Climate change<br>Other concern |
| Employee Relations | Strong union relations<br>No layoff policy<br>Cash profit sharing<br>Employee involvement<br>Strong retirement benefits<br>Health and safety strength<br>Other strength | Poor union relations<br>Health safety concern<br>Workforce reductions<br>Pension/benefits<br>Other concern |
| Product Quality | Quality<br>R&D/Innovation | Product safety<br>Marketing/contracting controversy |
| Governance | Political accountability<br>Public policy<br>Transparency<br>Compensation<br>Ownership | Public policy<br>Transparency<br>Compensation<br>Ownership<br>Accounting |

## Appendix B

## Interstate Bank Branching (IBBEA) Laws by State

| State | Effective Date | Age restriction | De novo interstate branching restriction (Yes = State restricts de novo interstate branching) | Individual branch acquisition restriction (Yes = State does not allow acquisition of branches) | Statewide cap on deposits restriction | Reciprocity requirement |
|---|---|---|---|---|---|---|
| Alabama | 5/31/1997 | 5 | Yes | Yes | 30% | No |
| Alaska | 1/1/1994 | 3 | Yes | No | 50% | No |
| Arizona | 8/31/2001 | 5 | Yes | No | 30% | Yes |
| Arizona | 9/1/1996 | 5 | Yes | Yes | 30% | Yes |
| Arkansas | 6/1/1997 | 5 | Yes | Yes | 25% | No |
| California | 9/28/1995 | 5 | Yes | Yes | 30% | No |
| Colorado | 6/1/1997 | 5 | Yes | Yes | 25% | No |
| Connecticut | 6/27/1995 | 5 | No | No | 30% | Yes |
| Delaware | 9/29/1995 | 5 | Yes | Yes | 30% | No |
| DC | 6/13/1996 | No | No | No | 30% | No |
| Florida | 6/1/1997 | 3 | Yes | Yes | 30% | No |
| Georgia | 5/10/2002 | 3 | Yes | Yes | 30% | No |
| Georgia | 6/1/1997 | 5 | Yes | Yes | 30% | No |
| Hawaii | 1/1/2001 | No | No | No | 30% | No |
| Hawaii | 6/1/1997 | 5 | Yes | Yes | 30% | No |
| Idaho | 9/29/1995 | 5 | Yes | Yes | No | Yes |
| Illinois | 8/20/2004 | No | No | No | 30% | Yes |
| Illinois | 6/1/1997 | 5 | Yes | Yes | 30% | No |
| Indiana | 7/1/1998 | 5 | No | No | 30% | Yes |
| Indiana | 6/1/1997 | No | No | No | 30% | Yes |
| Iowa | 4/4/1996 | 5 | Yes | Yes | 15% | No |
| Kansas | 9/29/1995 | 5 | Yes | Yes | 15% | No |
| Kentucky | 3/22/2004 | No | Yes | Yes | 15% | Yes |
| Kentucky | 3/17/2000 | No | Yes | Yes | 15% | No |
| Kentucky | 6/1/1997 | 5 | Yes | Yes | 15% | No |
| Louisiana | 6/1/1997 | 5 | Yes | Yes | 30% | No |
| Maine | 1/1/1997 | No | No | No | 30% | Yes |
| Maryland | 9/29/1995 | No | No | No | 30% | No |
| Massachusetts | 8/2/1996 | 3 | No | No | 30% | Yes |
| Michigan | 11/29/1995 | No | No | No | No | Yes |
| Minnesota | 6/1/1997 | 5 | Yes | Yes | 30% | No |
| Mississippi | 6/1/1997 | 5 | Yes | Yes | 25% | No |
| Missouri | 9/29/1995 | 5 | Yes | Yes | 13% | No |
| Montana | 10/1/2001 | 5 | Yes | Yes | 22% | No |

## Appendix B continued

| | | | | | | |
|---|---|---|---|---|---|---|
| Montana | 9/29/1995 | NA | | | Increases 1% per year from 18% to 22% | No |
| Nebraska | 5/31/1997 | 5 | Yes | Yes | 14% | No |
| Nevada | 9/29/1995 | 5 | Limited | Limited | 30% | No |
| New Hampshire | 1/1/2002 | No | No | No | 30% | Yes |
| New Hampshire | 8/1/2000 | 5 | No | No | 30% | Yes |
| New Hampshire | 6/1/1997 | 5 | Yes | Yes | 20% | No |
| New Jersey | 4/17/1996 | No | Yes | No | 30% | No |
| New Mexico | 6/1/1996 | 5 | Yes | Yes | 40% | No |
| New York | 6/1/1997 | 5 | Yes | No | 30% | No |
| North Carolina | 7/1/1995 | No | No | No | 30% | Yes |
| North Dakota | 8/1/2003 | No | No | No | 25% | Yes |
| North Dakota | 5/31/1997 | No | Yes | Yes | 25% | Yes |
| Ohio | 5/21/1997 | No | No | No | 30% | No |
| Oklahoma | 5/17/2000 | No | No | No | 20% | Yes |
| Oklahoma | 5/31/1997 | 5 | Yes | Yes | 15% | No |
| Oregon | 7/1/1997 | 3 | Yes | Yes | 30% | No |
| Pennsylvania | 7/6/1995 | No | No | No | 30% | Yes |
| Rhode Island | 6/20/1995 | No | No | No | 30% | Yes |
| South Carolina | 7/1/1996 | 5 | Yes | Yes | 30% | No |
| South Dakota | 3/9/1996 | 5 | Yes | Yes | 30% | No |
| Tennessee | 3/17/2003 | 3 | No | No | 30% | Yes |
| Tennessee | 7/1/2001 | 5 | No | No | 30% | Yes |
| Tennessee | 5/1/1998 | 5 | Yes | No | 30% | Yes |
| Tennessee | 6/1/1997 | 5 | Yes | Yes | 30% | Yes |
| Texas | 9/1/1999 | No | No | No | 20% | Yes |
| Texas | 8/28/1995 | N/A | N/A | N/A | 20% | N/A |
| Utah | 4/30/2001 | 5 | No | No | 30% | Yes |
| Utah | 6/1/1995 | 5 | Yes | No | 30% | No |
| Vermont | 1/1/2001 | No | No | No | 30% | Yes |
| Vermont | 5/30/1996 | 5 | Yes | No | 30% | No |
| Virginia | 9/29/1995 | No | No | No | 30% | Yes |
| Washington | 5/9/2005 | 5 | No | No | 30% | Yes |
| Washington | 6/6/1996 | 5 | Yes | Yes | 30% | No |
| West Virginia | 5/31/1997 | No | No | No | 25% | Yes |
| Wisconsin | 5/1/1996 | 5 | Yes | Yes | 30% | No |
| Wyoming | 5/31/1997 | 3 | Yes | Yes | 30% | No |

This table reports the changes in interstate bank branching laws in the United States from 1994 to 2005. This data is from Johnson and Rice (2008). The effective date of the state's implementation of interstate bank branching restrictions allowed under the Interstate Banking and Branching Efficiency Act (IBBEA) is in the first column, with some states having multiple effective dates as they imposed or removed restrictions gradually. The next five columns then report the actual restrictions set by each state as of each effective date.

## Chapter 2. An Empirical Analysis of the Interaction Between Price Stability and Financial Stability: The Case of the Fragile Five

### 1. Introduction

### 1.1. Fragile Five

Economists have been known to use acronyms and coined phrases to identify particular groups of countries that share characteristics based on populations, demographics, geography, and economic outlook. Former Goldman Sachs economist Jim O'Neill coined the acronym BRIC in 2001 to represent the group of emerging markets countries that includes Brazil, Russia, India, and China. These countries were considered great opportunities for foreign expansion and promising investments. O'Neill later used MINT in 2011 to reference another special group of emerging countries that include Mexico, Indonesia, Nigeria, and Turkey. He felt that the countries had very favorable demographics and interesting economic prospects. In 2013, James Lord, a research analyst at Morgan Stanley, used the phrase "Fragile Five" to represent emerging market economies that possessed fragile financial systems and were extremely reliant on foreign investments to cover their current account deficits and finance growth. These factors made them vulnerable to external shocks. Four out of the five countries were previously on the bright-outlook groups of BRIC or MINT. The Fragile Five group initially consisted of the following countries: Turkey, Brazil, India, Indonesia, and South Africa. Columbia and Mexico were considered replacements in the Fragile Five group after the economies of India and Indonesia experienced improvements. Bloomberg (2015) suggested that Russia, Columbia, and Peru should be added to the original list after their economies began to falter. In addition to financial fragilities, Fragile Five countries share volatility in their national currencies, high external debt, and a critically high current account deficit.

### 1.2. Beginning of Fragility

An emerging market economy is a nation's economy that is progressing toward becoming advanced, as shown by some liquidity in local debt and equity markets and the existence of some form of market exchange and regulatory body. Emerging market economies exhibit varying levels of economic growth, inflation, trade and fiscal conditions. BRIC countries were considered the most promising of the emerging markets countries in 2001. MINT was coined in 2011 to represent another group of emerging market economies poised for economic prosperity. In the early stages of the post-crisis recovery, emerging market economies benefited from a supportive external financing environment. Global funding conditions were favorable to emerging market economies, with central banks in advanced economies pursuing accommodative policies, keeping interest rates low and engaging in large-scale asset purchases. Capital flows continued to flow in the direction of emerging market economies. However, the promise of riches changed in the summer of 2013 for some of the emerging markets countries when Ben Bernanke commented that the Federal Reserve would lower the number of assets purchased each month if economic conditions, such as inflation and unemployment, were favorable. This was the start of tapering or gradual winding down of central bank activities used to improve the conditions for economic growth. External funding conditions tightened in anticipation of an increase in US interest rates. “Taper tantrum” resulted when investors panicked in reaction to the tapering news and withdrew their money from the bond market. During this period, China began to change its exchange rate policy which fuelled more uncertainty and financial market volatility. Therefore, a sudden shift in global risk sentiment could pose risks to the economic outlook of emerging markets economies. In May of 2013, speculation about the speed of monetary policy tightening in the United States caused a marked increase in the yield on ten-year US Treasury bonds, which rose by almost 100 basis points between then and the end of the year. Asset prices of emerging market countries fell and some countries’

currencies depreciated quickly. Economies with external fragilities, such as large current account deficits or heavy reliance on external funding, experienced particularly severe financial turmoil.

James Lord, a research analyst for Morgan Stanley, used the phrase Fragile Five to identify the emerging market economies that had become too dependent on unreliable foreign investment to finance their growth pursuits. The group includes Turkey, Brazil, India, South Africa, and Indonesia. The recovery that followed in developed markets drew a lot of capital flows back home and resulted in less foreign direct investment in emerging markets. Many of the emerging market countries' currencies experienced significant weakness and made it difficult to finance current account deficits. The lack of new investments also made it impossible to finance many growth projects, which contributed to a slowdown in their respective economies.

### 1.3. Financial Stability

Financial stability is concerned with the stability of financial institutions as well as the stability of the financial markets in which they operate. Svensson (2014) defined financial stability as "a situation where the financial system can fulfil its three main functions -- transforming saving into financing, providing risk management, and transmitting payments -- with sufficient resilience to disruptions that threaten these functions." The Reserve Bank adds that for financial institutions to be considered stable, they must have "sufficient liquidity to manage operations and volatility in normal periods." The Reserve Bank suggests that market are stable when positive economic consequences can be experienced throughout certain levels of volatility. A primary goal considering the recent global economic crisis, is to avoid these crises in the future. The ability to manage systemic financial risk goes far as one of the necessary objectives in avoiding crises. Private risk management is the channel through which this can be accomplished by market participants. The responsible authority, the central bank or a financial supervisory authority

depending on the country, can manage the risk through market surveillance and banking supervision.

The instruments that can be used varies depending on whether the economy is under normal circumstances or crises circumstances. According to Svensson (2014), the instruments during normal times include supervision, regulation and communication, including capital and liquidity requirements, loan-to-value (LTV) caps, and financial stability reports. In crisis times, lender of last resort, variable rate lending at longer maturities (credit easing), guarantees, bank resolution, capital injections, asset purchases, etc.

### 1.4. Inflation Targeting

Tight monetary policies were adopted by central banks in order to overcome the economic downturn during the 1970s. Inflation targeting was adopted by many central banks as a practical answer to the failing monetary policies, such as money growth targeting, exchange rate targeting, or currency pegging. In December 1989, New Zealand became the first country to adopt inflation targeting as a monetary policy strategy. In the 1990s, inflation targeting was mainly adopted by advanced countries like Canada, the United Kingdom, Australia, Sweden and others. More recently several emerging and developing economies, including Fragile Five countries, followed suit: Brazil and Columbia in 1999, South Africa in 2000, Mexico in 2001, Peru in 2002, Indonesia in 2005, and Turkey in 2006. Inflation targeting became a key part in laying the groundwork for the Great Moderation, the period from the mid-1980s to 2007, which was characterized by low and relatively stable inflation.

However, the emergence of the global financial crisis in 2008 was reason enough for policy makers to determine that monetary policy strategies needed to be revised. The central banks must now pay closer attention to financial stability in their monetary policy responsibilities. During this

period, central banks were given mandates to preserve price stability and the autonomy to accomplish the pursuit.

## 2. Theoretical Background

### 2.1. Monetary and Financial Policies

Svensson (2012) explains that the core objective of monetary policy is price stability. Inflation should be stabilized around an inflation target and the employment of resources should be around a tenable level. The following are additional required tasks of inflation targeting: the medium-term target for inflation should be announced, policy objectives should be stated, transparency should be applied in the actions of the central bank. The appropriate instruments during non-crisis periods are the policy rate and communication which includes published accounts of inflation forecasts, the real economy, and the policy rate. In more dire cases like the recent financial crisis, unconventional methods may be adapted: modification of the size and makeup of central bank assets, fixed rate lending at longer maturities, and foreign exchange intervention. The goal of financial policy is to maintain and promote financial stability. The instruments during normal periods are supervision, capital and liquidity requirements, and financial stability reports. The instruments under crisis times are lending of last resort, variable rate lending at longer maturities, special resolution regimes for insolvent financial firms, government lending guarantees, and government capital injections.

### 2.2. Price and Financial Stability Relation

A correlation between financial and price stability that is constituted in the monetary view holds that the unexpected inflation resulting from increases or decreases in the money supply may

lead to banking panics. The financial fragility view holds that in periods of economic booms, confidence and leverage increase which in turn leads to an increase in over-indebtedness.

According to Borio et al. (2000), a monetary regime that produces aggregate price stability will, as a by-product, tend to promote stability of the financial system. This is called the conventional wisdom or the Schwarz hypothesis. It is common knowledge that inflation rate volatility could cause chaos in the financial system. Defaults are more likely when the real value of outstanding debt increases because of unexpected declines in inflation. This situation is further exacerbated during monetary contractions and other restrictive fiscal policies. Financial stability is also threatened in a high inflation environment when the setting is ideal for increased asset acquisitions and misallocation of resources. According to Schwartz 1995, central banks are primarily assigned the price stability objectives and only implicitly the financial stability objective. Bordo et al. (2001) concluded that there was a positive relationship between price and financial stability. The authors also concluded that unexpected increases in inflation and price levels have led to financial instability. The evidence in Woodford (2011) supports the conventional wisdom. He found that impacts by monetary policy on price and financial stability were in the same direction. The recent financial crisis has of course lessened the confidence in the conventional wisdom view. Blot et al. (2015) examined A.J. Schwarz's "conventional wisdom" that price stability would yield financial stability. The authors reject the hypothesis that price stability is positively correlated with financial stability and that the correlation is stable over time. Svensson (2012) advises that monetary policy should be conducted taking financial policy into account, and financial policy should be conducted taking monetary policy into account. When disruptions subject financial markets to unusually strong selling pressures, NYSE specialists and NASDAQ market makers typically lean against the wind by absorbing the markets' selling pressure and creating liquidity: they buy large quantities of assets and build up inventories when selling pressure

in the market is large; then dispose of those inventories after that selling pressure has subsided. The Federal Reserve as the nation's monetary authority pursues an activist, countercyclical monetary policy. When the Fed perceives economic activity to be waning, it attempts to boost output and employment by increasing the supply of money, thereby putting downward pressure on interest rates and stimulating growth in such interest-sensitive sectors as housing and consumer durables.

When the Fed perceives inflation to be accelerating it does the opposite – it restricts the growth of money, which tends to put upward pressure on interest rates and ease inflationary pressures.

Before the global financial crisis, numerous central bankers felt that financial stability considerations should not have a part in monetary policy decisions. Woodford (2011) explained several reasons why the two policies should remain distinct. One reason is that crises situations are too unpredictable to prevent. Another reason for keeping financial stability attention away from monetary policymaking is because of the uncertainty of the effectiveness of monetary policy on financial stability risks. In the short-term, interest rate adjustments made by the central bank have only a small effect on the stock-market unless the changes in monetary policy were severe. The third reason is that monetary policy may not be the best tool available for financial stability. Better tools would include supervisory policy, regulatory policy, or macro-prudential policy.

The financial crisis brought on the new difficult challenge of finding an appropriate level of consideration of monetary policy on the objectives of financial stability. IMF (2013) explained a view that combines monetary policy and macroprudential policies to focus on countercyclical management: monetary policy would target price stability, macroprudential policy would focus on financial stability, and microprudential policy would focus on the safety and soundness of individual financial institutions.

The uncertainty brought on by the arguments and debates of these authors has inspired us to find out the relationship between price stability and financial stability. Do the instruments used to stabilize the objective of one policy affect the objectives of the other policy? If so, how are the objectives affected?

## 3. Methodology

### 3.1. Data and Variables

The relation between financial stability and price stability is measured in two steps for the fragile five countries. In the first step, we investigate the causation linkage between price and financial stability indicators. In the second step, we try to measure the effects of monetary policy tools employed by the central bank of each country. The policy tools are lending rate and required reserve ratio for financial stability and policy rate for price stability.

Stability of the financial system has been defined by numerous institutions and prepared indexes covering different parts of the financial sector. According to IMF (2003), ingredients of the index might be different for advanced and emerging market economies. Although the index for advanced economies includes institutions other than banks, the banking system is the most crucial part of the whole system. The classification and indexation methods are based on this explanation. So, we employ four sub-indicators to build up the financial stability index (FSI). These are asset quality rate, liquidity rate, capital adequacy rate, earnings and profitability rates. Each sub-indicator is measured by two ratios listed in Table 1. The financial stability index is constituted by the average of four sub-indicators. The weight of each sub-indicator is the same. An increase in the liquidity rate, profitability rate, and capital adequacy rate affects financial stability positively. This means an increase in one of them induces an increase in FSI. On the other hand, asset quality rate measures mainly the size of non-performing loans (NPL) in the system. The higher the value for

asset quality rate, the higher is the credit risk. That is why if the asset quality ratio increases, that means the size of NPL increases and the stability of financial system declines. In the end, an increase (decrease) in the financial stability index means that the stability of the financial system improves (worsens).

**Table 1: List of Financial Stability Indicators**

| Indicator | Abbreviation | Definition / Ratio | Coefficient |
|---|---|---|---|
| **Asset Quality Rate** | aqrate | Non-performing Loans Net of Provisions to Capital | 0.50 |
| | | Non-performing Loans to Total Gross Loans | 0.50 |
| **Liquidity Rate** | lrate | Liquid Assets to Total Assets (Liquid Asset Ratio) | 0.50 |
| | | Liquid Assets to Short Term Liabilities | 0.50 |
| **Profitability Rate** | prate | Return on Equity | 0.50 |
| | | Return on Assets | 0.50 |
| **Capital Adequacy Rate** | csrate | Regulatory Capital to Risk-Weighted Assets | 0.50 |
| | | Regulatory Tier 1 Capital to Risk-Weighted Assets | 0.50 |
| **Financial Stability Index** | FSI | Average of four sub-indicators | |

In order to measure price stability, we employ inflation gap instead of actual inflation rate. The reason is that central banks target a certain inflation rate annually or for a period which means the banks do not aim to reach a zero-point inflation rate. In this regard, the difference between actual inflation and the inflation target meets the price stability objective, even though the gap might be negative. The inflation target of Brazil, South Africa, Colombia, Mexico and Peru are 4.5%, 6%, 3%, 3% and 2%, respectively. On the other hand, The Central Bank of Republic of Turkey announces the target annually and it has been modified according to economic conditions.

In this regard, it varies between 4-8%. Similarly, the inflation target varies in Indonesia between 4-5%.

In the first step, we employ both time series and panel data methods to find the possible linkage between price and financial stability indexes. The bootstrap based Toda-Yamamoto causality method developed by Hatemi-J (2007) and the asymmetric causality method developed by Hatemi-J and Roca (2014) are employed. Also, we employ Emirmahmutoglu (2011) panel causality method to test causality between indexes.

In the second step, we investigate the effectiveness of each policy tool employed to achieve price and financial stability objectives and employ both time series and panel data methods. To determine the possible effects of each instrument, we investigate the following equation that includes inflation gap and the financial stability index using their lags. We use ***i*** to connote policy rate, ***rrr*** to connote reserve requirements ratio, ***lend*** to connote lending rate, and ***infgap*** to connote gap between actual inflation rate and target:

$$Policy\,tool_t = a_0 + \sum_{i=1}^{k} a_{1i} i_{t-i} + \sum_{j=k+1}^{d} a_{2j} i_{t-j} + \sum_{i=1}^{k} \beta_{1i} \inf gap_{t-i} + \sum_{j=k+1}^{d} \beta_{2j} \inf gap_{t-j} + \sum_{i=1}^{k} \delta_{1i} FSI_{t-i} + \sum_{j=k+1}^{d} \delta_{2j} FSI_{t-j} + \varepsilon_{1t}.$$

We use two main data sources which are both published by International Monetary Fund. The financial stability index data is collected from Financial Soundness Indicators, whereas the data of each policy instrument and inflation rate are collected from International Finance Statistics. The inflation target for each country is collected from the website of each central bank. Table 2 presents the time span for each country.

**Table 2: Time Span**

| | |
|---|---|
| Brazil | 2005Q1-2016Q1 |
| Turkey | 2007Q2-2015Q4 |
| Indonesia | 2011Q4-2016Q1 |
| South Africa | 2008Q1-2016Q1 |
| Mexico | 2005Q1-2015Q4 |
| Peru | 2010Q4-2016Q1 |
| Colombia | 2005Q1-2016Q1 |

### 3.2. Interaction Between Policy Objectives, Time Series Analysis

In the first step, it is helpful to present descriptive statistics to understand the nature of the series pertaining to each country's variables. Data for variables are obtained from International Financial Statistics. The descriptive statistics of variables are reported in Table 3. Data characteristics are slightly different in each country. According to the results, the standard deviation of financial stability in Brazil are high compared to others. On the other hand, inflation gap deviates in South Africa and Turkey. When we look at the skewness coefficients, the inflation gap series skewed to left for all countries except Turkey. Financial stability index series are skewed to left for all countries except Turkey, South Africa, and Indonesia. Kurtosis coefficients show that the financial stability series for Brazil and Mexico are steep. The other series are considerably flat. The Jarque and Bera normal distribution test results confirm the alternative hypothesis claiming abnormal distribution for financial stability index in Brazil and Mexico and inflation gap in South Africa. The rest of variables have normal distribution.

**Table 3: Descriptive Statistics**

| Country | Date | Variables | Mean | Std.Dev. | Coef. of Var. | Skewness | Kurtosis | Jarque-Bera |
|---|---|---|---|---|---|---|---|---|
| **Brazil** | 2005Q1-2016Q1 | **Fsi** | 51.821 | 22.361 | 0.431 | 4.384 | 25.898 | 1127.2 (0.00)*** |
| | | **infgap** | 1.404 | 1.652 | 1.176 | 0.741 | 3.770 | 5.239 (0.07)* |
| **Colombia** | 2005Q1-2016Q1 | **Fsi** | 47.425 | 7.207 | 0.151 | 0.682 | 2.892 | 3.513 (0.172) |
| | | **infgap** | 1.159 | 1.658 | 1.430 | 0.505 | 2.381 | 2.636 (0.267) |
| **Indonesia** | 2011Q4-2016Q1 | **Fsi** | 47.081 | 4.946 | 0.105 | -0.425 | 2.157 | 1.074 (0.584) |
| | | **infgap** | 1.297 | 1.600 | 1.233 | 0.193 | 1.380 | 2.07 (0.353) |
| **Mexico** | 2005Q1-2015Q4 | **Fsi** | 50.256 | 11.322 | 0.225 | 2.357 | 10.766 | 151.35 (0.00)*** |
| | | **infgap** | 1.022 | 0.841 | 0.822 | 0.790 | 3.902 | 6.072 (0.04)** |
| **South Africa** | 2008Q1-2016Q1 | **Fsi** | 64.468 | 9.151 | 0.141 | -0.267 | 2.237 | 1.193 (0.55) |
| | | **infgap** | 0.258 | 2.312 | 8.961 | 1.556 | 5.033 | 19.002 (0.00)*** |
| **Turkey** | 2007Q2-2015Q4 | **Fsi** | 41.687 | 8.755 | 0.210 | -0.087 | 2.362 | 0.638 (0.726) |
| | | **infgap** | 2.786 | 2.347 | 0.842 | -0.265 | 2.955 | 0.414 (0.813) |
| **Peru** | 2010Q4-2016Q1 | **Fsi** | 45.941 | 2.802 | 0.060 | 0.417 | 1.985 | 1.584 (0.452) |
| | | **infgap** | 1.321 | 0.663 | 0.501 | 0.209 | 2.254 | 0.670 (0.715) |

**Notes:** Coefficient of variation is the ratio of standard deviation to mean. The figures ***, **, * show 1%, 5% and 10% significance levels, respectively.

We need to determine whether unit roots are present in the time series prior to the VAR and VAR based causality testing. To do so, we use the Augmented Dickey-Fuller (1979 and 1981) and Phillips-Perron (1988) tests. Results are presented in Table 4.

**Table 4: Unit Root Test Results**

| Levels | Country | Vrb. | ADF | PP | First-Differences | Country | Vrb. | ADF | PP |
|---|---|---|---|---|---|---|---|---|---|
| **Intercept** | **Brazil** | **fsi** | -4.568 (0) [0.00]*** | -4.651 (3) [0.00]*** | **Intercept** | **Brazil** | **fsi** | -11.142 (0) [0.00]*** | -41.401 (42) [0.00]*** |
| | | **infgap** | -1.790 (1) [0.380] | -0.984 (3) [0.750] | | | **infgap** | -4.025 (0) [0.00]*** | -4.072 (2) [0.00]*** |
| | **Colombia** | **fsi** | -1.472 (3) [0.537] | -3.007 (10) [0.041]** | | **Colombia** | **fsi** | -9.285 (2) [0.00]*** | -20.063 (12) [0.00]*** |
| | | **infgap** | -1.870 (1) [0.342] | -1.503 (3) [0.522] | | | **infgap** | -3.241 (0) [0.024]** | -3.317 (3) [0.020]** |
| | **Indonesia** | **fsi** | 0.600 (2) [0.984] | -0.598 (9) [0.846] | | **Indonesia** | **fsi** | -4.333 (1) [0.00]*** | -5.093 (15) [0.00]*** |
| | | **infgap** | -2.045 (0) [0.266] | -2.045 (0) [0.266] | | | **infgap** | -4.092 (3) [0.00]*** | -3.650 (1) [0.016]** |
| | **Mexico** | **fsi** | -2.799 (0) [0.066]* | -2.679 (3) [0.085]* | | **Mexico** | **fsi** | -9.338 (0) [0.00]*** | -11.856 (9) [0.00]*** |
| | | **infgap** | -2.563 (7) [0.109] | -2.017 (4) [0.278] | | | **infgap** | -4.051 (3) [0.00]*** | -7.211 (4) [0.00]*** |
| | **South Africa** | **fsi** | -2.115 (0) [0.240] | -2.310 (4) [0.175] | | **South Africa** | **fsi** | -4.501 (0) [0.04]** | -4.431 (1) [0.41]** |
| | | **infgap** | -4.215 (3) [0.00]*** | -1.918 (2) [0.319] | | | **infgap** | -4.123 (0) [0.00]*** | -4.140 (3) [0.00]*** |
| | **Turkey** | **fsi** | -1.061 (0) [0.719] | -1.035 (3) [0.729] | | **Turkey** | **fsi** | -5.875 (0) [0.00]*** | -5.880 (3) [0.00]*** |
| | | **infgap** | -2.127 (4) [0.235] | -2.207 (6) [0.207] | | | **infgap** | -6.015 (3) [0.00]*** | -4.558 (9) [0.00]*** |

**Table 4 continued**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Peru | fsi | -1.995 (0) [0.286] | -1.887 (2) [0.331] | | Peru | fsi | -4.093 (1) [0.00]*** | -6.340 (5) [0.00]*** |
| | | infgap | -0.670 (4) [0.828] | -2.079 (2) [0.253] | | | infgap | -5.909 (3) [0.00]*** | -3.476 (2) [0.020]** |
| Trend and Intercept | Brazil | fsi | -6.587 (0) [0.00]*** | -6.587 (0) [0.00]*** | Trend and Intercept | Brazil | fsi | -11.005 (0) [0.00]*** | -40.900 (42) [0.00]*** |
| | | infgap | -3.655 (1) (0.036)** | -2.096 (2) [0.533] | | | infgap | -4.507 (0) [0.00]*** | -4.588 (1) [0.00]*** |
| | Colombia | fsi | -2.629 (3) [0.270] | -6.039 (10) [0.00]*** | | Colombia | fsi | -9.224 (2) [0.00]*** | -20.904 (12) [0.00]*** |
| | | infgap | -1.470 (1) [0.824] | -0.951 (3) [0.940] | | | infgap | -3.415 (0) [0.062]* | -3.485 (3) [0.053]* |
| | Indonesia | fsi | -2.778 (3) [0.226] | -3.005 (16) [0.159] | | Indonesia | fsi | -5.730 (1) [0.00]*** | -7.148 (10) [0.00]*** |
| | | infgap | -1.643 (0) [0.731] | -1.643 (0) [0.731] | | | infgap | -6.225 (3) [0.00]*** | -3.779 (2) [0.046]** |
| | Mexico | fsi | -4.134 (0) [0.011]** | -4.184 (3) [0.010]** | | Mexico | fsi | -9.215 (0) [0.00]*** | -11.681 (9) [0.00]*** |
| | | infgap | -3.572 (7) [0.046]** | -2.249 (4) [0.451] | | | infgap | -4.161 (3) [0.011]** | -7.174 (3) [0.00]*** |
| | South Africa | fsi | -4.179 (0) [0.015]** | -3.643 (2) [0.041]** | | South Africa | fsi | -2.403 (0) [0.370] | -2.403 (0) [0.370] |
| | | infgap | -3.698 (3) [0.038]** | -1.584 (2) [0.776] | | | infgap | -4.429 (0) [0.00]*** | -4.380 (2) [0.00]*** |
| | Turkey | fsi | -2.447 (0) [0.350] | -2.556 (3) [0.301] | | Turkey | fsi | -5.157 (6) [0.00]*** | -5.792 (3) [0.00]*** |
| | | infgap | -2.212 (4) [0.465] | -2.075 (6) [0.540] | | | infgap | -6.287 (3) [0.00]*** | -4.426 (9) [0.00]*** |
| | Peru | fsi | -3.070 (0) [0.138] | -3.060 (1) [0.140] | | Peru | fsi | -3.997 (1) [0.027]** | -6.482 (5) [0.00]*** |
| | | infgap | -0.343 (4) [0.980] | -2.078 (2) [0.527] | | | infgap | -6.608 (3) [0.00]*** | -3.367 (2) [0.084]* |

**Notes:** The figures ***, **, * show 1%, 5% and 10% significance levels, respectively.
For the ADF test: The figures in parenthesis denote the results of Dickey Fuller test in the case of zero lag length and lag length chosen due to SIC criteria. For the ADF test, the Mac Kinnon (1996) critical values for constant -3.485, -2.885, -2.579 at the 1%, 5% and 10% levels. The critical values for constant and trend are -4.035, -3.447 and -3.148 at the 1 %, 5 % and 10 % levels, respectively.
For the PP test: Values in the parenthesis show bandwidths obtained according to Newey-West using Bartlett Kernel criteria. For the PP test Mac Kinnon (1996) critical values for constant -3.483, -2.884, -2.579 at the 1%, 5% and 10% levels. The critical values for constant and trend -4.033, -3.446 and -3.148 at the 1% 5% and 10% levels, respectively.

According to ADF and PP unit root tests results, it is certain that financial stability and inflation gap are stationary in their first difference for all countries. Accordingly, the maximum integration order (d) of the variables equals one in the Toda Yamamoto (TY hereafter) procedure and the series in the first difference will be used in the other causality test. We use Schwartz Information Criteria (SIC) to select lag lengths for Brazil, Indonesia and South Africa (2), Colombia and Turkey (3), Mexico and Peru (4) as the order of VAR.

**Table 5. Linear TY Granger Causality Test**

| FSI does not Granger cause of infgap | | | | | Infgap does not Granger cause of fsi | | | |
|---|---|---|---|---|---|---|---|---|
| **Countries** | **Statistics** | **1%** | **5%** | **10%** | **Statistics** | **1%** | **5%** | **10%** |
| **Brazil** | 0.477 (0.787) | 20.573 | 13.675 | 11.286 | 3.601 (0.165) | 18.999 | 12.609 | 10.188 |
| **Colombia** | 2.478 (0.479) | 19.111 | 13.023 | 10.659 | 3.072 (0.380) | 20.204 | 13.433 | 10.630 |
| **Indonesia** | 1.372 (0.848) | 311.252 | 65.810 | 31.743 | 76.208 (0.00)*** | 418.577 | 68.994** | 33.874* |
| **Mexico** | 1.186 (0.756) | 10.501 | 6.587 | 4.945 | 3.606 (0.307) | 10.605 | 6.612 | 5.013 |
| **South Africa** | 16.224 (0.00)*** | 19.001 | 12.121** | 9.315* | 3.241 (0.518) | 18.814 | 11.920 | 9.262 |
| **Turkey** | 4.124 (0.389) | 18.564 | 11.948 | 9.272 | 2.303 (0.680) | 17.133 | 11.191 | 8.745 |
| **Peru** | 2.164 (0.338) | 14.148 | 7.809 | 5.674 | 3.146 (0.270) | 15.023 | 8.467 | 6.043 |

**Notes:** The figures ***, **, * show 1%, 5% and 10% levels, respectively. Brackets denote results of asymptotic TY. The SIC was used to determine the optimal lag lengths for VAR (p+d) models. Bootstrap critical values are obtained from 10,000 replications.

According to results obtained from TY Granger causality test shown in Table 5, there is no causation linkage between variables in Brazil, Colombia, Mexico, Turkey and Peru. The results for five of seven claim that there is no guarantee about the stable financial system, even if the price stability is achieved. That is the opposite of the classical view. On the other hand, uni-directional causality running from financial stability to price stability exists in South Africa. That means a change in the financial environment of South Africa would influence the inflation rate. Moreover, empirical findings indicate that the inflation gap is effective on financial stability in Indonesia. This is consistent with the implications of Schwartz (1995).

Another causality test technique we employ is the Breitung and Candelon's (2006) causality analysis which offers a way to decompose the causality test statistic into different frequencies. We calculate the test statistics at a high frequency of $\omega_i = 2.5$ and $\omega_i = 2.00$ to examine short term causality, $\omega_i = 1.00$ and $\omega_i = 1.50$ to examine medium term causality and finally $\omega_i = .1$ and $\omega_i = .5$ to investigate long term causality. Results obtained from frequency domain causality test are presented in Table 6.

**Table 6. Results for Frequency Domain Causality**

| Countries | fsi does not Granger cause of infgap | | | | | | Infgap does not Granger cause of fsi | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Long Term | | Med Term | | Short Term | | Long Term | | Med Term | | Short Term | |
| | 0.01 | 0.05 | 1.00 | 1.50 | 2.00 | 2.50 | 0.01 | 0.05 | 1.00 | 1.50 | 2.00 | 2.50 |
| **Brazil** | 2.468 | 2.486 | 0.564 | 0.161 | 2.183 | 3.090 | 0.633 | 0.631 | 2.115 | 0.012 | 0.001 | 1.781 |
| **Colombia** | 0.190 | 0.191 | 2.550 | 1.045 | 0.889 | 2.931 | 0.972 | 0.949 | 1.800 | 2.927 | 0.307 | 2.125 |
| **Mexico** | 1.456 | 1.459 | 0.247 | 0.611 | 0.948 | 0.619 | 0.127 | 0.129 | 1.050 | 1.242 | 2.711 | 1.033 |

**Notes:** The lag lengths for the VAR models are determined by SIC. F-distribution with (2, T-2p) degrees of freedom equals about 3,23 for Brazil; 3,24 for Colombia; and 3,23 for Mexico. For every $\omega_i$ (frequency) between 0 and $\pi$, $\omega \epsilon (0, \pi)$.

The frequency domain causality analysis results contain only three of 'fragile five' countries because of the sufficient data absence. Results for Brazil, Colombia and Mexico denote that there is no interaction between variables. That is consistent with the view that claims price stability does not guarantee financial stability.

In Table 7, the results are obtained from the asymmetric causality test method developed by Hatemi-J and Roca (2014). Similarly, results are obtained for only three of the countries analyzed. These are Brazil, Colombia and Mexico. According to the results, a decline in inflation gap induces an increase in the stability of the Brazilian financial system. The bootstrap analysis also supports the results. Similarly, a reduction in the inflation gap would lead to an increase in the financial stability. These results are consistent with the classical view claiming that price stability is a pre-condition of financial stability. On the other hand, in Colombia an increase (decrease) in financial stability causes a decrease (increase) in inflation gap. That means causality occurs in both cases. Contrary to classical view, results indicates that financial stability is the pre-condition of success in inflation targeting.

### 3.3. Interaction Between Policy Objectives, Panel Data Analysis

To investigate the unit root of the variables, the first task is to determine if there is a cross section dependency among the countries. If there is no cross-section dependency, first generation unit root test methods are applied. On the other hand, if there is a cross section dependency, second generation unit root test methods are applied. To investigate the cross-section dependency in panel data methods we employ Peseran (2004) $CD_{LM}$, Breusch-Pagan (1979) $CD_{LM1}$ and Peseran (2004) $CD_{LM2}$ test methods. $CD_{LM1}$ and $CD_{LM2}$ test methods are employed if T>N. On the other hand, we employ $CD_{LM}$ test in the case of N>T. While T denotes size of time period, N denotes the number of countries.

In cross dependency tests;

$H_0$: there is no cross-section dependency.

$H_1$: there is cross section dependency.

**Table 7. Hatemi J (2012)-Roca (2014) Asymmetric Causality Test Results**

| | Causality | MWALD | 1% Bootstrap Critical Value | 5% Bootstrap Critical Value | 10% Bootstrap Critical Value | Causality | MWALD | 1% Bootstrap Critical Value | 5% Bootstrap Critical Value | 10% Bootstrap Critical Value |
|---|---|---|---|---|---|---|---|---|---|---|
| **Brazil** | $(fsi)^{+} \neq> (infgap)^{+}$ | 0.009 (0.923) | 10.923 | 5.725 | 3.640 | $(infgap)^{+} \neq> (fsi)^{+}$ | 0.002 (0.960) | 9.451 | 4.562 | 3.020 |
| | $(fsi)^{+} \neq> (infgap)^{-}$ | 0.001 (0.973) | 9.712 | 4.897 | 3.027 | $(infgap)^{+} \neq> (fsi)^{-}$ | 3.581 (0.611) | 772.862 | 125.191 | 47.030 |
| | $(fsi)^{-} \neq> (infgap)^{-}$ | 1.063 (0.900) | 57.247 | 20.230 | 14.006 | $(infgap)^{-} \neq> (fsi)^{-}$ | 17.910 (0.00)*** | 47.921 | 21.624 | 15.391* |
| | $(fsi)^{-} \neq> (infgap)^{+}$ | 1.110 (0.292) | 13.953 | 5.778 | 3.413 | $(infgap)^{-} \neq> (fsi)^{+}$ | 1637.0 (0.00)*** | 370.964*** | 79.887** | 40.679* |
| **Colombia** | $(fsi)^{+} \neq> (infgap)^{+}$ | 4.728 (0.03) | 8.674 | 4.740 | 3.042 | $(infgap)^{+} \neq> (fsi)^{+}$ | 0.908 (0.341) | 11.294 | 5.737 | 3.581 |
| | $(fsi)^{+} \neq> (infgap)^{-}$ | 18.102 (0.00)*** | 496.53 | 97.451 | 48.184 | $(infgap)^{+} \neq> (fsi)^{-}$ | 0.037 (0.982) | 14.850 | 8.759 | 5.935 |
| | $(fsi)^{-} \neq> (infgap)^{-}$ | 0.792 (0.673) | 15.287 | 8.843 | 6.254 | $(infgap)^{-} \neq> (fsi)^{-}$ | 0.895 (0.639) | 14.745 | 9.628 | 6.718 |
| | $(fsi)^{-} \neq> (infgap)^{+}$ | 12.881 (0.02)** | 432.24 | 93.663 | 48.828 | $(infgap)^{-} \neq> (fsi)^{+}$ | 0.508 (0.776) | 16.383 | 9.630 | 7.00 |
| **Mexico** | $(fsi)^{+} \neq> (infgap)^{+}$ | 0.337 (0.562) | 9.535 | 4.867 | 3.380 | $(infgap)^{+} \neq> (fsi)^{+}$ | 0.161 (0.688) | 10.373 | 4.913 | 3.443 |
| | $(fsi)^{+} \neq> (infgap)^{-}$ | 1.579 (0.209) | 9.946 | 4.985 | 3.351 | $(infgap)^{+} \neq> (fsi)^{-}$ | 0.462 (0.993) | 381.42 | 75.053 | 38.629 |
| | $(fsi)^{-} \neq> (infgap)^{-}$ | 2.794 (0.732) | 325.98 | 71.433 | 30.513 | $(infgap)^{-} \neq> (fsi)^{-}$ | 12.494 (0.02)** | 573.54 | 110.58 | 55.901 |
| | $(fsi)^{-} \neq> (infgap)^{+}$ | 0.014 (0.906) | 8.086 | 4.562 | 3.129 | $(infgap)^{-} \neq> (fsi)^{+}$ | 936.63 (0.00)*** | 597.15*** | 102.74** | 46.383* |

**Not:** $\neq>$ sign shows that there is no causality. The values in the parenthesis show the probability ratios asymptotically. *. ** and *** supports causality in 90%. 95% and 99% confidences interval. The Bootstrap number is 10.000.

**Table 8. Cross Section Dependency Test Results in Level**

| | Model with Constant | | | | Model with Constant and Trend | | | |
|---|---|---|---|---|---|---|---|---|
| | FSI | | infgap | | FSI | | Infgap | |
| | Statistic | p-value | Statistic | p-value | Statistic | p-value | Statistic | p-value |
| $CD_{lm}$ (BP,1980) | 38.307 | 0.01 | 46.703 | 0.00 | 44.909 | 0.00 | 44.658 | 0.00 |
| $CD_{lm}$ (Pesaran, 2004) | 2.671 | 0.00 | 3.966 | 0.00 | 3.689 | 0.00 | 3.650 | 0.00 |
| $CD$ (Pesaran, 2004) | -1.996 | 0.02 | -2.124 | 0.01 | -1.569 | 0.05 | -2.115 | 0.01 |
| $LM_{adj}$ (PUY, 2008) | -1.139 | 0.873 | -1.697 | 0.955 | -0557 | 0.711 | -1.404 | 0.920 |

Notes: The lag number ($p_i$) is determined as 1 in the model $\Delta y_{i,t} = d_i + \delta_i y_{i,t-1} + \sum_{j=1}^{p_i} \lambda_{i,j} \Delta y_{i,t-j} + u_{i,t}$.

When we take $CD_{LM1}$ and $CD_{LM2}$ tests into account alternative hypotheses are accepted in level. That means there is the cross dependency among the country series.

**Table 9. Cross Dependency Test Results in the First Difference**

| | Model with Constant | | | | Model with Constant and Trend | | | |
|---|---|---|---|---|---|---|---|---|
| | Fsi | | infgap | | fsi | | Infgap | |
| | Statistic | p-value | Statistic | p-value | Statistic | p-value | Statistic | p-value |
| $CD_{lm}$ (BP,1980) | 10.401 | 0.00 | 42.746 | 0.00 | 32.503 | 0.05 | 43.857 | 0.00 |
| $CD_{lm}$ (Pesaran, 2004) | 2.994 | 0.00 | 3.356 | 0.00 | 1.775 | 0.03 | 3.527 | 0.00 |
| $CD$ (Pesaran, 2004) | -1.732 | 0.04 | -2.261 | 0.01 | -1.914 | 0.02 | -2.361 | 0.00 |
| $LM_{adj}$ (PUY, 2008) | 0.421 | 0.337 | 4.898 | 0.00 | 0.050 | 0.480 | 4.132 | 0.00 |

Notes: In the model $\Delta y_{i,t} = d_i + \delta_i y_{i,t-1} + \sum_{j=1}^{p_i} \lambda_{i,j} \Delta y_{i,t-j} + u_{i,t}$, the no. of lags ($p_i$) is determined to be 1.

When we take $CD_{LM1}$ and $CD_{LM2}$ tests into account alternative hypotheses are accepted in the first difference. That means there is cross dependency among the country series.

The second generation unit roots tests that can determine if the series are stationary for each country are the Seemingly Unrelated Regression Augmented Dickey-Fuller (SURADF) and the Cross Sectionally Augmented Dickey-Fuller (CADF) tests. Hypotheses for the SURADF test:

$H_0$: Series have unit root and series are not stationary.

$H_1$: Series do not have unit root and series are stationary.

If the SURADF test statistics are smaller than the critical value, then the series of the related country is stationary. If the SURADF test statistics are greater than the critical value, the null hypothesis is accepted meaning that each series of the related country has an unstationary characteristic. According to the test results presented in the table below, it is certain that the FSI series are not stationary. On the other hand, the inflation gap variable results indicate that the series of the inflation gap for Peru, Colombia, Indonesia and Turkey have no unit root in level.

We also employ unit root tests taking structural breaks into account. One of them is ILT (2005). The null and alternative hypotheses are as follows:

H0: There is no structural breaks, there is a unit root.

H1: There is a structural break, there is no unit root.

In order to decide whether a series has a unit root test or not, we compare the test statistics and critical values. If the absolute value of test statistics is greater than the absolute value of the critical value, the null hypothesis is rejected, and the alternative hypothesis is accepted, or vice versa.

**Table 10. SURADF Unit Root Test Results**

| | Constant | | | Constant and Trend | | |
|---|---|---|---|---|---|---|
| | Lags | SURADF t-stat | 10% | Lags | SURADF t-stat | 10% |
| ***FSI*** | | | | | | |
| Peru | 3 | -1.8464 | -5.2934 | 3 | 0.4288 | -9.0704 |
| Mexico | 1 | -2.9723 | -4.4894 | 1 | -4.3189 | -5.9277 |
| Colombia | 1 | -1.3544 | -6.0218 | 1 | -5.1585 | -7.1708 |
| South Africa | 1 | -1.3408 | -4.8003 | 1 | -2.4121 | -5.2360 |
| Indonesia | 1 | -1.5958 | -5.0351 | 4 | -4.7518 | -8.3409 |
| Brazil | 4 | -4.6096 | -5.9084 | 4 | -3.3508 | -7.8770 |
| Turkey | 1 | -2.1093 | -5.0520 | 1 | -5.3777 | -10.3896 |
| ***Infgap*** | | | | | | |
| Peru | 2 | -5.1327 | -3.3964 | 2 | -4.8552 | -5.1883 |
| Mexico | 2 | -1.8135 | -5.7867 | 2 | -1.5465 | -10.3664 |
| Colombia | 1 | -4.7453 | -3.7797 | 1 | -6.0052 | -6.0030 |
| South Africa | 3 | -3.7248 | -5.2006 | 3 | -2.5365 | -6.7687 |
| Indonesia | 4 | -5.3310 | -0.4215 | 4 | -4.2490 | 1.7890 |
| Brazil | 1 | -2.5864 | -4.3802 | 1 | -2.6777 | -6.7733 |
| Turkey | 4 | -3.6511 | 0.4036 | 4 | -4.3465 | 0.9388 |

Notes: the maximum lag length is determined as 4 and the optimal lag length criteria is chosen as Schwarz information criteria. Critical values are obtained from the bootstrap method and the number of bootstraps is 100.

According to results for the financial stability index, the series have structural breaks during the post-crisis period. Although there might be numerous reasons for the breaks, the declaration of Bernanke in the second quarter of 2013 is one of the most important reasons for the breaks in the financial stability index via capital outflows.

**Table 11. Im, Lee & Tieslau (2005) Panel Unit Root Test with Structural Breaks Results for Financial Stability Index**

| | One break model | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Level shift model: Break in constant | | | | Level and trend shift model: Break in constant and trend Transformed | | | |
| | Lag | LM-stat. | Break | | Lag | LM-stat. | Break | |
| Peru | 4 | -4.417** | 2010Q3 | | 4 | -4.435** | 2010Q3 | |
| Mexico | 0 | -10.652*** | 2014Q1 | | 0 | -5.710*** | 2013Q2 | |
| Colombia | 3 | -4.350** | 2010Q3 | | 3 | -4.778*** | 2013Q2 | |
| South Africa | 0 | -5.972*** | 2010Q3 | | 0 | -5.996*** | 2010Q3 | |
| Indonesia | 0 | -3.783* | 2010Q3 | | 0 | -3.737* | 2010Q3 | |
| Brazil | 0 | -8.350*** | 2014Q1 | | 0 | -11.184*** | 2014Q1 | |
| Turkey | 0 | -4.361** | 2013Q2 | | 0 | -5.368*** | 2014Q1 | |
| Panel-LM | | -15.704 | | | | -13.160 | | |
| p-value | | 0.00 | | | | 0.00 | | |
| | Two breaks model | | | | | | | |
| Peru | 0 | -7.464*** | 2013Q2 | 2014Q1 | 0 | -14.084*** | 2010Q3 | 2014Q2 |
| Mexico | 0 | -22.487*** | 2013Q4 | 2015Q1 | 0 | -7.462*** | 2013Q2 | 2015Q1 |
| Colombia | 0 | -41.615*** | 2014Q2 | 2015Q1 | 0 | -5.593*** | 2013Q2 | 2015Q2 |
| South Africa | 0 | -14.615*** | 2010Q3 | 2015Q1 | 0 | -.7.430*** | 2010Q3 | 2015Q2 |
| Indonesia | 0 | -5.396*** | 2013Q4 | 2015Q1 | 4 | -5.738*** | 2013Q4 | 2014Q4 |
| Brazil | 0 | -12.895*** | 2013Q4 | 2014Q3 | 0 | -8.607*** | 2013Q2 | 2014Q1 |
| Turkey | 0 | -8.430*** | 2014Q1 | 2014Q4 | 0 | -6.686*** | 2014Q1 | 2014Q4 |
| Panel-LM | | -57.052 | | | | -20.816 | | |
| p-value | | 0.00 | | | | 0.00 | | |

*, **, and *** denote significance levels 1%, 5% and 10%, respectively. Critical values for individual statistics for one break model: -4.604 (1%); -3.950 (5%); -3.635 (10%) Critical values for individual statistics for two breaks model: -5.365 (1%); -4.661 (5%); -4.338 (10%). The maximum lag length is selected as four and the optimal lag length is identified via the "t-stat significance" approach.

The results for the inflation gap variable are presented in the following table. According to results there are breaks in the series of inflation gap. Similar to financial stability index series, break points are intensive in 2013. The declaration of Bernanke also effects the inflation performance of the economies.

**Table 12. Im, Lee & Tieslau (2005)** Panel Unit Root Test with Structural Breaks Results for Inflation Gap

| | One break model | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Level shift model: Break in constant | | | | Level and trend shift model: Break in constant and trend Transformed | | | |
| | Lag | LM-stat. | Break | | Lag | LM-stat. | Break | |
| Peru | 0 | -5.674*** | 2014Q4 | | 0 | -5.352*** | 2013Q4 | |
| Mexico | 1 | -7.188*** | 2014Q4 | | 1 | -6.350*** | 2014Q4 | |
| Colombia | 0 | -5.900*** | 2015Q2 | | 0 | -6.078*** | 2014Q3 | |
| South Africa | 0 | -11.223*** | 2014Q1 | | 0 | -10.234*** | 2014Q1 | |
| Indonesia | 0 | -5.642*** | 2014Q4 | | 0 | -5.508*** | 2014Q4 | |
| Brazil | 1 | -8.966*** | 2014Q3 | | 1 | -6.919*** | 2014Q3 | |
| Turkey | 0 | -6.854*** | 2015Q2 | | 0 | -6.854*** | 2015Q2 | |
| Panel-LM | | -21.336 | | | | -16.698 | | |
| p-value | | 0.00 | | | | 0.00 | | |
| | Two breaks model | | | | | | | |
| Peru | 0 | -39.106*** | 2013Q2 | 2014Q2 | 0 | -24.925*** | 2013Q2 | 2015Q1 |
| Mexico | 1 | -10.618*** | 2013Q2 | 2015Q1 | 1 | -10.088*** | 2013Q2 | 2015Q1 |
| Colombia | 0 | -51.811*** | 2013Q4 | 2014Q3 | 1 | -7.782*** | 2013Q2 | 2014Q3 |
| South Africa | 0 | -15.670*** | 2013Q2 | 2014Q1 | 0 | -14.385*** | 2013Q2 | 2014Q1 |
| Indonesia | 0 | -54.046*** | 2013Q2 | 2014Q1 | 0 | -5.320*** | 2014Q1 | 2014Q4 |
| Brazil | 0 | -11.200*** | 2014Q2 | 2015Q1 | 0 | -11.990*** | 2014Q1 | 2015Q2 |
| Turkey | 0 | -8.774*** | 2013Q2 | 2014Q3 | 0 | -7.262*** | 2013Q2 | 2014Q3 |
| Panel-LM | | -101.526 | | | | -37.018 | | |
| p-value | | 0.00 | | | | 0.00 | | |

*, **, and *** denote significance levels 1%, 5%, and 10%, respectively. Critical values for individual statistics for one break model: -4.604 (1%); -3.950 (5%); -3.635 (10%) Critical values for individual statistics for two breaks model: -5.365 (1%); -4.661 (5%); -4.338 (10%). The maximum lag length is selected as four and the optimal lag length is identified via "t-stat significance" approach.

**Table 13. Panel Co-integration Test Results**

| | | Constant | Constant –Trend |
|---|---|---|---|
| **Panel –tests** | Panel $\upsilon$ -Statistic | -1.168 (0.878) | -1.552 (0.939) |
| | Panel $\rho$ -Statistic | -0.309 (0.378) | -1.672 (0.047)** |
| | Panel PP-Statistic | -0.962 (0.167) | -5.860 (0.00)*** |
| | Panel ADF-Statistic | 0.624 (0.733) | -2.656 (0.00)*** |
| **Group-tests** | Group $\rho$ -Statistic | 0.370 (0.644) | -0.214 (0.415) |
| | Group PP-Statistic (non-parametric) | -0.784 (0.216) | -7.585 (0.00)*** |
| | Group ADF-Statistic (non-parametric) | 0.511 (0.695) | -2.784 (0.00)*** |
| | Kao (1999) and Pedroni (1999) Cointegration Tests | 1.691 (0.042)** | |
| | Johansen-Fisher (1999) Cointegration Test | 22.09 (0.077)* | 23.66 (0.050)* |

Notes: Lag length was selected based on the Schwarz information criterion. ***, **, and * denote statistical significance at the 1, 5, and 10% level of significance, respectively. The null hypothesis is no co-integration. Bartlett as a spectral estimation and Newey-West as a bandwidths election were used. Test statistics are weighted statistics and probabilities were reported in parentheses. Fisher statistics are based on the Trace test and the Johansen-Fisher test.

After we determine the unit root and structural breaks in the series, we analyze the co-integration tests developed by Kao (1999) and Pedroni (1999) and Johansen-Fisher (1999). According to Kao's (1999) and Pedroni (1999) residual co-integration test results there is evidence of co-integration among variables of interest. Additionally, Johansen - Fisher panel co-integration test results indicate the presence of one co-integration relationship. For both Models 3 and 4, Johansen co-integration tests show a co-integration relationship among variables of interest.[4]

[4] Model 3 implies intercept (no trend) in co-integration equation and VAR., while Model 4 means intercept and trend in co-integration equation, but no trend in VAR.

When all the results are evaluated together it is concluded that there are several co-integration relationships between variables. Therefore, it is important to implement advanced panel data methodology to better understand the relation between variables. İn this regard, we employ panel causality tests in the rest of the section.

The pairwise panel causality test developed by Dumitrescu Hurlin (2012) tests causality in heterogenous panels. According to test results, there is no causality between the financial stability index and the inflation gap.

**Table 14. Pairwise Dumitrescu Hurlin panel causality test**

| INFGAP does not Granger Cause FSI | Statistic | p-value |
|---|---|---|
| W stat | 2.456 | 0.971 |
| Zbar stat | -0.035 | |
| FSI does not Granger Cause INFGAP | | |
| W stat | 1.952 | 0.653 |
| Zbar stat | -0.448 | |

Maximum lag number is set to three and optimal lags for each country is determined by the means of Akaike information criterion

In the following table, we present the results of the panel causality test developed by Emirmahmutoglu and Kose (2011). The panel causality test for heterogenous panels allows us to investigate the interaction between variables in both a single country and the group. According to results, it is certain that there is no causation linkage between variables in the group. Besides, there is no causation linkage between variables in any country except Colombia. Results for Colombia show that financial stability influences the inflation gap in the case of Colombia.

**Table 15. Emirmahmutoğlu ve Köse panel Causality Test Results**

| Country | Lag | fsi=>infgap | | infgap=>fsi | |
|---|---|---|---|---|---|
| | | Wald | p-value | Wald | p-value |
| Peru | 2 | 0.478 | 0.787 | 1.863 | 0.393 |
| Mexico | 1 | 1.540 | 0.214 | 0.296 | 0.585 |
| Colombia | 2 | 5.847 | 0.053* | 2.089 | 0.351 |
| South Africa | 3 | 0.623 | 0.891 | 1.040 | 0.791 |
| Indonesia | 1 | 1.025 | 0.311 | 0.755 | 0.384 |
| Brazil | 3 | 5.505 | 0.138 | 4.992 | 0.172 |
| Turkey | 3 | 2.331 | 0.506 | 1.070 | 0.784 |
| **Fisher** | | **17.28536** | **0.24190** | **11.40231** | **0.654182** |

*, **, and *** denote significance levels 1%. 5% and 10% respectively.

The panel vector autoregression results confirm that there is no interaction between variables in the short run. The result is consistent with Emirmahmutoglu and Kose (2011) and Dumitrescu and Hurlin (2012) pairwise panel causality test results. On the other hand, different from short run analysis, there is a bi-directional causality between variables in the long run. Uni-directional causality running from price stability to financial stability index is significant statistically in 1% level, uni-directional causality running from financial stability index to price stability is significant in 10% level. That means in the longer time periods, price stability would induce a healthier financial system and financial system health would allow a stable general price level in the economy.

**Table 16. Panel VECM Causality Test Results**

| | Short-run causality | | Long-run causality |
|---|---|---|---|
| | Δ (fsi) | Δ (infgap) | Ect(-1) |
| Δ (fsi) | | 1.222571 (0.2689) | -0.017604 (0.00751)*** |
| Δ (infgap) | 0.298296 (0.5228) | | -0.368715 (0.08546)* |

*, **, and *** denote significance levels 1%, 5%, and 10%, respectively.

### 3.4. Effectiveness of Policy Instruments on Policy Objectives, Time Series Analysis

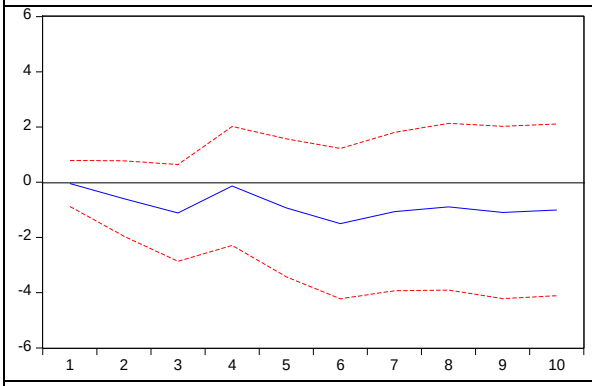
In the second stage of the analysis, we investigate the impact of the policy rate on the financial stability index to understand how the inflation targeting regime influences the stability of the financial system. The lending rate and the reserve requirement ratio are normally used to control the financial system, but we will use them to test their impact on price stability.

In the first step, we employ each sector independently by using the times series analysis method and the vector autoregressive method (VAR). For each country, we build up a VAR model and we include the inflation gap and the financial stability index next to the policy instrument.

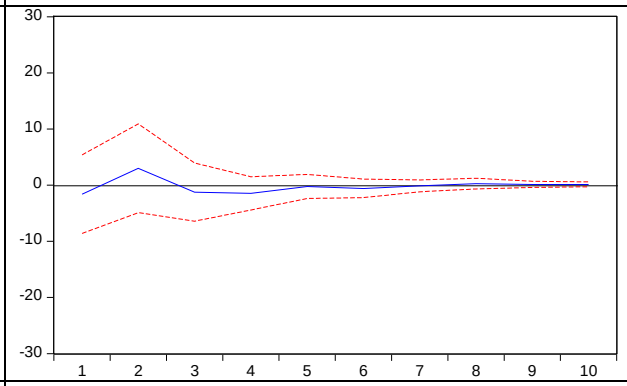
Before we get the results for the impulse response analysis, we test the lag length for each country. In the first level, we build up the model for policy rate and investigate the impact of policy rate on the financial stability index. We use the lag length criteria to determine the lag length and double check for an auto-correlation problem. According to analysis results, the lag length is four for Turkey and Mexico, two for Brazil, three for Colombia, and one for Indonesia, South Africa and Peru.

**Chart 1. Response of FSI to Policy Rate Shocks**

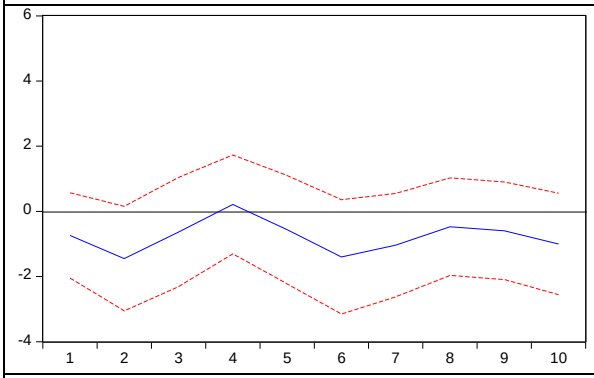
TURKEY



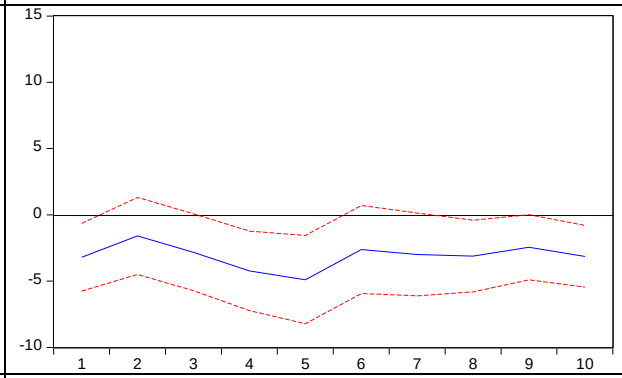

BRAZIL



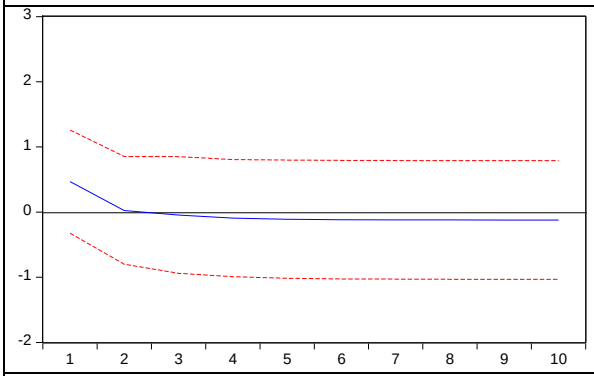

COLOMBIA



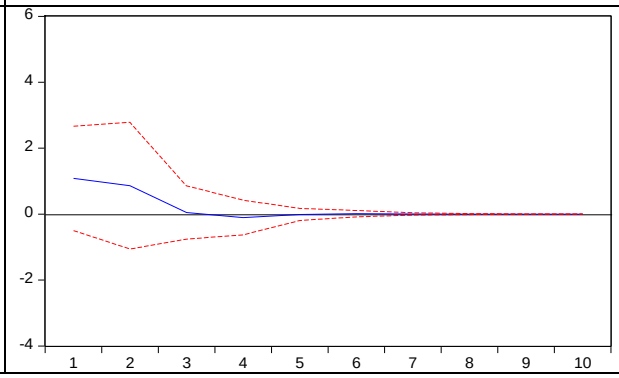

MEXICO



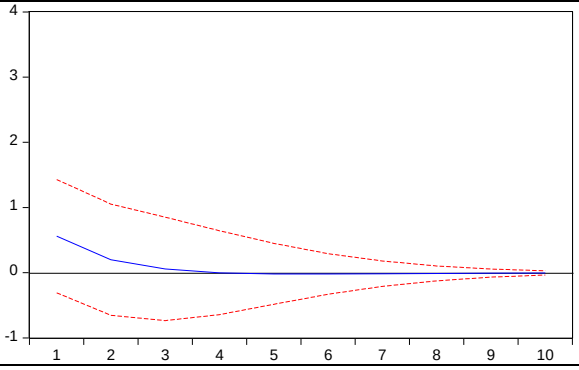

PERU




INDONESIA




SOUTH AFRICA

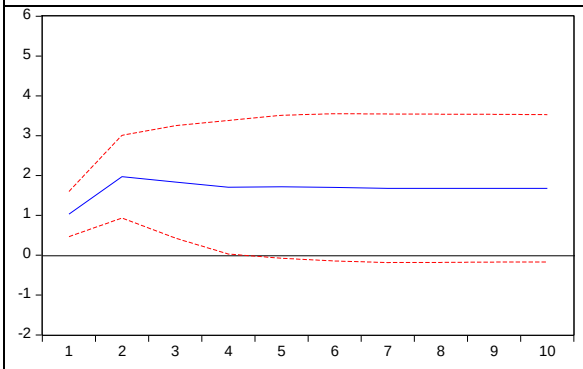


According to results, it is certain that there is no positive contribution of the policy rate which is employed to control price stability on financial stability. While an increase in the policy rate would reduce the inflation rate, it has no effect on the financial stability. This is contrary to the view that if price stability is achieved then financial stability occurs automatically. An increase in policy rate causes a reduction in the financial stability index in Turkey, Brazil and Colombia. Although it is possible to discuss theoretically, results are insignificant statistically. Similarly, an increase in policy rate increases the financial stability index in South Africa, Peru and Indonesia, but the results are insignificant statistically. Only results for Mexico show that policy rate increases induce a reduction in the financial stability index. That means in a possible increasing inflation environment, central bank's policy rate intervention positively would induce a decrease in the financial stability index. That is why the central bank of Mexico should implement the instruments carefully not to imbalance another policy instruments.

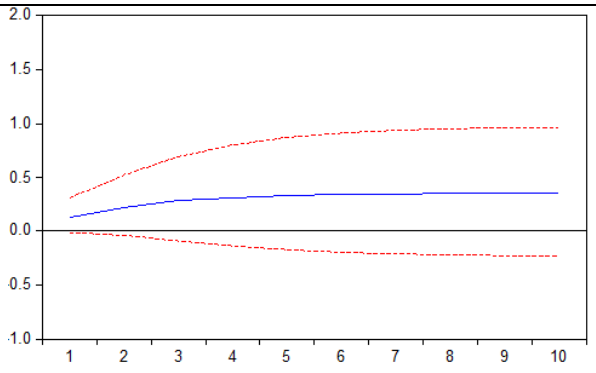
In the second level, we build up the model for lending rate and investigate the impact of lending rate on price stability. We use lag length criteria to determine lag length and double check if there is an auto-correlation problem. According to analysis results, the lag length is two for Turkey, one for Brazil, Peru, South Africa and Indonesia, three for Colombia.

**Chart 2. Response of INFLATION GAP to LENDING RATE Shock**

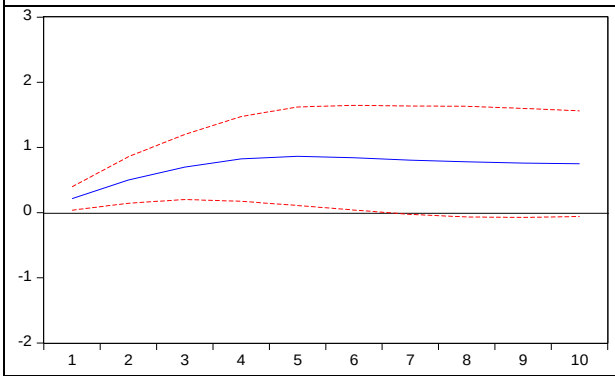
TURKEY



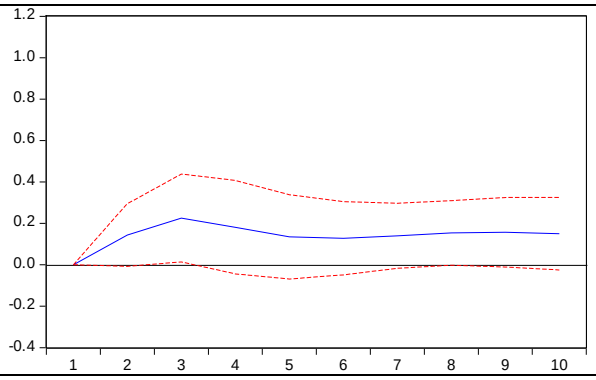

BRAZIL



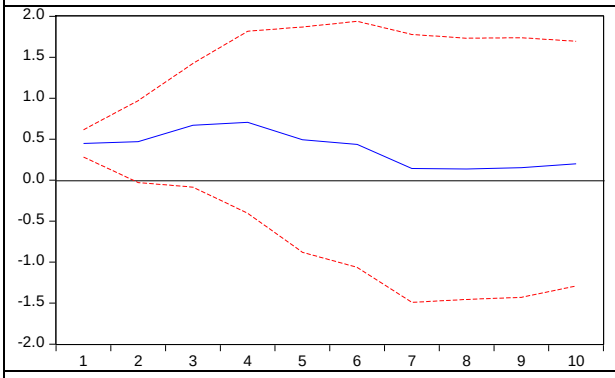

COLOMBIA



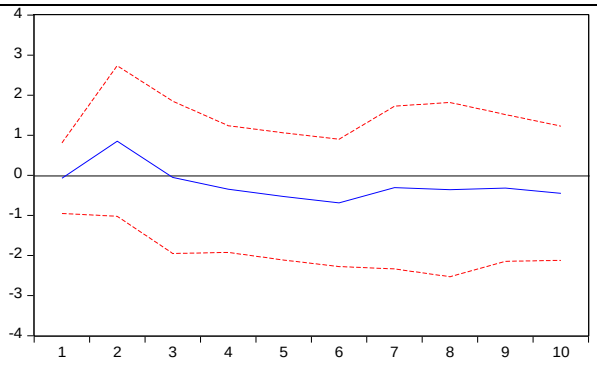

MEXICO



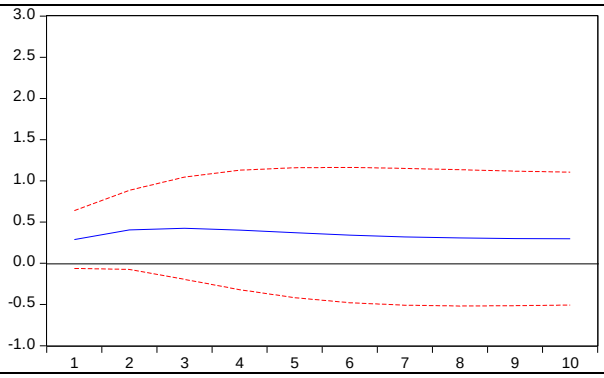

PERU




INDONESIA



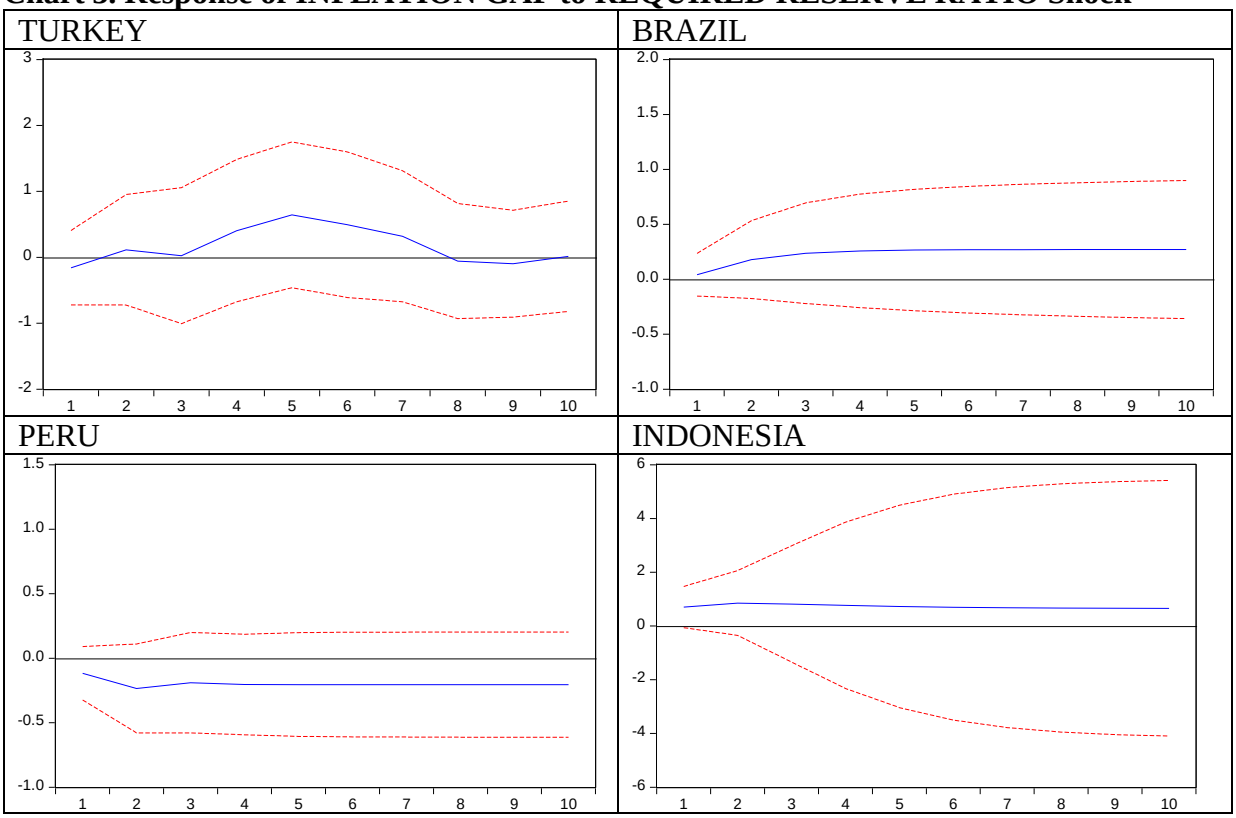

SOUTH AFRICA



According to results, the lending rate has an impact on inflation gap for most of the economies. In the case of Turkey, a positive shock in lending rate would increase inflation gap. This result is statistically significant for four quarters. In the case of Columbia, the impact of the positive lending rate shock on the inflation gap is significant for six quarters and it would increase the gap between the target and actual inflation rates. For the case of Peru, the inflation gap variable responds to a positive shock in the lending rate positively. It is significant statistically during almost two quarters. For the case of Mexico, the inflation gap variable responds to a positive shock in the lending rate positively. It is significant statistically during three quarters. On the other hand, for the case of Brazil, the response of the inflation gap variable to the same shock is positive and statistically significant for only one month. Contrary these economies, the impact of the lending rate on the inflation gap is statistically insignificant in Indonesia and South Africa, although they have both positive responses. Considering the results, implementing lending rate as an instrument of financial stability objective has a negative impact on the price stability objective.

In the third level, we build up the model for the required reserve ratio and investigate the impact of the required reserve ratio on price stability. We use the lag length criteria to determine lag length and double check if there is an auto-correlation problem. According to analysis results, the lag length is four for Turkey and one for Brazil, Peru and Indonesia.

**Chart 3. Response of INFLATION GAP to REQUIRED RESERVE RATIO Shock**




According to results, it is certain that the required reserve ratio has no meaningful impact in the case of Turkey, Brazil and Peru. Although the response of the inflation gap is negative in Turkey and Peru, it is not significant statistically. Similarly, in Brazil, the response of the inflation gap is positive, but it is statistically insignificant. Response of inflation to a positive shock in reserve requirements ratio is positive in Indonesia and statistically significant for only one month. Results imply that reserve requirements ratio has no impact on price stability in most of the countries. Indonesia is the only country where the inflation targeting regime could be affected negatively. But the response of inflation is weak and temporary.

### 3.5. Effectiveness of Policy Instruments on Policy Objectives, Panel Data Analysis

In the first step, we test the cross-section dependency in order to analyze unit root. If there is no cross-section dependency, first generation unit root tests are employed, otherwise second generation unit root tests are employed. To test the cross-section dependency, we employ Peseran (2004) $CD_{LM}$, Breusch-Pagan $CD_{LM1}$, Peseran (2004) $CD_{LM2}$ test methods. If T>N, $CD_{LM1}$ and $CD_{LM2}$ test methods are employed and if N>T, $CD_{LM}$ test method is used.

In a cross section dependency test;

$H_0$: There is no cross-section dependency,

$H_1$: There is cross section dependency.

**Table 17. Cross Section Dependency Test Results**

| | INFGAP | FSI | POLRATE | LENDING | RRR |
|---|---|---|---|---|---|
| $CD_{lm}$ (BP, 1980) | 44.428 | 21.727 | 7.544 | 11.349 | |
| | (0.00) | (0.00) | (0.273) | (0.07) | - |
| $CD_{lm}$ (Pesaran, 2004) | 11.093 | 4.540 | 0.446 | 1.544 | |
| | (0.00) | (0.00) | (0.328) | (0.06) | - |
| $CD$ (Pesaran, 2004) | -2.610 | -1.401 | -1.783 | -2.221 | |
| | (0.00) | (0.08) | (0.03) | (0.01) | - |
| $LM_{adj}$ (PUY, 2008) | 2.146 | 6.635 | 7.779 | 10.029 | |
| | (0.01) | (0.00) | (0.00) | (0.00) | - |

In the model $\Delta y_{i,t} = d_i + \delta_i y_{i,t-1} + \sum_{j=1}^{p_i} \lambda_{i,j} \Delta y_{i,t-j} + u_{i,t}$ lag length ($p_i$) is accepted as one.

The test results for required reserves ratio are statistically insignificant. So, it is not possible to report them. On the other hand, there is no cross-section dependency for the other variables.

The SURADF unit root test results are reported in the following table. The test hypotheses are as follows:

$H_0$: Series has unit root and it is not stationary.

$H_1$: Series has no unit root and it is stationary.

If the test statistics are smaller than critical values the series is stationary and alternative the hypothesis is valid for the related country. Otherwise the null hypothesis is accepted, and the series of the related country has a non-stationary characteristic.

**Table 18. SURADF Unit Root Test Results**

| | Constant | | | Constant and Trend | | |
|---|---|---|---|---|---|---|
| | Lags | SURADF t-stat | 10% | Lags | SURADF t-stat | 10% |
| *INFGAP* | | | | | | |
| Peru | 1 | -1.7486 | -7.5392 | 2 | -1.2197 | -4.5532 |
| Indonesia | 3 | -3.1552 | -5.1201 | 2 | -3.4186 | -4.5513 |
| Brazil | 1 | -2.2326 | -3.8299 | 1 | 0.6276 | -4.6590 |
| Turkey | 1 | -4.7707 | -4.9112 | 1 | -4.0159 | -4.3231 |
| Mexico | 1 | -2.9723 | -4.4894 | 1 | -4.3189 | -5.9277 |
| Colombia | 1 | -1.3544 | -6.0218 | 1 | -5.1585 | -7.1708 |
| South Africa | 1 | -1.3408 | -4.8003 | 1 | -2.4121 | -5.2360 |
| *FSI* | | | | | | |
| Peru | 2 | -0.4769 | -5.6559 | 3 | 3.2488 | -4.5420 |
| Indonesia | 3 | 0.6642 | -4.8492 | 2 | -1.4787 | -7.1525 |
| Brazil | 1 | -3.5307 | -4.0350 | 4 | -6.6553 | -0.1373 |
| Turkey | 1 | -1.6648 | -5.1904 | 1 | -1.8891 | -7.2881 |
| Mexico | 2 | -1.8135 | -5.7867 | 2 | -1.5465 | -10.3664 |
| Colombia | 1 | -4.7453 | -3.7797 | 1 | -6.0052 | -6.0030 |
| South Africa | 3 | -3.7248 | -5.2006 | 3 | -2.5365 | -6.7687 |
| *POLRATE* | | | | | | |
| Peru | 1 | 1.6293 | -3.6314 | 4 | -4.3326 | 0.8884 |
| Indonesia | 4 | -2.0219 | -5.0013 | 4 | -3.7258 | 0.9763 |
| Brazil | 4 | 1.7361 | -6.2895 | 4 | -3.7470 | -13.8142 |
| Mexico | 1 | -1.5958 | -5.0351 | 4 | -4.7518 | -8.3409 |
| Colombia | 4 | -4.6096 | -5.9084 | 4 | -3.3508 | -7.8770 |
| South Africa | 1 | -2.1093 | -5.0520 | 1 | -5.3777 | -10.3896 |
| Turkey | 4 | -3.9089 | -0.4036 | 4 | 2.6694 | -0.1202 |

**Table 18 continued**

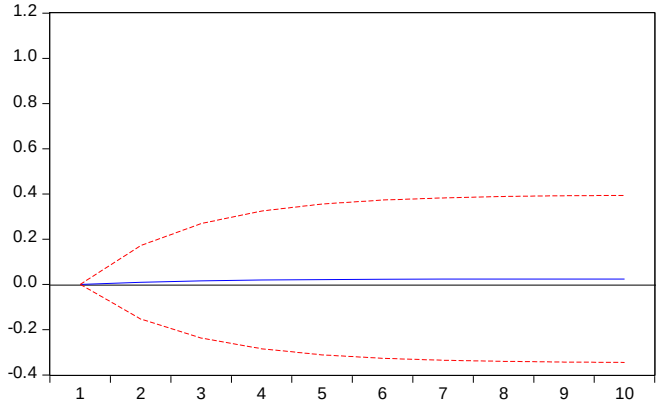
| LENDING | | | | | | |
|---|---|---|---|---|---|---|
| Peru | 4 | -3.8661 | -0.2729 | 4 | -7.9495 | 1.3816 |
| Indonesia | 3 | -3.0715 | -4.0355 | 4 | -9.7112 | -0.8239 |
| Brazil | 4 | -1.0882 | -3.2737 | 4 | -0.6876 | -11.9655 |
| Mexico | 4 | -3.0876 | -4.5878 | 4 | -4.2490 | 1.7890 |
| Colombia | 1 | -1.6895 | 3.3966 | 1 | -2.6777 | -6.7733 |
| South Africa | 4 | -3.6225 | -4.0258 | 4 | -4.3465 | 0.9388 |
| Turkey | 1 | -1.7212 | -3.3618 | 1 | -2.6728 | -6.5856 |

The maximum lag length is selected as four and the optimal lag length is selected according to Schwarz information criteria. Critical values are obtained from a bootstrap process and the number of bootstraps is 100.

According to results, the variable series are taken into account with their first difference. In light of these findings, we include all variables into vector autoregressive analysis in their first difference. While we take seven countries into account for impulse response analysis of policy rate and lending rate, we take four countries into account for impulse response analysis of required reserves ratio. These are Brazil, Turkey, Indonesia and Peru. The optimal lag length for the policy rate and lending rate analysis is three and it is one for required reserves ratio analysis.

**Chart 4. Impulse Response Analysis of Each Policy Instrument on Policy Objectives**

**Response of Inflation Gap to a Positive Shock in Reserve Requirements Rate**




According to impulse response analysis, the effect of a positive shock in policy rate on financial stability is positive. Theoretically the result would support the classical view. But it is statistically insignificant. The response of inflation gap to a positive shock in lending rate would be positive and the response is statistically significant for two months. The result means that a policy action to increase financial stability would increase the gap between target and actual inflation rate. So, financial stability actions may hurt the price stability objective. Lastly, the response of the inflation gap variable to a positive shock in required reserves ratio is slightly positive. Moreover, the sign of the response is statistically insignificant.

According to results, the monetary policy instrument which is used to stabilize the general price level does not affect the financial stability objective. On the other hand, the lending rate employed by the central bank to stabilize the financial system affects inflation gap positively and it is significant statistically. That means the financial stability objective influences the price stability objective negatively. Required reserves ratio have no impact on actual inflation rate.

## 4. Conclusion

Before the global financial crisis of 2008, financial stability wasn't included in monetary policy objectives, but afterwards financial stability became a major concern of the central banks. Financial stability, according to convention wisdom, is automatically attained with price stability. The fact that many economies had stable price levels during the crisis period led many economists to argue against conventional wisdom.

This study investigates the interaction between price stability and financial stability for "Fragile Five" countries. In the first step, the causation linkage between price stability and financial stability indicators is investigated. In the second step, we analyze the effect of financial stability instruments, lending rate and required reserve ratio, on price stability. We then test the price stability instrument policy rate on financial stability. Empirical findings, in the first step, indicate that there is no meaningful relationship between policy objectives in the short run, while the relation between financial stability and price stability occurs in the longer time frequencies. However, the situation is not valid for all economies. In the second step, we measure the effects of monetary policy tools employed by the central bank of each of the Fragile Five countries. The findings from the analysis that investigates the effects of each policy instrument imply that the policy rate instrument implemented to achieve the inflation target does not affect the financial stability goal. Similarly, the reserve requirement ratio instrument to achieve the financial stability goal does not affect the price stability goal. On the other hand, results give some implication about the negative effects of the lending rate instrument on the inflation targeting objective.

This study contributes to the literature by investigating the effects of price stability on financial stability in developing countries with fragile financial systems and strong dependencies on foreign financial flows. It also adds in testing the validity of the Schwartz hypothesis which

claims that a monetary regime that produces aggregate price stability will, as a by-product, tend to promote stability of the financial system. Similar studies can provide guidance for the creation and improvement of policymaking processes.

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# VITA

The author was born in Slidell, Louisiana. He obtained his Bachelor of Science degree in physics from Dillard University in 1985. He earned an MBA from the University of New Orleans in 2001. He later re-enrolled at the University of New Orleans to pursue a PhD in Financial Economics.