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The 'Competition–Stability/Fragility' Nexus: A Comparative Analysis of Islamic and Conventional Banks

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Abstract

The 'competition–stability/fragility' nexus is one of the more debated issues in the banking literature. While there is ample evidence on the relationship between competition and stability in different countries and regions, no prior study investigates the competition–stability/fragility nexus in the context of Islamic and conventional banks. We do this using data on banks drawn from 16 economies over the period 2000–2012. We measure the lack of competition using the Lerner index, stability using both accounting-based measures, such as the Z-score and the NPL ratio, and market-based measures, including Merton's distance to default. We employ PVAR and two-stage quantile regression to estimate the relationship. Our results lend support to the competition–fragility hypothesis in both Islamic and conventional banks. We also find the magnitude of the market power effect on stability is greater for conventional banks than Islamic banks. Lastly, banks in the median quantile of stability have a greater ability to reduce credit risk through gaining market power than banks in the lower and upper quantiles.

Key words: Competition, Stability, Lerner index, Panel VAR, Z-score, Distance-to-default

JEL classification: G21; G28; G32

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1. Introduction

In just a few decades, Islamic banking has grown worldwide at a rate of nearly 15–20 percent annually. This has attracted the attention of policymakers, regulators, and investors, particularly after the recent global financial crisis, when the possibility emerged that Islamic banking could be a viable alternative to the conventional banking system. According to a recent survey, in 2013 alone, global *Shariah*-compliant assets increased by 8.67% and the aggregate return on assets (ROA) for Islamic banks was about 1.47%, with about 349 Islamic financial institutions offering their services worldwide, up from less than a score two decades earlier (Banker, 2013). The rapid growth of Islamic financial institutions naturally raises questions concerning the sustainability of the Islamic banking system in the longer run.

The impact of competition on stability in the banking sector is one of the more debated issues among academics and policymakers. On the one hand, the literature argues that excessive competition can erode the franchise value of banks leading to financial fragility (Ariss, 2010b; Besanko and Thakor, 1993; Keeley, 1990). On the other, competition can also enhance bank stability through bringing about efficiency, promoting new product innovation and enhancing loan portfolio diversification (Caminal and Matutes, 2002; Fiordelisi and Mare, 2014; Nicoló et al., 2006). Both views enjoy strong theoretical and empirical support. Research has also recently emerged investigating this competition–stability/fragility hypothesis in different economies and over different periods, with the existing results best described as mixed in that there are no conclusive findings concerning either hypothesis.

In most economies, Islamic and conventional banks compete with each other. Further, many conventional banks have recently installed Islamic banking 'windows' to further intensify competition. Competition also arises not only from domestic conventional banks, but also from foreign banks, which also may adopt this Islamic banking strategy. On the plus side, Islamic banks will bring to the market more innovative *Shariah*-compatible financial

products; on the downside, this excess competition may have a detrimental effect on their long-run sustainability (Ariss, 2010a). Based on this background, we present research questions as follows. First, does competition enhance financial stability in Islamic and conventional banking systems? Second, in light of this, do regulators need to undertake separate competition policy for Islamic and conventional banks? Responding to these questions through examining the competition–stability/fragility hypothesis in the context of Islamic and conventional banks will have important policy implications for both regulators and practitioners of those economies where both banking systems coexist.

A number of prior studies have investigated the financial stability of Islamic and conventional banks using a number of different techniques and contexts. While a few find that Islamic banks are less stable than conventional banks, others conclude that Islamic banks are more stable, especially small Islamic banks when compared with both conventional banks and large Islamic banks (Abedifar et al., 2013; Beck et al., 2013; Čihák and Hesse, 2010). Conversely, existing studies that have investigated the level of competition between Islamic and conventional banks have concluded that Islamic banks have more market power, indicating that they are less competitive than conventional banks (Ariss, 2010a; Weill, 2011). However, to the best of our knowledge, no prior study has investigated the competition–stability/fragility nexus by comparing Islamic and conventional banks. Our research aims to shed light on the relation between competition and stability in both Islamic and conventional banks. Combining these two strands of the literature should provide an indication as to whether Islamic banks are both less competitive and/or more stable than conventional banks.

To investigate the 'competition–stability/fragility hypothesis, we select 16 national banking systems where both Islamic and conventional banks operate during the period 2000–2012. The empirical procedure is as follows. First, we measure market power (i.e., the lack of competition) for each bank using the Lerner index (LI), with a higher LI value indicating less

market competition. Compared with other methods of measuring competition, the LI is generally more suitable than other measurements because we can calculate it at the individual bank level, and it is therefore more informative. Second, we measure the level of financial stability using two accounting-based credit risk measures, namely, the Z-score and the nonperforming loan (NPL) ratio, and a market-based credit risk measure, in the form of Merton's distance to default (DD) model. Employing both accounting- and market-based measures of stability will yield more robust findings on the precise relationship between competition and stability.

Third, we then use panel vector autoregressive (PVAR) estimation methods to describe the relationship between competition and stability. As both our variables of interest (competition and stability) are endogenous (Anginer et al., 2014; Schaeck and Cihák, 2014), PVAR is a suitable estimation technique as it allows the relationship between the variables to be endogenous and does not require a specific a priori relationship between them. We also derive impulse response functions (IRF) and undertake variance decomposition through which we investigate how the shock of one variable affects the other variable in future periods. According to Schaeck and Cihák (2014) and Dima et al. (2014), the response of riskier banks may significantly differ from that of more stable banks when competition increases or decreases. Thus, we specify two-stage quantile regressions by which we can identify the impact of competition at different stability levels for both Islamic and conventional banks.

Our PVAR estimation technique provides some interesting results concerning the relationship between competition and stability. First, we identify a consistent Granger-causality effect between market power and stability. Second, our empirical evidence shows that market power is positively associated with stability. This in turn lends support to the competition–fragility hypothesis in that low competition (i.e. high market power) increases stability. This

result is consistent across the three stability proxies. Third, among these, the Lerner index has a long-term impact on the NPL ratio, whereas its impact on the Z-score and DD is more short term. Complementary analysis using two-stage quantile regressions also reveals some interesting results. First, consistent with our previous findings, the two-stage quantile regression results indicate that market power has a positive and significant impact on stability in both Islamic and conventional banks for all three proxies of stability, thus supporting the competition–fragility hypothesis. Second, the magnitude of the effect (i.e. the estimated coefficient of the Lerner index) is higher for conventional banks than Islamic banks. Third, the significance level of the impact on stability is weaker for Islamic banks than for conventional banks. Fourth, the impact of market power on stability varies significantly across the different quantiles for the alternative systems. Finally, it appears that banks in both banking systems at the median quantile have a better ability to reduce credit risk through gaining market power than banks in the lower and upper quantiles.

Our contribution to the literature is threefold. First, this is the first study to investigate the impact of competition on stability in the context of both Islamic and conventional banks using an international sample. For the most part, prior studies investigate stability and market power separately, with no study considering both conventional and Islamic banks. Second, we calculate both accounting and market-based stability measures. Critics argue that accounting-based measures, although very popular, may not be good proxies for stability as they yield a backward looking assessment and do not incorporate future expectations. To overcome these problems and to yield robust evidence, we employ both accounting- and market-based credit risk proxies. Third, we use two different methodologies, namely, PVAR and two-stage quantile regression, to estimate the relationship between competition and stability. These methodologies capture different dimensions and the relationship between competition and stability, and thereby provide a more comprehensive analysis. In addition,

both methods are capable of dealing with the problem of endogeneity in the estimation process.

Our research has a number of policy implications. First, it suggests regulating competition in economies where both Islamic and conventional banks coexist, given market power has a significant positive impact on stability. Second, the impact of market power on stability significantly varies across different levels of bank stability, so regulators should consider the effects of any competition regulation policy on the health of the banks. Finally, as both banking systems follow the competition–fragility hypothesis, our results do not suggest the necessity of separate competition regulation for the two banking systems.

The remainder of this chapter is structured as follows. Section 2 discusses the literature and Section 3 describes the methodology. Section 4 details the descriptive statistics and Section 5 provides the empirical results. Section 6 concludes the paper.

2. Literature Review

2.1. Theoretical Evidence

As argued by Carletti (2008) and Berger, Klapper, and Turk-Ariss (2009), there are two opposing views regarding the relationship between competition and stability in the banking sector. Both have strong theoretical and empirical evidence supporting their claims. In this section, we briefly describe the theoretical evidence supporting the competition–fragility and competition–stability hypotheses. In seminal work, Keeley (1990) triggered debate on the competition–fragility relation by showing that the failure of a large number of US banks resulted from deregulation in the banking industry. Using a state preference model, Keeley (1990) showed that an increase in competition accounted for a decline in the charter value of the bank, thereby increasing the probability of bankruptcy. Marcus (1984) also found that

deregulation in the banking industry, along with a system of deposit insurance, facilitated competition that eroded the franchise value of the bank.

To protect this franchise value, banks usually undertake high-risk strategies that eventually may lead to bankruptcy. For instance, Hellmann, Murdock, and Stiglitz (2000) showed that the liberalization of both the US and Japanese banking sectors had increased competition to such an extent it could be held accountable for subsequent bank failures in both countries. Besanko and Thakor (1993) also showed that excessive competition could induce banks to take excessive risk, such that banks could generate informational rents by having a long-term relationship with the borrowers and that banks would in general not wish to break this relationship. However, if there were more banks (that is, more competition), borrowers would readily shift their banking operations to other banks.

Competition on the deposit side may also lead to fragility in that this would increase the deposit rate, thereby lowering bank margins. Supporting this view, Marquez (2002) argued that increased competition in the banking industry would lead to inefficiency, with incumbent banks having an informational advantage over smaller banks. Repullo (2004) also supported the competition–fragility view by suggesting that in a highly competitive market, the franchise value of banks would be eroded, and that a gambling equilibrium would arise in the market such that banks as a whole would take on excessive risk. Conversely, in less competitive (oligopolistic) market, banks would be more stable and take on less risk. Elsewhere, Matutes and Vives (1996) showed that market power lowered the probability of bank default.

However, several theoretical papers have argued that competition in the banking sector would not necessarily lead to excessive risk taking or financial fragility. While banks could certainly obtain higher rents in a more concentrated market, these banks would also have the ability to charge higher interest rates for borrowers, such that to meet the higher interest rate criteria,

borrowers would need to invest in risky projects. In turn, this would increase the default probability for the bank on the asset side, implying that less competition would lead to banking sector instability (Boyd and De Nicolo, 2005). Furthermore, banking systems that consist of a few larger banks (or a highly concentrated banking system) may induce risk-taking behavior by larger banks because of the doctrine of their being "too-big-to-fail". During banking crises, big banks are usually rescued by governments, generating a moral hazard problem among the larger banks (Kane, 2000). Supporting this 'competition–stability' hypothesis, Caminal and Matutes (2002) argued that traditional competition theory disregards the role of banks in reducing asymmetric information problem. If this is sufficiently strong, competition may actually be associated with greater solvency, although the relationship between market power and bank solvency is necessarily complex.

2.2. Empirical Evidence

Similar to the underlying theoretical arguments, there is no clear consensus in the empirical literature as to whether competition enhances stability or fragility. Certainly, one reason for the mixed results is the differences in the methodologies used to calculate competition and financial stability, combined with the analysis of banks in different countries and periods. In this subsection, we first review the empirical literature that finds that competition enhances fragility in the banking sector and then the empirical evidence supporting the competition–stability hypothesis.

Most studies investigating competition–stability/fragility hypotheses have concentrated on the US banking system. Using data from the 150 largest US bank holding companies, Keeley (1990) found that an increase in competition caused the charter value of banks to decline, which in turn led to an increase in default risk. In another study, Fungáčová and Weill (2013) found evidence for the competition–fragility hypothesis using quarterly data over 2001–07

from the Russian banking sector, concluding that market power, as measured by the Lerner index, was negatively associated with bank failure.

Evidence from cross-country analysis also tends to favor the competition–fragility hypothesis. Yeyati and Micco (2007) examined the relationship between competition (again measured by the Lerner index) and risk (as measured by the Z-score) using a sample of commercial banks from eight Latin American countries over the period 1993–2002. They found that banks in more competitive banking systems enjoyed less stability. In another cross-country analysis, Beck, Demirgüç-Kunt, and Levine (2006) concluded that more concentrated banking systems were less likely to experience crisis. Using macroeconomic data on 69 countries over the period 1980–97, they found that the negative relationship between concentration and stability held, once conditioned on macroeconomic, financial, and regulatory characteristics. Moreover, they suggested that 'concentration', which is frequently used as a proxy of competition, might not be a suitable measure of competition. Lastly, Berger et al. (2009) argued that the two strands of literature do not necessarily yield opposing predictions regarding the relationship bank market power and stability. Using data on nearly 9,000 banks across 23 developed economies, they found that while there was support for the competition–fragility hypothesis, the increase in loan portfolio risk associated with market power was also consistent with the competition–stability hypothesis.

Some empirical evidence also exists supporting the competition–stability hypothesis. According to this hypothesis, more competition (or typically less concentration) increases banking sector stability. For instance, Nicoló et al. (2006) examined the competition–stability hypothesis using two different data sets, one cross-sectional data on US banks and the other bank-year data from 134 nonindustrial countries. Consistent with their theoretical findings (Boyd et al, 2005), they provided empirical evidence that the probability of bank failure is positively and significantly correlated with concentration. In another single country study,

Yaldiz and Bazzana (2010) provided evidence supporting the competition–stability' hypothesis for the Turkish banking sector.

A sizeable array of cross-country and regional analysis also provides empirical evidence supporting this hypothesis. Using Panzar and Rosse (1987) H-statistics as a measure of competition, Schaeck, Cihak, and Wolfe (2009) investigated the relationship between systemic crisis and competition across 45 countries, concluding that more competitive banking systems were less likely to experience systemic crisis. In addition, they cast doubt on the use of concentration as a measure of competition as this captures different aspects of banking systems. Anginer et al. (2014) undertook a very similar study by investigating the relationship between competition and systemic risk. One of the more distinctive points of this analysis was the use of the Merton credit risk model to measure systemic risk instead of an accounting-based model such as the Z-score. Using data for 1,872 banks from 63 countries over the period 1997–2009, they found that greater competition in the banking system induced banks to diversify risk that made them less susceptible to systemic shocks. Elsewhere, Liu and Wilson (2013) claimed that the relationship between competition and risk depended on the type of bank, and by conducting an analysis of the Japanese banking system over the period 2000–09, found that an increase in competition reduced the risk of city banks, but increased the risk of regional, Tier 2 regional, Shinkin, and cooperative banks.

In a regional setting, Fu, Lin, and Molyneux (2014) examined the influence of competition, concentration and regulation on individual bank failure in 14 Asia-Pacific countries from 2003 to 2010. They measured competition in both structural (the ratio of the total assets of the three-largest banks to total country assets) and nonstructural ways (Lerner index) and measured systemic risk using Merton's distance to default probability and the Z-score. Fu, Lin, and Molyneux (2014) observed that greater concentration in the banking sector increased financial fragility, reduced pricing power, and increased bank risk exposure. In another study

of 12 Asian countries, Soedarmono, Machrouh, and Tarazi (2011) and Soedarmono, Machrouh, and Tarazi (2013) found that market power was associated with higher insolvency, even though banks were generally better capitalized in a less competitive market.

In other work, Jiménez, Lopez, and Saurina (2013) tested the competition–stability hypothesis using data from the Spanish banking sector. According to their findings, there was a nonlinear relationship between competition and stability after controlling for macroeconomic conditions and banks characteristics. This supports the findings of Martinez-Miera and Repullo (2010) who showed that a nonlinear relationship theoretically exists between competition and risk-taking. In contrast to the findings of Jiménez et al. (2013), in another study conducted on European banking using data from 10 countries over the period 2000–08, Liu, Molyneux, and Wilson (2013) found that an inverted U-shaped relationship existed between competition and stability, but that too much or too little competition could impede financial stability. Tabak, Fazio, and Cajueiro (2012) found the complete opposite, showing that competition affected bank risk-taking behavior nonlinearly–however, unlike Liu et al. (2013), that both high and low competition increased financial stability while moderate competition lowered financial stability.

3. Methodology and Data

In this section, we first describe the measurement of market power, and then we discuss the proxy of financial stability along with other control variables. We provide a brief explanation of two estimation methods that we use in this study, which are PVAR and two-stage quantile regression.

3.1. Lerner Index Calculation

Our calculation of the Lerner index is mainly based on the stochastic frontier estimation approach proposed by Kumbhakar, Baardsen, and Lien (2012) and Coccorese (2014). This

estimation technique has an advantage over other more conventional methods, as argued by Kumbhakar et al. (2012). To start with, there could be optimization error by the firm in minimizing total costs. In addition, markups calculated using the Lerner procedure should theoretically be nonnegative; in practice, the conventional approach generates many nonnegative observations (Coccorese, 2014). Measuring the Lerner index using stochastic frontier techniques overcomes these problems.

In brief, the Lerner index measures the ability of a firm to set a price above marginal cost. In other words, it directly measures the market power of an individual firm. Mathematically, we express this as follows:

$$Lerner_{it} = P_{it-} - MC_{it} / P_{it} \quad (1)$$

Where, P_{it} and MC_{it} are the price and marginal cost of the output of bank *i* in year *t*. We calculate the price of output using the ratio of total revenues to total assets following Fungáčová and Weill (2013) and Fiordelisi and Mare (2014). In line with recent studies, we estimate marginal cost using a trans-log cost function comprising one output, Q_{it} (loans) and three input prices, W_{hit} (*h* = deposits, labor and capital), as follows:

$$\begin{aligned} LnTC_{it} = {} & \alpha_0 + \alpha_1 \ln Q_{it} + \sum_{h=1}^{3} \alpha_h \ln W_{hit} + \frac{1}{2}\alpha_{QQ} (\ln Q_{it})^2 + \frac{1}{2}\sum_{h=1}^{3}\sum_{k=1}^{3} \alpha_{hk} \ln W_{hit} \ln W_{kit} + \\ & \sum_{h=1}^{3} \alpha_{Qh} \ln Q_{it} \ln W_{hit} + \alpha_E \ln E_{it} + \frac{1}{2}\alpha_{EE} (\ln E_{it})^2 + \\ & \sum_{h=1}^{3} \alpha_{Eh} \ln E_{it} \ln W_{hit} + \alpha_{EQ} \ln E_{it} \ln Q_{it} + \alpha_T T + \alpha_{TT} T^2 + \sum_{h=1}^{3} \alpha_{Th} T \ln W_{hit} + \alpha_{TQ} T \ln Q_{it} + \varepsilon_{it} \end{aligned} \quad (2)$$

where *E* is each bank's total equity, *T* is a time trend that captures technological change and ε is the error term. Total equity (*E*) in this model accounts for the possible use of capital as a source of loan funding. This is in line with the intermediation approach to bank behavior where deposits are an intermediate input for producing loans. To impose the symmetry

condition and linear homogeneity restrictions, we divide total cost and the prices of all inputs by the price of labor. As a result, the translog cost function becomes:

$$LnTC_{it}/W_{3it} = \alpha_0 + \alpha_1 \ln Q_{it} + \sum_{h=1}^{3} \alpha_h (\ln W_{hit}/W_{3it}) + \frac{1}{2}\alpha_{QQ}(\ln Q_{it})^2 + \frac{1}{2}\sum_{h=1}^{3}\sum_{k=1}^{3} \alpha_{hk}(\ln W_{hit}/W_{3it})(\ln W_{kit}/W_{3it}) + \sum_{h=1}^{3} \alpha_{Qh} \ln Q_{it}(\ln W_{hit}/W_{3it}) + \alpha_E \ln E_{it} + \frac{1}{2}\alpha_{EE}(\ln E_{it})^2 + \sum_{h=1}^{3} \alpha_{Eh} \ln E_{it}(\ln W_{hit}/W_{3it}) + \alpha_{EQ} \ln E_{it} \ln Q_{it} + \alpha_T T + \alpha_{TT} T^2 + \sum_{h=1}^{3} \alpha_{Th} T(\ln W_{hit}/W_{3it}) + \alpha_{TQ} T \ln Q_{it} + \varepsilon_{it} \quad (3)$$

In this Equation, the error term ε_{it} is a two-component error term $\varepsilon_{it} = \upsilon_{it} + \nu_{it}$ where ν_{it} is a two-sided error term representing noise, and υ_{it} is a one-sided disturbance term representing inefficiency. We estimate this Equation using maximum likelihood techniques. From Equation 3, we calculate *MC* as follows:

$$MC_{it} = \frac{TC_{it}}{Q_{it}}[\widehat{\alpha}_1 + \widehat{\alpha}_2 \ln Q + \sum_{h=1}^{3} \widehat{\delta}_j \ln W_{hit} \quad (4)$$

Once the marginal cost is estimated and the price of output computed, we can calculate the Lerner index for each bank by replacing these two values in Equation 1.

3.2. Financial stability measurement

We measure the financial stability by using three alternative proxies. Two of the proxies are based on accounting-based information, namely, the Z-score and NPL ratio; and the other proxy is the distance to default (DD), a market-based measurement of financial stability. In the following sections, we briefly describe all three proxies of stability.

3.2.1. The Z-score

The Z-score has been used extensively in the literature as a proxy of a bank's stability (Ariss, 2010b; Berger et al., 2009; Fiordelisi and Mare, 2014). One of the important reasons for having popularity of the Z-score as a proxy of financial stability is that it can be computed for both listed and non-listed banks, whereas market-based credit risk measurement such as DD can be calculated only for listed banks. The Z-score measures how many standard-deviations a bank is from exhausting its capital base. To calculate the Z-score, we use the following:

$$Z = (ROA + E/A)/\sigma\, ROA \tag{5}$$

Where, ROA = return on assets, being net profit divided by total assets, E/A = Total equity divided by total assets, and $\sigma\, ROA$ = standard deviation of ROA over a three-year period. Generally, a three-year window for the standard deviation of ROA is sufficient to allow for variation in the Z-score. A higher value of Z indicates the increased solvency of banks and vice versa.

3.2.2. NPL ratio

The other accounting-based proxy of stability used in this research is the NPL ratio (Ariss, 2010b; Schaeck and Cihák, 2014). We measure the NPL ratio by dividing the total amount of impaired loans held by the bank by the net amount of loans. A higher NPL ratio indicates the increased probability of bank insolvency.

3.2.3. Distance-to-default

The third proxy of stability used in this research is the distance-to-default model, a market-based credit risk measure. Recent literature in banking has adopted DD model as a proxy of stability because it overcomes the many problems accounting-based stability measures face

(Anginer et al., 2014; Jokipii and Monnin, 2013; Koutsomanoli-Filippaki and Mamatzakis, 2009). The DD model is calculated using market information following the theory of Merton (1974) and Black and Scholes (1973). The Merton (1974) model assumes that the equity of a firm is equivalent to a call option on the firm's assets, given the equity holders are the residual claimants on the firm's assets after all liabilities have been met. In this model, the strike price of the call option is the book value of the firm's liabilities. If the value of the firm's assets is lower than the strike price, the value of equity is zero. The Merton model has two important assumptions. First, the total market value of the firm's underlying assets follows a geometric Brownian motion,

$$dV_A = \mu V_A dt + \sigma_A V_A dW \tag{6}$$

where, V_A is a firm's assets value, μ is the expected instantaneous periodic rate of return on assets, σ_A is the instantaneous standard-deviation of the rate of return on assets, or asset volatility and dW is a standard Weiner process. The second assumption in this model is that the firm has issued a single discount bond maturing in *T* periods. Under this assumption, the equity of the firm is a call option on the underlying value of the firm's asset with a strike price, denoted by V_A, equal to the face value of firm's debt, *X* at a time-to-maturity of *T*. The current market value of equity, V_E, can be expressed by using Black and Scholes (1973) option pricing formula for call options:

$$V_E = V_A N(d_1) - X_e^{-rT} N(d_2) \tag{7}$$

Where

$$d_1 = \frac{\ln\left(\frac{V_A}{X}\right) + \left(r + 0.5{\sigma_A}^2\right)T}{\sigma_A \sqrt{T}} \tag{8}$$

and $d_2 = d_1 - \sigma_A\sqrt{T}$ where r is the risk free rate, σ_A is the instantaneous standard-deviation of the rate of return on the value of assets of banks (asset volatility) and N is the cumulative density function of the standard normal distribution.

In order to calculate the DD, two equations are required. The first is Equation 7, which states that the value of the firm's equity is a function of the value of the firm. The second relates to the volatility of its equity.

$$\sigma_E = \left(\frac{V_A}{E}\right)\frac{\partial E}{\partial V}\sigma_v \tag{9}$$

In the Black–Scholes–Merton model, we can show that $\frac{\partial E}{\partial V} = N(d_1)$, such that under the assumption of Merton's model, the relation between the volatilities of the firm and its equity is

$$\sigma_E = \left(\frac{V_A}{E}\right)N(d_1)\sigma_A \tag{10}$$

and the DD and probability of default are:

$$DD_t = \frac{\ln\left(\frac{V_{A,t}}{X_t}\right) + \left(\mu - \frac{1}{2}\sigma_A^2\right)T}{\sigma_A\sqrt{T}} \tag{11}$$

$$PD = N(-DD) \tag{12}$$

where DD = distance-to-default, PD = probability of default, V_A= value of assets, σ_A = volatility of assets, X_t= total liabilities, μ = expected asset return, T = time period, and N = cumulative probability distribution.

This approach has several distinct advantages when compared with other market-based credit risk indicators such as the ratings of subordinated debt or credit, or accounting-based measures such as the Z-score and nonperforming loan (NPL) ratio. Anginer et al. (2014)

argue that using accounting-based credit risk measurement is problematic for investigating the relationship between competition and stability, since competition measurement is mostly based on accounting information. Hence, there is a probability of spurious regression results and market-based credit risk measurement such DD model overcomes this problem. In addition, we can obtain share price at a high frequency and easily for listed banks. Further, stock prices incorporate investor expectations, thus we can easily consider the DD model as a forward-looking assessment of bank soundness, whereas accounting-based measurements are backward looking.

3.3 Estimation Methods

We use two different sophisticated methodologies to investigate the relationship between competition and stability. These are the panel vector autoregressive method and the two-stage quantile regression method. In the following sections, we briefly discuss these two methods.

3.3.1. PVAR Estimation Technique

Since seminal work by Sims (1980), VAR has played a significant role in analyzing the dynamic relationships between variables. The VAR model is especially useful when the underlying theory is weak and when the variables are endogenous. The PVAR methodology combines the traditional VAR approach with a panel data approach that allows for unobserved individual heterogeneity. Many recent studies have employed PVAR estimation techniques to analyze the behavior of macroeconomic variables (Grossmann, Love, and Orlov, 2014; Jokipii and Monnin, 2013) between macroeconomic and bank-specific variables (Love and Turk Ariss, 2014) and in banking particularly (Koutsomanoli-Filippaki and Mamatzakis, 2009; Saeed and Izzeldin, 2014). In our study, both our variables of interest (competition and stability) are endogenous, as argued in the extant literature. However, the relationship between these two variables is complex. Given the VAR model does not require

a strong *a priori* relationship between the variables, the VAR model is appropriate for our purposes. In addition, we can calculate impulse response function and variance decomposition using the VAR model. We employ the PVAR model developed by Love and Zicchino (2006) for our analysis. The model takes the following form:

$$Z_{it} = \mu_{\iota\tau} + \varepsilon_{\iota\tau} + \tau Z_{\iota\tau} - 1 \quad (13)$$

where Z_{it} is a vector of two random variables (here, competition and financial stability), τ is an $m \times m$ matrix of coefficients, μ is a vector of m individual effects and ε_{it} is a multivariate white-noise vector of m residuals. One of the restrictions imposed in the PVAR is that the underlying structure is identical for each cross-sectional unit. However, in practice, this restriction seldom holds. One way to address this problem is to allow for individual heterogeneity in the levels of the variables by introducing fixed effects, denoted μ in the model. This is one of the advantages of using PVAR (Love and Turk Ariss, 2014). Because of the dependent variable lags, there would be correlation between the fixed effects and the regressors, which results in biased coefficients. In order to eliminate this problem, we use forward-mean differencing, also known as the Helmert procedure, following Love and Zicchino (2006), which removes only the forward mean. This method preserves the orthogonality between transformed variables and lagged regressors, which allows us to use lagged regressors as instruments and estimate the equation by system GMM (Arellano and Bover, 1995).

After computing the coefficients of the PVAR, we estimate the impulse response functions (IRF) and the variance decompositions (VDC) using a Cholesky decomposition that identifies the orthogonal shocks in our variables. We use the IRFs to identify the response of one variable to the shock of another variable. Variance decompositions estimate the percentage of variation in one variable explained by the shock to another variable over time. We generate

confidence intervals for the orthogonolized IRFs using Monte Carlo simulation and identify the response to one shock at a time while holding other shocks constant. An implicit assumption behind the Cholesky decomposition is that the variables listed earlier in the VAR order affect the other variables contemporaneously, whereas the variables listed later in the VAR order impact those earlier listed variables, only with lag. That is, variables listed earlier are more exogenous. Since our data set is a panel and there is large cross country variation among the countries, to control this effect we include Gross domestic product (GDP) growth rate and log of total asset (LTA) in the equation as control variables. Hence, we have four variables in the equation and based on the exogeneity, we order our variables as follows: *GDP*, *LTA*, *LERNER*, and *STABILITY*. Since GDP growth rate is a macro economic variables, it is expected that GDP will have impact on the size of the banks. In the same way, size of the banks will have impact on gaining market power and market power is expected to influence the stability of the banks.

3.3.2. Two-stage Quantile Regression

Quantile regression, as opposed to least squares estimation, provides robust estimation results if the treatment of the program varies across different segment of the population. This method was first developed by Koenker and Bassett Jr (1978) and subsequently used in different areas of research. As argued by Schaeck and Cihák (2014) and Dima et al. (2014), response from weak banks towards competition may differ from the stable banks. Thus, employing quantile regression would give a better predictive ability on the relationship between competition and stability. Since our main variable of interest – Lerner index – is an endogenous variable, it may produce biased result in conventional quantile regression estimates. To overcome this problem, we employ the two-stage quantile regression developed by Amemiya (1982). In the first stage, we regress the Lerner index on the excluded instruments along with other exogenous variables. By following Schaeck and Cihák (2014),

we use Financial Freedom Index (FFI) as an instrument of market power. In the second stage, we regress the credit risk variable on the predicted value for the Lerner index and other bank specific and macro-specific variables that may potentially affect the stability. A bootstrapping procedure is followed to calculate the correct standard error in the second stage. Our baseline regression equation is as follows:

$$\text{Stability} = f(\text{Competition, Bank controls, Macro Controls}) \quad (14)$$

3.4. Control Variables

We use both bank specific and macro-economic control variables in our regression Equation 14. Among the bank specific variables, we use log of total asset (*LTA*), non-interest income to total income (*NIIGR*) as a proxy of diversification, growth of gross loan (*GGL*) and loan to deposit (*LCD*) ratio. Among the country specific variables, we use inflation, economic freedom index (*EFI*) and governance index. Definitions of the variables that are used in this study are presented in Table 1.

[INSERT TABLE 1 HERE]

3.5. Data

Our initial sample consists of countries that have both Islamic and conventional banks over the period 2000–2012. Our sample varies slightly depending on the proxies of stability. Our initial sample includes 16 countries that have both Islamic banks and conventional banks and data are available to calculate the Z-score and the Lerner index. These are Bahrain, Bangladesh, Brunei, Egypt, Indonesia, Jordan, Kuwait, Lebanon, Malaysia, Mauritania, Pakistan, Qatar, Saudi Arabia, Syria, UAE and Yemen. Among these countries, Mauritania and Lebanon do not have data on the NPL ratio, thus are excluded from the sample when the dependent variable is NPL ratio. Further, as DD calculation requires stock market data, we exclude five more countries – Brunei, Indonesia, Malaysia, Syria and Yemen from analysis,

when the DD is dependent variable due to lack of market price data on banks. Our final number of observations for the full sample is 2678, 2283 and 1342 when the stability proxies are the Z-score, NPL ratio and DD score respectively. Data on bank specific variables are collected from the Bankscope database, and macro-economic data are collected from the World Bank database and Heritage foundation.

4. Descriptive Statistics

Summary statistics of all variables are presented in Table 2. As shown in this table, the overall mean of the LI for Islamic banks (0.23) is significantly higher than that for conventional banks (0.14). This result is consistent with the prior literature (Ariss, 2010a; Weill, 2011) that investigated the differences in competition between Islamic and conventional banks using the LI. Proxy of stability – the Z-score – is significantly higher for conventional banks (66.75) than Islamic banks (55.814), indicating that Islamic banks are less stable than their counterpart conventional banks when stability is measured by the Z-score. The overall NPL ratio is 9.917 % for the full sample, whereas the NPL ratios for conventional banks and Islamic banks are 9.33% and 8.62% respectively. That implies that the NPL ratio is significantly lower for Islamic banks than for conventional banks. The last proxy of stability – the DD score – also shows that Islamic banks have higher stability than conventional banks, as the DD score of Islamic banks is significantly higher than that of conventional banks.

Among the bank-specific control variables, we find that the size of the bank is significantly lower for Islamic banks than for their counterpart conventional banks. This is in line with previous research, as most Islamic banks are relatively new in banking operations in most of the sample countries. Non-interest income to total revenue (NIIGR) – a proxy of diversification – is significantly higher for Islamic banks (41.36%) than for conventional banks (35.36%), implying that Islamic banks' business operations are more diversified than

conventional banks'. Growth of gross loans (GGL) are also significantly higher for Islamic banks than for conventional banks, since most of the Islamic banks are having unprecedented growth in most of the sample countries. Loan to deposit ratio (LCD) is also significantly higher for Islamic banks. Among the macro-economic variables, the average score of the Economic Freedom index (EFI) is 54.96 among the sample countries. Financial freedom index lies between 19.65 and 90 with an average score of 38.2. Average inflation is 6.3%, ranging between -10% and 53%. Finally, the governance score lies between -1.928 and 0.790, with an average score of -0.451.

[INSERT TABLE 2 HERE]

5. Empirical Analysis

5.1. PVAR Analysis

In this section, we present the PVAR estimation results followed by the impulse response function and variance decomposition of competition and financial stability. One of the more important steps in VAR estimation is to select the appropriate lag length. Selecting too many lags will result in a loss of degree of freedom, while too short a lag length will fail to capture the dynamics of the model. We first use the Lagrange multiplier (LM) test for autocorrelation to select the appropriate lag length. The result shows that the appropriate lag length is one. We confirm this with the results of the Schwarz information criteria (SIC).

Table 3 displays the estimated coefficient of the PVAR model with a lag of one for endogenous and exogenous variables. Since the objective of this study is to investigate the impact of competition on stability, we focus mainly on the association between the Lerner index and the three proxies of stability, such as the Z-score, the NPL ratio and the DD. From Panel A, the estimated coefficient shows that the lag value of market power does not have any significant impact on the Z-score in the full sample, conventional and Islamic banks. In

the Granger causality framework, this means that the Lerner index does not Granger–cause the Z-score in either conventional or Islamic banks. From Panel B, we observe that the Lerner index has significant negative impact on the NPL ratio in the full sample and conventional banks; however, it has no significant impact on Islamic banks. It can be argued that the Lerner index Granger–causes the NPL ratio for conventional banks. Finally, from Panel C it can be observed that the lag value of the Lerner index has a positive relationship with the DD in the full sample, conventional banks and also in Islamic banks. It is difficult to generalize the result based on these regressions, since different proxies of credit risk provide mixed results. To understand further the relationship between competition and stability, we direct our attention to impulse response function and variance decomposition.

[INSERT TABLE 3 HERE]

5.2. Impulse Response Function and Variance Decomposition

To investigate better the competition–stability hypothesis, we concentrate on the impulse response function and the variance decomposition derived from the PVAR estimation. Figures 1–3 plot the impulse response function of the Lerner index with the Z-score; figures 4–6 depict the impulse response function with the NPL ratio; and Figures 7–9 illustrate the impulse response function of the DD score. In these figures we plot the responses of row variables to a one standard-deviation to the shock to the column variables. All figures show responses for the first six years. The two lines on either side of the impulse response are 5^{th} and 95^{th} percentile bounds, constructed using Monte Carlo simulations with 500 repetitions. Again in line with our objective, we discuss only the Lerner shock on proxies of stability, which is in Row 4 and Column 3 in every graph.

5.2.1. Lerner Index and Z-score

Figures 1–3 illustrate the impulse response function for all banks, conventional banks and Islamic banks respectively. From Figure 1, it appears that the impact of one positive standard-deviation shock to the Lerner index results in an increase in the Z-score of nearly 5 points for all banks (Fig 1: Row 4, Column 3). The effect remains positive throughout the period and reaches equilibrium point at Year Six. This positive relationship between market power and stability supports the competition–fragility hypothesis. Splitting the sample into Islamic and conventional banks provides very similar results. Figure 2 displays the response of the Z-score in conventional banks from an impulse in the Lerner index. It can be seen that the immediate reaction to the Lerner index was an increase in the Z-score in the first year by nearly 5 points, and the effect reached zero immediately in Year Two and it remained the same for the subsequent periods, indicating that a positive relationship exists between market power and stability; and the effect is very short term. Looking at Figure 3 that represents the impulse response for the Z-score and the Lerner index in Islamic banks, it reveals that the Z-score responds negatively to the one standard-deviation shock of the Lerner index in the first year, and from Year Two the effect is positive throughout the remaining period. Comparing conventional and Islamic banks reveals that the effect of market power on the Z-score is more persistent for Islamic banks than conventional banks. The immediate effect of market power on stability is positive for conventional banks but negative for Islamic banks. A similarity between both banking systems is that the competition–fragility hypothesis is applicable for both banking systems.

Looking at the variance decomposition of the Z-score and the LI presented in Table 4 (panel A), we observe that the Lerner index explains the 0.3%, 0.04% and 7% variation of the Z-score in the full sample, conventional banks and Islamic banks respectively. This indicates

that, as regards market power, Islamic banks have better ability than conventional banks to explain the variation of stability when it is measured by the Z-score.

[INSERT FIGURE 1 HERE]

[INSERT FIGURE 2 HERE]

[INSERT FIGURE 3 HERE]

5.2.2. Lerner Index and NPL Ratio

The IRF for the NPL ratio and the Lerner index are presented in Figures 4–6 for all banks, conventional banks and Islamic banks respectively. From Figure 4 it can be seen that a positive standard-deviation shock to the Lerner index results in a decrease in the NPL ratio by 0.50% in the first period and a slight decrease in the second period, where it reached a peak. The effect of the Lerner index on the NPL ratio started increasing from Period 3 but far from the equilibrium point, indicating that the effect of market power on the NPL ratio is long lasting. The IRF for conventional banks also show similar trends (See Figure 5). For Islamic banks (Figure 6), although the NPL responds negatively to the shock of the Lerner index, similar to conventional banks, it does not have a sharp decrease like conventional banks. These graphs indicate that the impact of market power on the NPL ratio is negative, which supports the competition–fragility hypothesis. The variance decomposition presented in Table 4 (Panel B), indicates that the 0.7% variation in the NPL ratio can be explained by the Lerner index in the full sample, while it is only 0.4% and 0.2% for conventional and Islamic banks respectively.

[INSERT FIGURE 4 HERE]

[INSERT FIGURE 5 HERE]

[INSERT FIGURE 6 HERE]

5.2.3. Lerner Index and DD Score

Figures 7–9 plot the impulse response function for the DD and the LI for all banks, Islamic banks and conventional banks, respectively. The positive impact of the LI on the DD for all banks is observable from the estimated impulse response function presented in Figure 7. According to this, the DD responds positively but has a decreasing trend to one innovation shock of LI throughout the entire period, and the effect is diminished at Year Six.

As for conventional banks, in Figure 8 we find the consistent evidence that a standard-deviation shock to the Lerner index results in a slight increase in the DD for the first period and then a sharp decrease from Year Two, although the effect remains positive for the subsequent years. Turning to the results for the impulse response function of Islamic banks in Figure 9, we can see that one standard-deviation shock to the LI does not have impact in the first year, followed by a further slight increase in the second year, and nearly zero by the sixth year. As shown in Table 4 (Panel C), approximately 0.09% of the variation in the DD (stability) can be explained by the LI (competition) for the full sample. For Islamic banks, the LI explains some 11% of the variation in the DD, while for conventional banks, the LI explains 0.04% of the variation in the DD. This indicates the effect that market power has better predictive ability for Islamic banks than for conventional banks.

[INSERT FIGURE 7 HERE]

[INSERT FIGURE 8 HERE]

[INSERT FIGURE 9 HERE]

[INSERT TABLE 4 HERE]

5.3. Two-Stage Quantile Regression

5.3.1. Impact of Lerner Index on the Z-score

Table 5 presents the results on the impact of market power on the Z-score for the full sample, conventional and Islamic banks respectively. Columns 1–5 represent the estimation results for the full sample; columns 6–10 present the results for conventional banks; and columns 11–15 present the results for Islamic banks. Using the quantile regression, we can obtain point estimates for the effect of the Lerner index on different stages of stability for both types of banking systems. From Table 5 we note that the Lerner index has a positive relationship with the Z-score and the impact is significant at the 10^{th}, 50^{th} and 75^{th} quantiles in the full sample, and the coefficient of the Lerner index is significantly higher for the 75^{th} quantile than for other quantiles, which indicates that banks that have higher stability (in terms of the Z-score) and benefit more from increasing stability than banks that are staying at a lower quantile of the Z-score.

In the sample of conventional banks (Columns 6–10), the Lerner index appears to be significant at the 50^{th} and 75^{th} quantiles, at 5% and 1% respectively. Similar to the full sample, the coefficient of market power at the 75^{th} quantile is much higher than at other quantiles. Conventional banks that are in the lower and upper quantiles do not have any significant impact of market power on the Z-score. On the other hand, the Lerner index has significant impact on stability at the 10^{th} quantile only for Islamic banks, indicating that high-risk Islamic banks (lower quantile of the Z-score) are able to reduce their credit risk by gaining more market power. Market power loses its significance towards the upper quantile of the Z-score for Islamic banks. A sharp contrast between Islamic and conventional banks is that high-risk Islamic banks benefit in reducing credit risk by gaining more market power, while safer conventional banks are able to increase their stability by gaining more market power

when the credit risk is measured by the Z-score. The varying effect of the Lerner index on stability at different quantiles signifies the usage of quantile regression.

[INSERT TABLE 5 HERE]

We plot the coefficients obtained from different quantiles for the full sample, conventional and Islamic banks, which are presented in Figures 10–12. These estimates illustrate a one-unit change of the Lerner index on stability, with the other variables held constant. The vertical axis indicates the covariate effect and the horizontal line represents the different quantile scale. As reported earlier, while in both the full sample and the conventional bank sample the coefficient increases towards a higher quantile, the coefficient decreases in the Islamic bank sample. One notable similarity among all three samples is that from the 80^{th} quantile the coefficient has a decreasing trend, indicating safer banks benefit less in reducing credit risk by gaining more market power than riskier banks. Based on these tables and graphs, a positive relationship can be established between market power (Lerner index) and stability (Z-score). These findings lend support to the competition–fragility hypothesis.

[INSERT FIGURE 10 HERE]

[INSERT FIGURE 11 HERE]

[INSERT FIGURE 12 HERE]

Among the bank-specific control variables, size has a significant positive impact on the Z-score in the lower quantile but has a significant negative impact on the upper quantile of the Z-score. This indicates that riskier banks can increase their stability by increasing their size compared to banks that are highly stable. A proxy of diversification – NIIGR – shows a significant negative relationship with the Z-score at the lower and median quantile for both banking systems. Growth of gross loans (GGL) shows a negative significant impact on the Z-score across all the quantiles for the full sample but shows no significant impact on Islamic

banks. The Economic Freedom index shows a positive significant relationship with the Z-score in conventional banks only, indicating that a better economic freedom helps to stabilize the banking sector. Consistent with conventional economic theory, inflation shows a significant negative relationship with the Z-score in the full sample and conventional banks only. Governance appears to be positively significant in the full sample and the upper quantile of Islamic banks, which signifies that good governance is required to achieve better stability in the banking system.

5.3.2. Impact of Lerner Index on the NPL Ratio

Quantile regression results affecting the relationship between the Lerner index and the NPL ratio are presented in Table 6. Columns 1–5 are for all banks, 6–10 are for conventional banks only and 11–15 are for Islamic banks.

Based on the reported results in Table 6, in general we find that the Lerner index has significant negative impact on the NPL ratio across all quantiles for the full sample, implying that an increase in market power significantly lowers the NPL ratio, thus supporting the competition–fragility hypothesis. Similar to the full sample, the Lerner index has significant negative impact on the NPL ratio in all quantiles, at 1% significant level in the conventional banks sample. In contrast, market power does not have any significant impact on the reduction of the NPL ratio on the lower and upper quantiles in the case of Islamic banks. In other words, Islamic banks that have a very low NPL ratio or have an extremely high NPL ratio, do not benefit in reducing credit risk by gaining more market share.

[INSERT TABLE 6 HERE]

To better understand the effect of the Lerner index on the NPL ratio from quantile regression, we plot the coefficient of the Lerner index in Figures 13–15 for all banks, conventional banks and Islamic banks respectively. In Figure 13 we see that the effect of the Lerner index on the NPL ratio is consistently negative for the full sample of banks. We also note that the effect of market power on stability varies a great deal across the different quantiles. Figure 14, which illustrates the effect of the Lerner index on the NPL in different quantiles in conventional banks, also indicates similar results obtained from the full sample. A greater market power helps to lower the NPL ratio for risky banks (banks that have a high NPL ratio). Figure 15 depicts the impact of the Lerner index on the NPL ratio on different points for Islamic banks. Overall, these graphs signify that troubled banks are benefiting more from an increase in market power than comparatively more stable banks. Moreover, conventional banks have a higher ability to lower the credit risk than Islamic banks in all quantiles, since the coefficient of each quantile of conventional banks is significantly higher than Islamic banks.

[INSERT FIGURE 13 HERE]

[INSERT FIGURE 14 HERE]

[INSERT FIGURE 15 HERE]

Among the control variables, size (LTA) has a significant negative impact on the reduction of the NPL ratio for both banking systems. In particular, banks that are lying in a higher quantile have the advantage of lowering the NPL ratio. As banks get bigger, they have more resources that can be allocated for better screening and monitoring procedures, and thus may lower the NPL ratio of the bank. Non-interest income to total revenue (NIIGR) significantly increases the NPL ratio across all quantiles in conventional banks only. This implies that conventional banks that concentrate on areas of business other than their main operations face greater instability. The growth of gross loans (GGL) has a significant negative impact on the

reduction of the NPL ratio for both the conventional and Islamic bank samples. The loan to deposit ratio (LCD) does not have any significant impact on the reduction of the NPL ratio in either of the banking systems. The Economic Freedom index appears to be significant for conventional banks only. The governance score has a significant negative impact on the NPL ratio for conventional banks only, which indicates that a good governance mechanism in a country helps to lower the NPL ratio.

5.3.3. Impact of Lerner Index on the DD Score

Regression results based on the DD score as a proxy of credit risk have been presented in Table 7. As appears in Table 7 (Columns 1–5), the Lerner index has a significant positive impact in all quantiles on the DD score for the full sample of banks, indicating that market power increases stability, thus lending support to the competition–fragility hypothesis. The coefficient of the Lerner index is highest (5.01) at the 50^{th} quantile and lowest (2.51) at the 10^{th} quantile, implying that banks are staying in the median (50^{th} quantile) in terms of stability, as measured by the DD score, and benefit more by increasing stability, by increasing market power, compared to the lower and upper quantiles of the DD score.

As for the conventional banks sample, the Lerner index positively significantly affects the DD score at a 1% significant level for all quantiles, thus supporting the competition–fragility hypothesis (Table 7, Columns 6–10). Contra to the full sample, the coefficient of the Lerner index is highest at the 10^{th} quantile of the DD score in conventional banks, while it is lowest at the 90^{th} quantile (4.68). This indicates that conventional banks with lower stability can increase their stability by increasing market power, compared to relatively stable banks. We do not find any significant impact of the Lerner index on the DD score in the Islamic banks sample except at the 75^{th} quantile. Moreover, at the 25^{th} quantile, the impact of market power on stability is negative, although not significant.

[INSERT TABLE 7 HERE]

The coefficient of the Lerner index from different quantiles has been plotted in Figures 16–18 for the all, conventional and Islamic banks samples. For the full sample of banks, the coefficient of the Lerner index has an upward trend until the 75th quantile, and from then on, the effect of market power on the DD decreases. For the conventional bank sample, the Lerner index has a decreasing trend, and for Islamic banks, the coefficient of the Lerner index decreases until the 30th quantile and then it increases up to the 75th quantile. Comparing the coefficient of the Lerner index between Islamic and conventional banks, the coefficient of the Lerner index in conventional banks is higher than in Islamic banks, indicating that an increase in market power increases the stability of conventional banks more than Islamic banks.

[INSERT FIGURE 16 HERE]

[INSERT FIGURE 17 HERE]

[INSERT FIGURE 18 HERE]

5.4. Comparative Analysis between Conventional and Islamic Banks

Based on the foregoing discussion, it can be argued that market power has a significant positive impact on stability for both Islamic and conventional banks. This result supports the traditional competition–fragility hypothesis for both banking systems and is in line with the findings of Ariss (2010b) and Dima et al. (2014). Second, the impact of market power on stability is higher for conventional banks than for Islamic banks, as the coefficient of the Lerner index is higher for conventional banks. The impact of the Lerner index on credit risk proxies is very weak in the case of Islamic banks, as two out of three proxies of stability do not show a significant correlation with market power across the different quantiles. Third,

among the proxies of credit risk, we find that both the NPL and the DD score provide more consistent results than the Z-score.

6. Conclusion

The competition–stability/fragility nexus is one of the widely investigated hypotheses in the banking literature. One strand of literature argues that excessive competition in the banking industry lowers the franchise value of the bank and induces the bank to have a riskier loan portfolio, thus is associated with higher instability. The other strand of literature argues that without enough competitive force, banks will charge a higher interest rate to the borrower, which may make the loan risky. Furthermore, lack of competition often results in lack of innovation in products and lack of efficiency, which may make the banking industry fragile. Thus, an 'appropriate' level of competition is required to increase stability among banks. Both views enjoy theoretical and empirical support in the literature and the results can be described, at best, as mixed.

The Islamic banking system has been enjoying an unprecedented level of growth during the last two decades. It has also received special attention from policy makers and regulators as a viable alternative banking system. Islamic banks face fierce competition from their peer Islamic banks, as well as from their counterpart conventional banks in most of the countries where they operate. Thus, the sustainability of Islamic banks in the long run is a concern for policy makers as well as practitioners. However, the effect of competition on stability by comparing Islamic and conventional banks has not been investigated so far in the literature, either in a single country or in an international sample of banks. Our research attempts to contribute to the literature by investigating the impact of competition on stability in the context of Islamic and conventional banks.

To investigate the competition–stability hypothesis, we select 16 countries that have both Islamic and conventional banks, for the period 2000–2012. We estimate the market power (lack of competition) by using the Lerner index, and stability by using both accounting-based measurements such as the Z-score and the NPL ratio, and market-based credit risk measurements such as Merton's distance to default model. We use panel vector autoregressive (PVAR) estimation techniques, as this method has better predictive ability if the variables considered are likely endogenous. In addition, we can derive impulse response function (IRF) and undertake variance decomposition using PVAR to investigate better the relationship between competition and stability. As a robustness check, we also use two-stage quantile regression, as this method is robust to the non-normality of data and other error term misspecification.

The PVAR estimation method provides interesting results with regards to the relationship between competition and stability in both Islamic and conventional banks. First, we do not find a consistent Granger causality effect between competition and stability. Second, our results indicate that a one standard-deviation shock to the Lerner index, results in an increase in stability for the subsequent period for both Islamic and conventional banks, though the magnitude varies greatly depending on the stability proxies. This finding lends support to the competition–fragility hypothesis. Third, the Lerner index has a short-term effect on both the Z-score and the DD, while it has a long-term effect on the NPL ratio. Further analysis by using two-stage quantile regression provides some interesting results. First, in general, market power increases stability, regardless of changing stability proxies for the full sample, conventional and Islamic banks, thus lending support to the competition–fragility hypothesis. Second, the level of significance of market power on stability is stronger for conventional banks than for Islamic banks. Third, the magnitude of effect of the Lerner index is also higher for conventional banks than for Islamic banks, as the coefficient of the Lerner index is higher

for conventional banks. Fourth, while we find a general positive relationship between market power and stability, the magnitude of effect on stability significantly varies in the different degrees of stability in both conventional and Islamic banks. Finally, we find that banks that are in the median (50^{th}) quantile have higher ability to turn market power into stability than have banks in the lower and upper quantiles.

Our results have a number of policy implications. First, they suggest regulating the level of competition in those countries where both Islamic and conventional banks coexist. Second, since the response from weak or riskier banks differs from the response from strong or stable banks significantly in terms of market power, regulators should address this issue in designing appropriate policy for banks. Third, in general, our results provide evidence that the relationship between market power and stability is the same for the Islamic and the conventional banking system, hence, a uniform stability-enhancing regulation policy can be developed for both banking systems.

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Table 1: Variable Descriptions and Data Sources

Variable	Description	Source
Z-score components		
Return on equity	Net profit/Total asset	Bankscope
Leverage	Equity/asset	Bankscope
Nonperforming Loan	Net impaired loans/Gross loans	Bankscope
Distance to Default (DD) Component		
Volatility of equity(s_E)	Annualized volatility based on daily share price	DataStream
Market capitalization	Share price times number of shares outstanding	DataStream
Total liabilities(X_t)	Short-term + half of the long-term liabilities	Bankscope
Risk-free rate (R)	Three-/six- month Treasury rate	DataStream/Central bank of website of each country/IMF database
Value of asset (V_a)	Market value of asset	Author's calculation
Volatility of asset (s_A)	Volatility of asset	Author's calculation
Expected return on asset (m)	Expected market return on asset	Author's calculation
Lerner Index (LI) components		
Total revenue	Interest + other operating income	Bankscope
Total cost	Interest + personnel + other operating expenses	Bankscope
Total output	Loans+ other earning asset	Bankscope
Price of deposits	Interest expense/ total deposit	Bankscope
Price of labor	Personnel expense/total assets	Bankscope
Price of capital	Other operating expense/ total fixed assets	Bankscope
Equity	Total equity	Bankscope
Bank-specific Variables		
Log of total assets (LTA)	Natural logarithm of total assets (USD million)	Bankscope
Diversification (NIIGR)	Non-interest income/Total operating income	Bankscope
Growth of gross loans (GGL)	Year on year change of total Loan	Bankscope
Loan to deposit ratio (LCD)	Gross loan/ Total deposit	Bankscope
Macroeconomic variables		
Inflation (INF)	Year on year change of CPI index	World Bank
Governance (GOV)	Average of six governance measures compiled by Kaufmann et al.(2010)	WorldWide governance Indicators
Financial Freedom Index (FFI)	Measures the banking independence ranges between 0 (no freedom) to 100(maximum freedom)	The heritage foundation
Economic Freedom Index (EFI)	Economic Freedom Index	The heritage foundation

Table 2: Summary Statistics

	All banks					Conventional banks					Islamic banks					t stat
Variable	N	Mean	Std. Dev.	Min	Max	N	Mean	Std. Dev.	Min	Max	N	Mean	Std. Dev.	Min	Max	
LI	2678	0.18	0.15	0	0.73	2122	0.16	0.13	0	0.73	556	0.25	0.2	0	0.73	–13.27***
Z-score	2678	63.71	99.04	–0.96	644.17	2122	66.76	98.04	–0.96	644.17	556	55.81	101.22	–0.96	644.17	3.08****
NPL	2283	9.2	11.4	0.1	61.6	1901	9.33	11.14	0.1	61.6	382	8.62	12.44	0.1	61.6	1.29*
DD	1342	2.24	3.31	–10.74	10.01	1151	2.17	3.26	–10.74	10.01	191	2.58	3.53	–10.74	10.01	–1.81**
LTA	2678	7.13	2.2	–3.91	15.72	2122	7.51	1.97	–2.41	15.72	556	6.24	2.44	–3.91	14.17	18.07***
NIIGR	2678	37.09	40.22	–749.63	928.27	2122	35.36	32.5	–355.02	928.27	556	41.32	54.45	–749.63	901.62	–4.38***
GGL	2678	28.73	66.54	–100.00	900.69	2122	24.5	53.27	–92.88	848.1	556	39.81	91.83	–100.00	900.69	–6.49***
LCD	2678	86.16	76.23	0.08	982.5	2122	77.47	53.37	0.77	982.5	556	109.36	113.96	0.08	973.73	–12.15***
INF	2678	0.06	0.06	–0.10	0.53											
GOV	2678	–0.45	0.6	–1.93	0.79											
FFI	2678	38.2	19.65	0	90											
EFI	2678	54.96	16.43	0	77.7											

Notes: Asterisks denote significance at the * – .10, ** – .05 and *** – .01 level.

Table 3: Coefficient Estimates for the Baseline PVAR Model

Panel A				
Dependent variable :	GDP	LTA	LI	Z-score
All banks				
GDP (t–1)	0.254***	0.64***	0.037	237.033
LTA(t–1)	–0.006***	0.843***	0.000	23.662***
LI(t–1)	0.114***	0.029	0.474***	19.677
Zscore (t–1)	0.000	0.000	0.0001	0.318***
Conventional banks				
GDP (t–1)	0.260***	0.651***	–0.036	27.746
LTA(t–1)	–0.005***	0.849***	0.000	26.279***
LI(t–1)	0.040*	–0.054	0.465***	–14.452
Zscore (t–1)	0.0001**	0.000*	0.0001	0.288***
Islamic banks				
GDP (t–1)	0.223***	0.597***	0.179	888.503
LTA(t–1)	–0.01***	0.825***	–0.005	21.6
LI(t–1)	0.248***	0.024	0.433***	–222.332
Zscore (t–1)	–0.0001	0.000	0.0001**	0.389*
Panel B				
Dependent variable :	GDP	LTA	LI	NPL
All banks				
GDP (t–1)	0.247***	0.680***	0.068	–13.875***
LTA(t–1)	–0.004	0.849***	0.002	–0.095
LI(t–1)	0.043***	–0.395***	0.522***	–6.261*
NPL (t–1)	–0.002*	–0.004***	0.0001*	0.683***
Conventional banks				
GDP (t–1)	0.263***	0.63***	0.032	–14.966**
LTA(t–1)	–0.004**	0.851***	0.002	–0.187
LI(t–1)	0.009	–0.232	0.534***	–8.764**
NPL (t–1)	–0.0007	–0.003***	0.000	0.658***
Islamic banks				
GDP (t–1)	0.241**	1.019**	0.134	–11.924*
LTA(t–1)	–0.001	0.849***	–0.003	0.086
LI(t–1)	0.216***	–0.797**	0.379***	–1.947
NPL (t–1)	–0.0002*	–0.013***	0.001**	0.845***
Panel C				
Dependent variable:	GDP	LTA	LI	DD
All banks				
GDP (t–1)	0.372***	0.109	–0.008	7.166*
LTA(t–1)	–0.006**	0.776***	0.006	0.732***
LI(t–1)	0.12***	0.411*	0.430***	4.904
DD (t–1)	0.002***	0.002	0.001	0.139***
Conventional banks				
GDP (t–1)	0.374***	0.34*	–0.056	6.001
LTA(t–1)	–0.004*	0.786***	0.009*	0.608**

LI(t–1)	0.062**	0.373**	0.397***	7.39*
DD (t–1)	0.001***	0.003*	0.000	0.13***
Islamic banks				
GDP (t–1)	0.260*	–1.224**	0.079	17.904
LTA(t–1)	–0.006	0.713***	–0.009	1.233**
LI(t–1)	0.281***	0.304	0.424**	1.179
DD (t–1)	0.003***	–0.009	0.005***	0.23**

Notes: Asterisks denote significance at the * – .10, ** – .05 and *** – .01 level.

Table 4: Variance Decomposition

	All bank				Conventional banks				Islamic banks			
Panel A: Z-score	GDP	LTA	Lerner	Z-score	GDP	LTA	Lerner	Z-score	GDP	LTA	Lerner	Z-score
GDP	0.926	0.004	0.069	0.001	0.981	0.002	0.010	0.007	0.737	0.009	0.228	0.027
LTA	0.086	0.909	0.002	0.003	0.102	0.891	0.000	0.007	0.043	0.947	0.008	0.002
Lerner	0.004	0.001	0.992	0.003	0.007	0.001	0.992	0.000	0.012	0.002	0.913	0.073
Z-score	0.011	0.003	0.002	0.984	0.009	0.005	0.001	0.986	0.061	0.001	0.016	0.923
Panel B: NPL ratio												
	GDP	LTA	Lerner	NPL	GDP	LTA	Lerner	NPL	GDP	LTA	Lerner	NPL
GDP	0.984	0.001	0.011	0.003	0.992	0.001	0.001	0.006	0.846	0.000	0.151	0.003
LTA	0.113	0.816	0.015	0.056	0.126	0.837	0.005	0.032	0.072	0.756	0.030	0.143
Lerner	0.003	0.002	0.986	0.008	0.003	0.002	0.991	0.004	0.034	0.003	0.937	0.025
NPL	0.036	0.025	0.017	0.921	0.036	0.023	0.026	0.914	0.071	0.041	0.012	0.875
Panel C: DD score												
	GDP	LTA	Lerner	DD	GDP	LTA	Lerner	DD	GDP	LTA	Lerner	dd
GDP	0.853	0.005	0.093	0.050	0.921	0.001	0.037	0.041	0.606	0.033	0.189	0.172
LTA	0.033	0.923	0.042	0.002	0.045	0.905	0.044	0.006	0.027	0.920	0.006	0.047
Lerner	0.016	0.029	0.955	0.001	0.021	0.025	0.954	0.000	0.009	0.091	0.784	0.116
DD	0.005	0.011	0.030	0.955	0.003	0.014	0.044	0.939	0.035	0.008	0.015	0.942

Note: Each row represents the variance decomposition of the row variable. Each cell shows how much the column variable affects the variance of each row variable

Table 5: The Effect of Competition on Bank Stability (the Z-score)

Dep. Variable	Z-score														
	All banks					Conventional banks					Islamic banks				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
	10th	25th	50th	75th	90th	10th	25th	50th	75th	90th	10th	25th	50th	75th	90th
LERNER	5.076	6.25	17.419	37.348	24.31	1.993	8.514	19.984	69.84	49.642	10.349	2.119	–11.407	–37.018	–98.532
	(1.66)*	-1.44	(2.68)***	(1.82)*	-0.55	-0.43	-1.24	-1.86	(2.73)***	–0.75	(1.90)*	-0.29	(–1.03)	(–1.41)	(–1.40)
LTA	0.639	0.375	0.018	–1.625	–8.925	0.603	0.606	–0.116	–0.977	–6.617	0.364	0.202	–0.699	–2.211	–9.235
	(3.90)***	-1.56	-0.05	(–2.29)**	(–5.92)***	(3.34)***	(2.61)***	(–0.35)	(–1.35)	(–3.91)**	-0.73	-0.37	(–0.84)	(–1.14)	(–1.76)*
NIIGR	–0.044	–0.056	–0.066	–0.120	–0.028	–0.062	–0.069	–0.082	–0.133	–0.034	–0.035	–0.023	–0.014	0.133	0.291
	(–3.17)***	(–2.61)***	(–2.48)**	(–2.06)**	(–0.18)	(–3.21)***	(–2.46)**	(–2.57)**	(–1.94)	(–0.20)	(–1.63)*	(–0.62)	(–0.30)	-0.93	-0.59
GGL	–0.017	–0.036	–0.036	–0.075	–0.186	–0.020	–0.019	–0.030	–0.066	–0.155	–0.011	–0.021	–0.003	–0.028	–0.178
	(–2.24)**	(–2.86)***	(–2.07)**	(–2.07)**	(–3.80)***	(–2.18)**	(–1.40)	(–1.26)	(–1.81)	(–2.98)**	(–0.83)	(–0.90)	(–0.08)	(–0.67)	(–1.14)
LCD	–0.010	–0.008	–0.021	–0.029	0.023	–0.011	–0.001	–0.013	–0.030	0.138	–0.008	–0.014	–0.013	–0.023	–0.055
	(–2.62)**	(–0.90)	(–2.38)**	(–1.16)	-0.33	(–1.22)	(–0.12)	(–0.60)	(–0.51)	–1.05	(–1.48)	(–1.51)	(–1.12)	(–0.93)	(–0.85)
EFI	0.018	–0.018	–0.139	0.024	–0.527	0.067	0.503	0.855	1.972	3.506	0.036	–0.098	–0.321	–0.417	–1.373
	-0.37	(–0.23)	(–1.32)	-0.1	(–0.86)	–0.42	(3.17)***	(2.93)***	(3.46)***	–1.96	(0.37)*	(–0.77)	(–1.70)*	(–0.94)	(–1.19)
INF	–35.420	–50.647	–73.660	–90.338	–131.123	–46.114	–53.535	–68.003	–95.167	–138.387	12.213	3.725	–11.001	8.42	100.695
	(–6.24)***	(–8.17)***	(–10.74)***	(–3.78)***	(–2.10)**	(–6.25)***	(–7.41)***	(–9.28)***	(–4.66)***	(–2.18)*	-0.69	-0.21	(–0.40)	-0.15	-0.54
GOV	0.833	3.095	8.023	12.664	42.2	1.241	0.571	2.457	–1.711	5.077	1.693	1.925	8.076	14.551	81.26
	-0.83	(2.18)**	(3.68)***	(2.41)**	(2.50)**	–0.83	–0.36	–0.7	(–0.31)	–0.25	-0.76	-0.66	(2.44)***	-1.43	(2.09)**
C	8.886	21.718	44.376	79.851	204.213	7.982	–9.896	–9.271	–35.330	–35.833	4.65	16.515	49.352	88.138	278.878
	(2.50)***	(3.97)***	(6.09)***	(4.38)***	(4.41)***	–0.83	(–1.01)	(–0.55)	(–1.14)	(–0.38)	-0.72	(1.65)*	(4.21)***	(3.25)***	(2.78)***
N	2678	2678	2678	2678	2678	2122	2122	2122	2122	2122	556	556	556	556	556
R–squared:	0.018	0.02	0.022	0.026	0.041	0.024	0.031	0.034	0.041	0.052	0.014	0.007	0.009	0.013	0.048

Notes: Figures in parentheses are standard error. Asterisks denote significance at the * – .10, ** – .05 and *** – .01 level. Definitions of all variables are listed in Table 5.1.

Table 6: The Effect of Competition on Bank Stability (the NPL Ratio)

Dep. Var:	NPL ratio														
	All banks					Conventional banks					Islamic banks				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
	10th	25th	50th	75th	90th	10th	25th	50th	75th	90th	10th	25th	50th	75th	90th
LERNER	–1.978	–2.648	–5.776	–15.097	–22.362	–2.353	–3.697	–6.386	–18.555	–25.460	–0.865	–2.484	–5.408	–12.096	–17.415
	(–3.28)***	(–4.09)***	(–6.16)***	(–7.76)***	(–3.72)***	(–3.46)***	(–4.92)***	(–5.49)***	(–7.67)***	(–3.57)***	(–0.80)	(–2.23)**	(–3.24)***	(–3.15)***	(–1.29)
LTA	0.034	–0.051	–0.235	–0.820	–1.553	0.024	–0.069	–0.246	–0.804	–1.546	0.085	–0.026	–0.203	–0.875	–1.684
	-1.36	(–2.27)**	(–5.91)***	(–9.68)***	(–8.64)***	-0.88	(–2.63)***	(–5.39)***	(–9.06)***	(–8.38)***	–1.47	(–0.44)	(–1.70)*	(–3.77)***	(–2.44)**
NIIGR	0.004	0.007	0.009	0.034	0.06	0.005	0.004	0.011	0.04	0.068	0.001	–0.003	–0.02	0.011	0.054
	(2.27)**	(1.92)*	-1.03	(2.26)**	(2.90)***	(2.02)**	-0.82	-1.3	(2.62)***	(2.90)***	–0.06	(–0.32)	(–0.98)	–0.23	–0.68
GGL	–0.015	–0.022	–0.034	–0.046	–0.044	–0.016	–0.022	–0.034	–0.044	–0.038	–0.014	–0.019	–0.025	–0.041	–0.075
	(–6.21)***	(–6.99)***	(–7.76)***	(–5.00)***	(–4.24)***	(–6.03)***	(–5.60)***	(–6.00)***	(–4.10)***	(–3.43)***	(–2.41)**	(–3.03)***	(–2.75)***	(–3.09)***	(–3.16)***
LCD	–0.001	–0.001	–0.002	–0.001	–0.004	–0.001	0.001	–0.000	–0.007	–0.005	–0.002	–0.002	–0.003	0.003	0.034
	(–0.78)	(–0.76)	(–0.74)	(–0.16)	(–0.25)	(–0.53)	-0.3	(–0.03)	(–0.86)	(–0.37)	(–0.77)	(–0.86)	(–1.09)	–0.2	–1.12
EFI	0.063	0.084	0.104	0.133	0.095	0.069	0.118	0.168	0.198	0.21	–0.002	–0.014	–0.02	0.103	0.385
	(3.51)***	(3.79)***	(3.62)***	(1.96)*	-0.61	(3.73)***	(4.91)***	(4.47)***	(2.03)**	-1.24	(–0.06)	(–0.30)	(–0.38)	–0.69	–1.1
INF	1.06	2.585	6.503	16.24	21.895	0.478	1.532	6.158	14.182	32.385	10.474	12.603	13.54	22.39	20.115
	-1.23	-1.52	-1.9	(2.71)***	(2.22)**	-0.55	-0.86	(1.73)*	(2.00)**	(3.20)***	(2.20)**	(3.27)***	(2.33)**	(2.15)**	–1.12
GOV	–0.712	–1.238	–2.048	–2.650	–2.998	–0.741	–1.387	–2.651	–3.827	–3.737	–0.26	–0.451	–0.823	0.831	–2.34
	(–3.97)***	(–5.38)***	(–6.63)***	(–3.83)***	(–1.87)*	(–3.78)***	(–5.20)***	(–6.66)***	(–4.77)***	(–2.17)**	(–0.68)	(–0.88)	(–1.30)	–0.51	(–0.66)
	(–2.07)**	(–1.63)	(–0.46)	-1.12	(2.26)**	(–2.13)**	(–2.44)**	(–1.89)*	-0.3	-1.55	(–0.01)	–0.87	–1.56	–0.97	–0.21
c	–0.019	2.138	4.917	8.221	6.219	–2.322**	–3.467**	–4.384*	1.642	14.92	–0.019	2.138	4.917	8.221	6.219
	(–0.01)	-0.82	-1.59	-0.98	-0.28	(–2.02)	(–2.44)	(–1.95)	-0.3	-1.38	(–0.01)	-0.82	-1.59	-0.98	-0.28
N	2283	2283	2283	2283	2283	1901	1901	1901	1901	1901	382	382	382	382	382
R–squared:	0.03	0.037	0.054	0.088	0.112	0.03	0.039	0.057	0.096	0.119	0.059	0.057	0.06	0.085	0.145

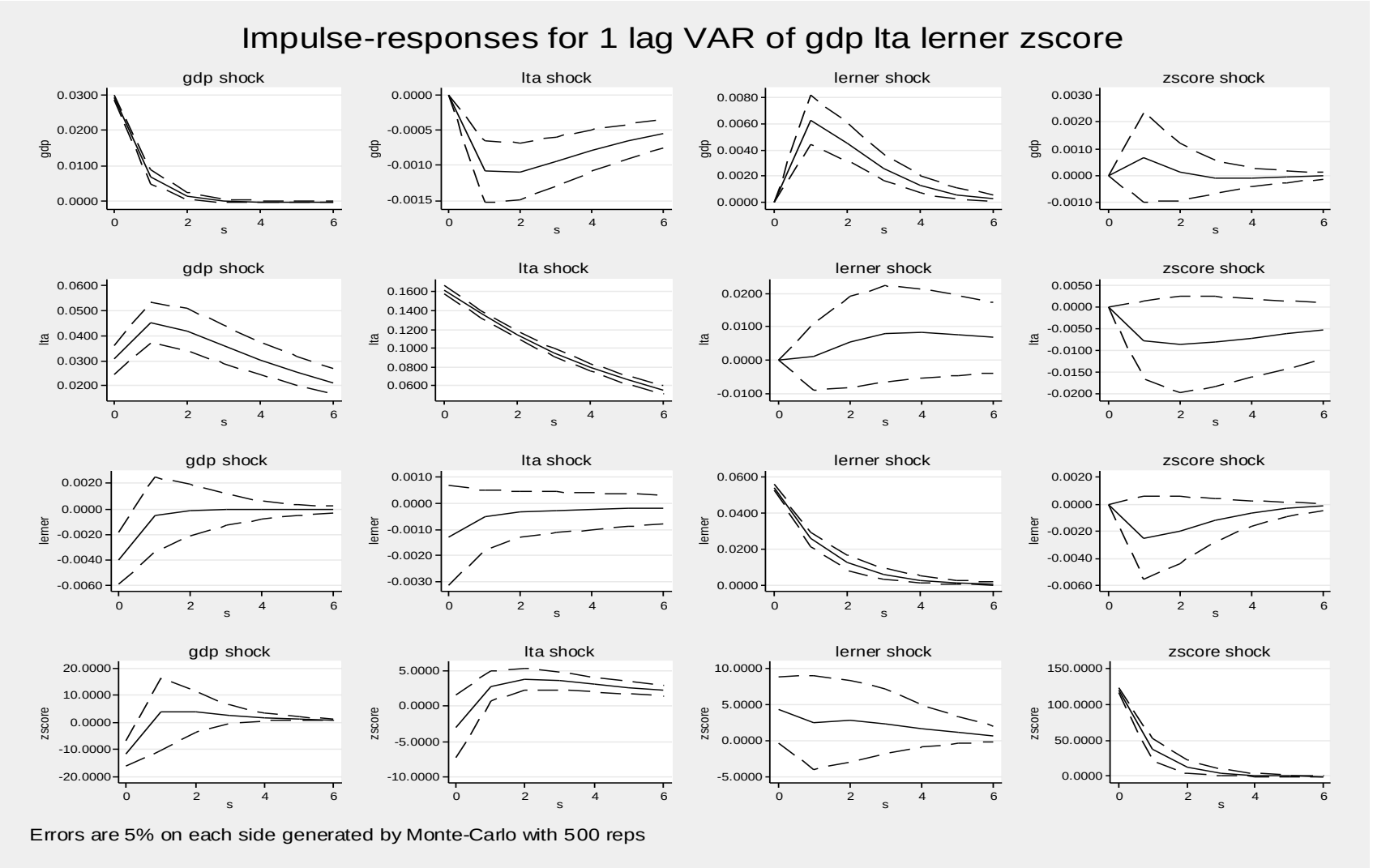
Notes: Figures in parentheses are standard error. Asterisks denote significance at the * – .10, ** – .05 and *** – .01 level. Definitions of all variables are listed in Table 1

Table 7:The Effect of Competition on Bank Stability (the DD score)

Dep. Var:	DD Score														
	All banks					Conventional banks					Islamic banks				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
	10th	25th	50th	75th	90th	10th	25th	50th	75th	90th	10th	25th	50th	75th	90th
LERNER	2.512	4.393	5.014	4.839	3.92	7.989	6.987	7.214	6.141	4.685	4.625	–0.720	2.476	4.064	2.757
	-1.37	(3.48)***	(4.70)***	(6.37)***	(3.01)***	(3.44)***	(5.33)***	(5.62)***	(5.59)***	(2.96)***	-1.17	(–0.34)	-0.86	(1.93)*	-1.32
LTA	0.006	0.087	0.157	0.094	0.022	0.143	0.131	0.198	0.1	0.041	–0.001	–0.086	0.241	0.057	–0.011
	-0.08	-1.53	(4.49)***	(2.82)***	-0.41	(1.73)*	(2.43)**	(5.12)***	(2.82)***	-0.66	(–0.00)	(–0.35)	-1.21	-0.5	(–0.09)
NIIGR	–0.004	–0.005	–0.002	0.004	0.007	–0.012	–0.004	–0.000	0.003	0.011	0.042	0.007	0.018	0.036	0.033
	(–0.50)	(–1.01)	(–0.32)	-0.51	-0.82	(–1.22)	(–0.86)	(–0.02)	-0.31	-1.14	-1.37	-0.27	-0.83	-1.42	(1.96)*
GGL	0.001	0.001	–0.001	–0.002	0.007	–0.001	0.001	–0.002	–0.006	0.003	0.012	0.003	0.004	0.011	0.003
	-0.3	-0.41	(–0.24)	(–0.85)	-0.81	(–0.20)	-0.18	(–0.91)	(–2.24)**	-0.23	-1.07	-0.45	-0.68	-0.88	-0.19
LCD	0.005	0.001	0.001	–0.001	0.005	0.005	0.001	–0.001	–0.001	–0.004	0.008	0.004	0.003	0	0.013
	-1.21	-0.53	-0.45	(–0.13)	-1.01	-0.71	-0.31	(–0.16)	(–0.28)	(–0.63)	-0.82	-0.53	-0.4	-0.02	-1.4
EFI	0.183	0.066	0.029	0.057	0.137	0.129	0.015	–0.001	0.045	0.132	0.101	0.098	0.049	0.062	0.082
	(2.41)**	(1.66)*	-1.06	(1.95)*	(3.26)***	(1.77)*	-0.36	(–0.02)	-1.24	(2.80)***	-0.61	-0.81	-0.5	-0.69	-1.08
INF	–22.210	–22.439	–20.277	–16.834	–11.257	–24.777	–23.385	–19.231	–16.328	–10.176	–13.318	–10.038	–27.639	–19.067	–16.624
	(–6.28)***	(–6.96)***	(–8.60)***	(–6.36)***	(–3.66)***	(–5.81)***	(–6.90)***	(–7.97)***	(–5.86)***	(–3.22)***	(–1.04)	(–1.28)	(–3.07)***	(–2.43)**	(–2.16)**
GOV	0.379	0.956	0.957	1.073	1.059	0.737	1.297	1.206	1.144	1.38	1.147	1.066	0.455	1.464	0.858
	-0.64	(2.60)***	(3.13)***	(4.19)***	(2.08)**	-1.15	(3.61)***	(3.73)***	(3.77)***	(2.31)**	-0.83	-1.2	-0.42	(1.79)*	-1.21
C	–7.861	–0.722	1.991	3.058	–0.407	–6.338	1.23	2.975	3.325	0.8	–5.046	–1.971	1.141	2.094	0.034
	(–1.84)*	(–0.33)	-1.25	(1.76)*	(–0.16)	(–1.64)*	-0.57	(1.70)*	(1.66)*	-0.28	(–0.48)	(–0.30)	-0.2	-0.38	-0.01
N	1342	1342	1342	1342	1342	1151	1151	1151	1151	1151	191	191	191	191	191
R–squared:	0.19	0.147	0.144	0.136	0.146	0.225	0.167	0.154	0.136	0.148	0.139	0.109	0.131	0.145	0.195

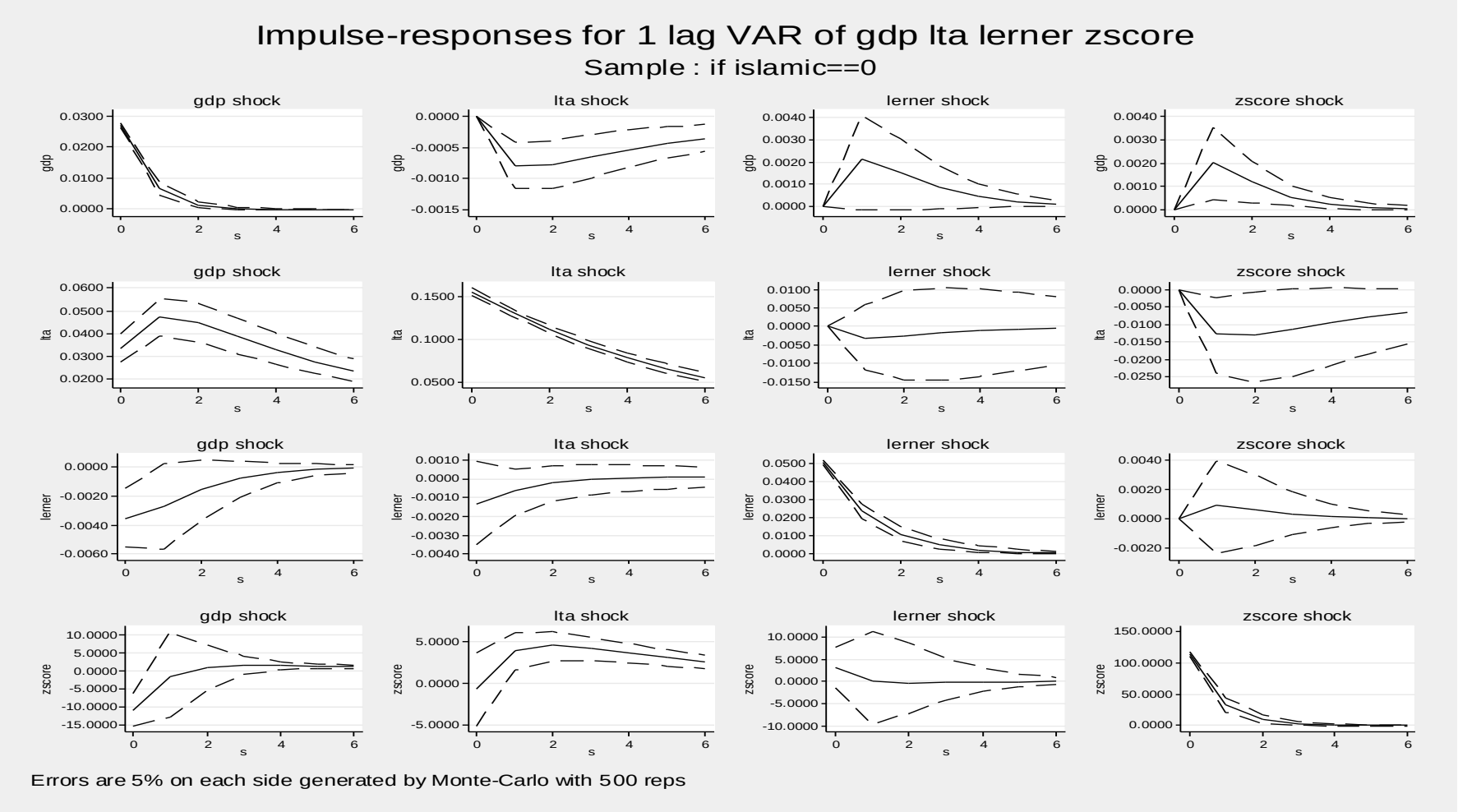
Notes: Figures in parentheses are standard error. Asterisks denote significance at the * – .10, ** – .05 and *** – .01 level. Definitions of all variables are listed in Table 5.1.

Figure 1: Impulse response function to shocks: Lerner and the Z-score for All Banks



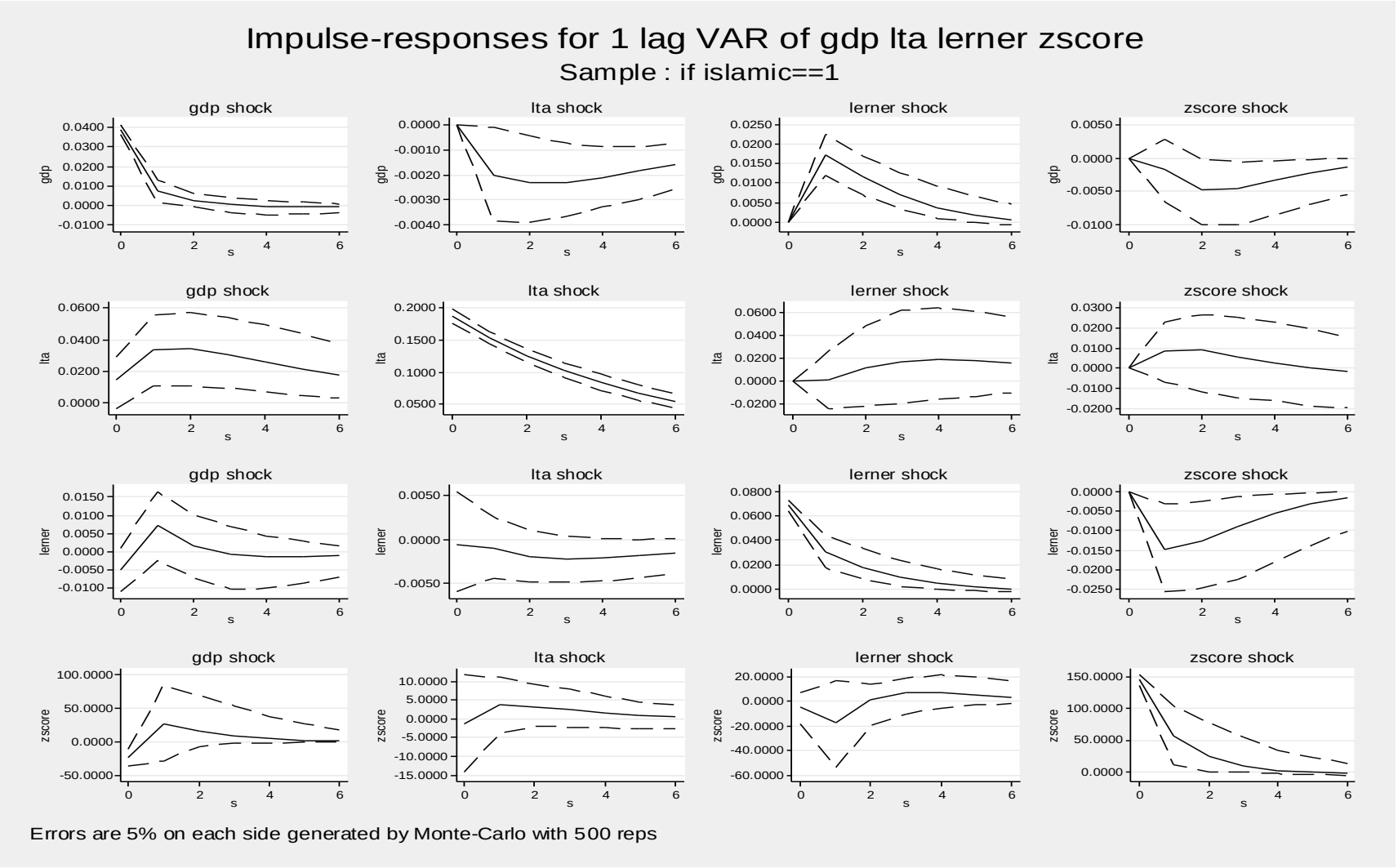
Note: The solid line shows the impulse responses. The dashed lines indicate five standard error confidences around the estimate. Errors generated by Monte-Carlo with 500 repetitions.

Figure 2: Impulse response function to shocks: Lerner and the Z-score for conventional banks



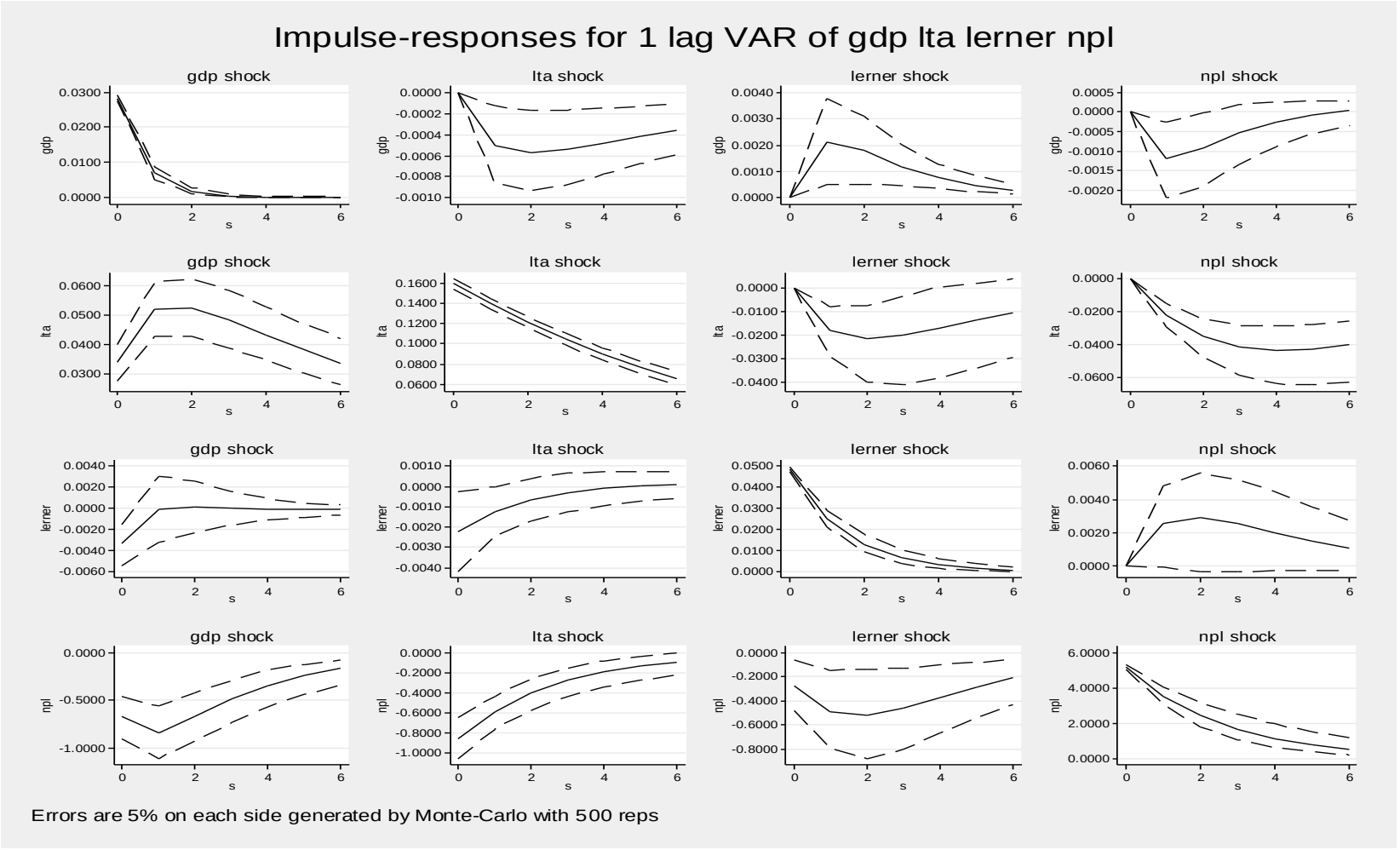
Note: The solid line shows the impulse responses. The dashed lines indicate five standard error confidences around the estimate. Errors generated by Monte-Carlo with 500 repetitions.

Figure 3: Impulse response function to shocks: Lerner and the Z-score for Islamic banks



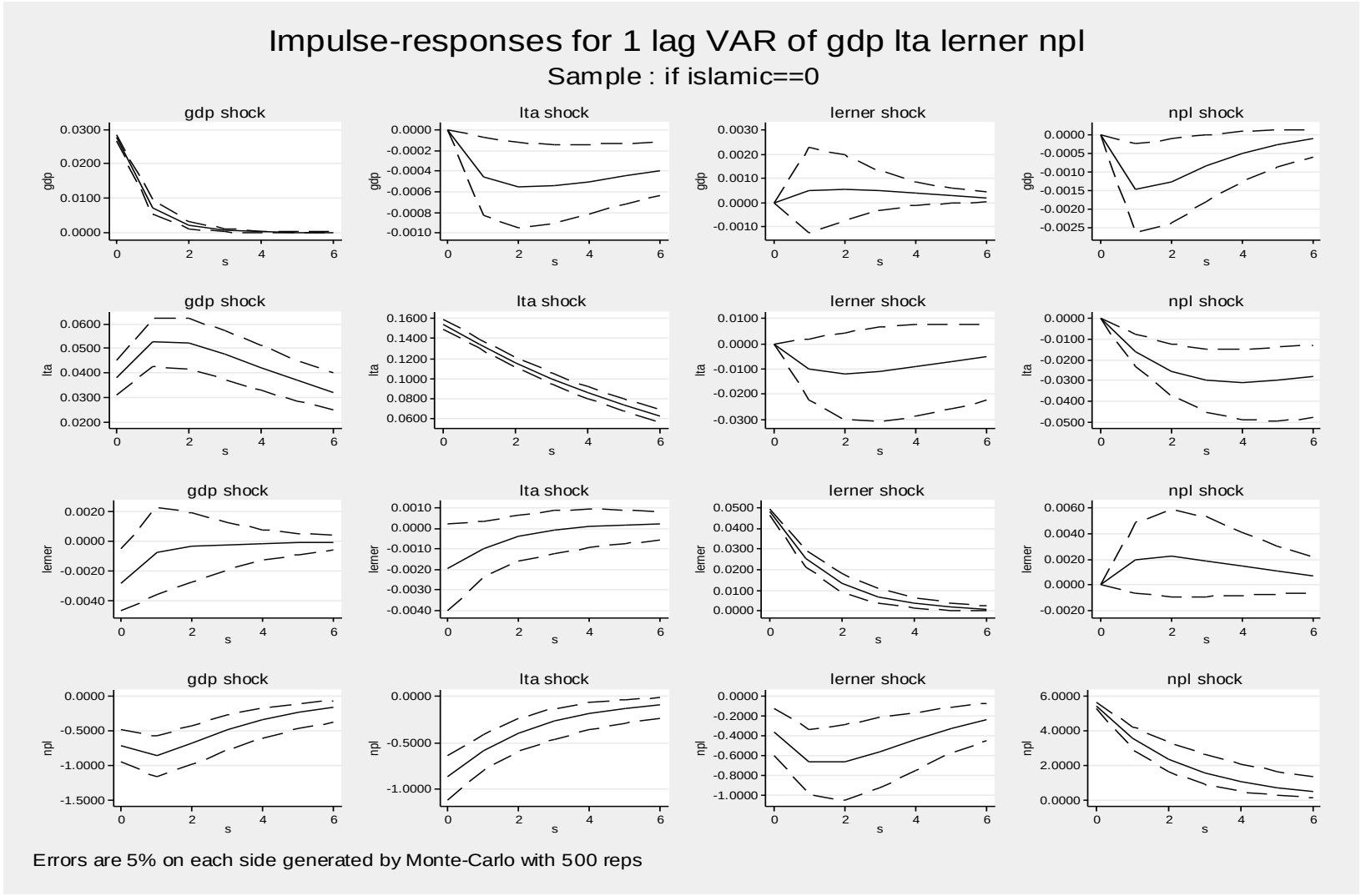
Note: The solid line shows the impulse responses. The dashed lines indicate five standard error confidences around the estimate. Errors generated by Monte-Carlo with 500 repetitio

Figure 4: Impulse response function to shocks: Lerner and the NPL ratio for all banks



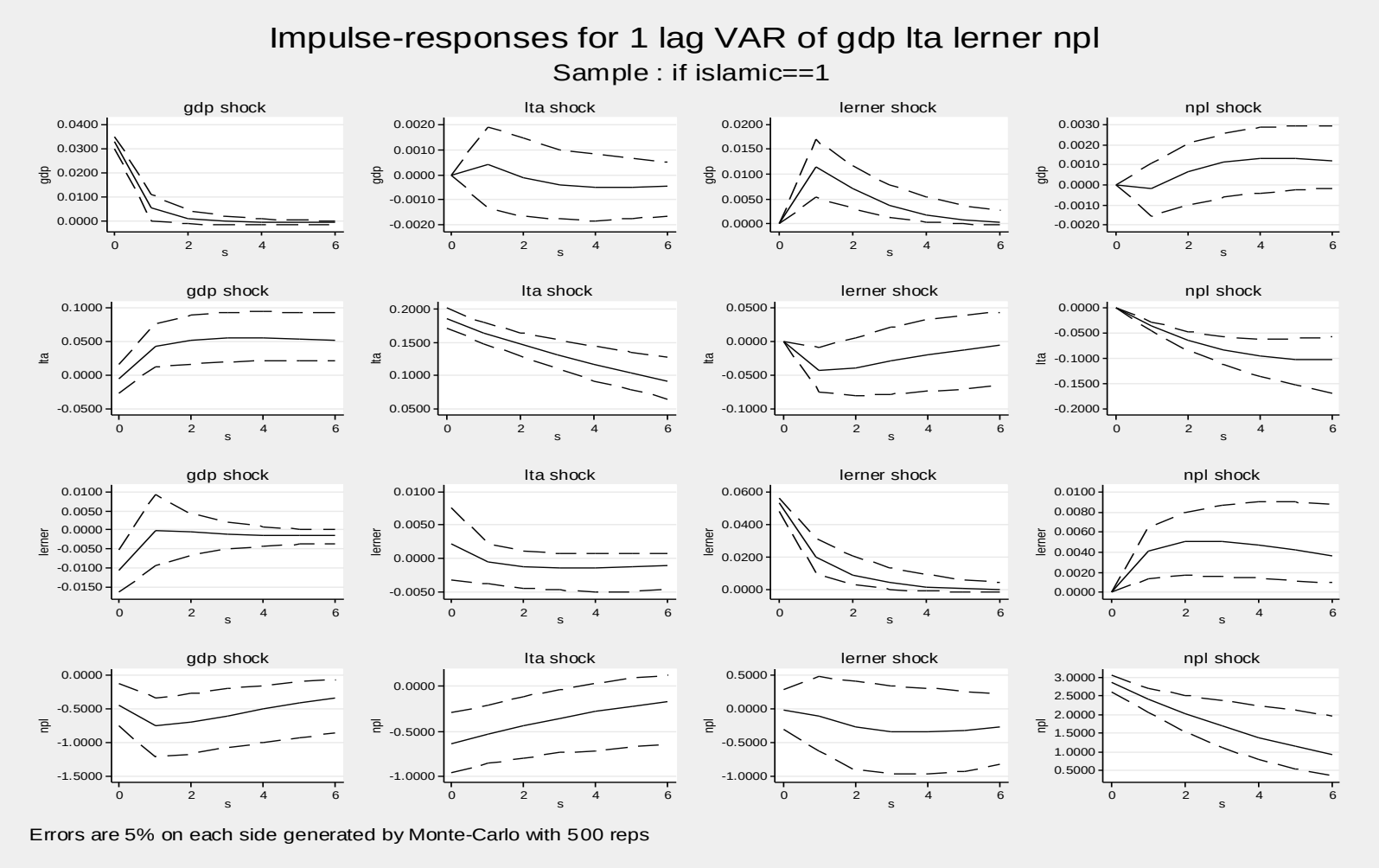
Note: The solid line shows the impulse responses. The dashed lines indicate five standard error confidences around the estimate. Errors generated by Monte-Carlo with 500 repetitions

Figure 5: Impulse response function to shocks: Lerner and the NPL ratio for conventional banks



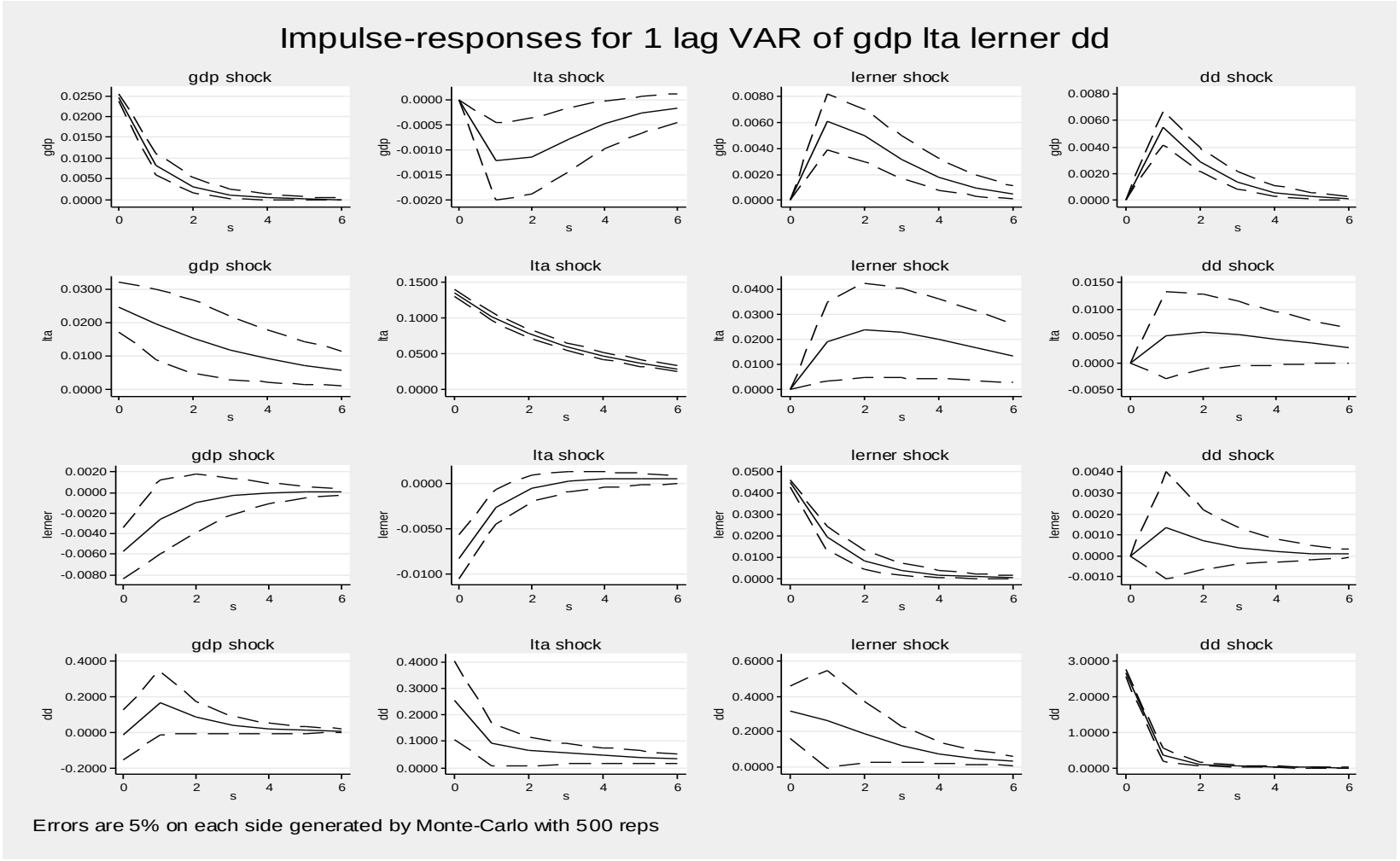
Note: The solid line shows the impulse responses. The dashed lines indicate five standard error confidences around the estimate. Errors generated by Monte-Carlo with 500 repetitions

Figure 6: Impulse response function to shocks: Lerner and the NPL ratio for Islamic banks



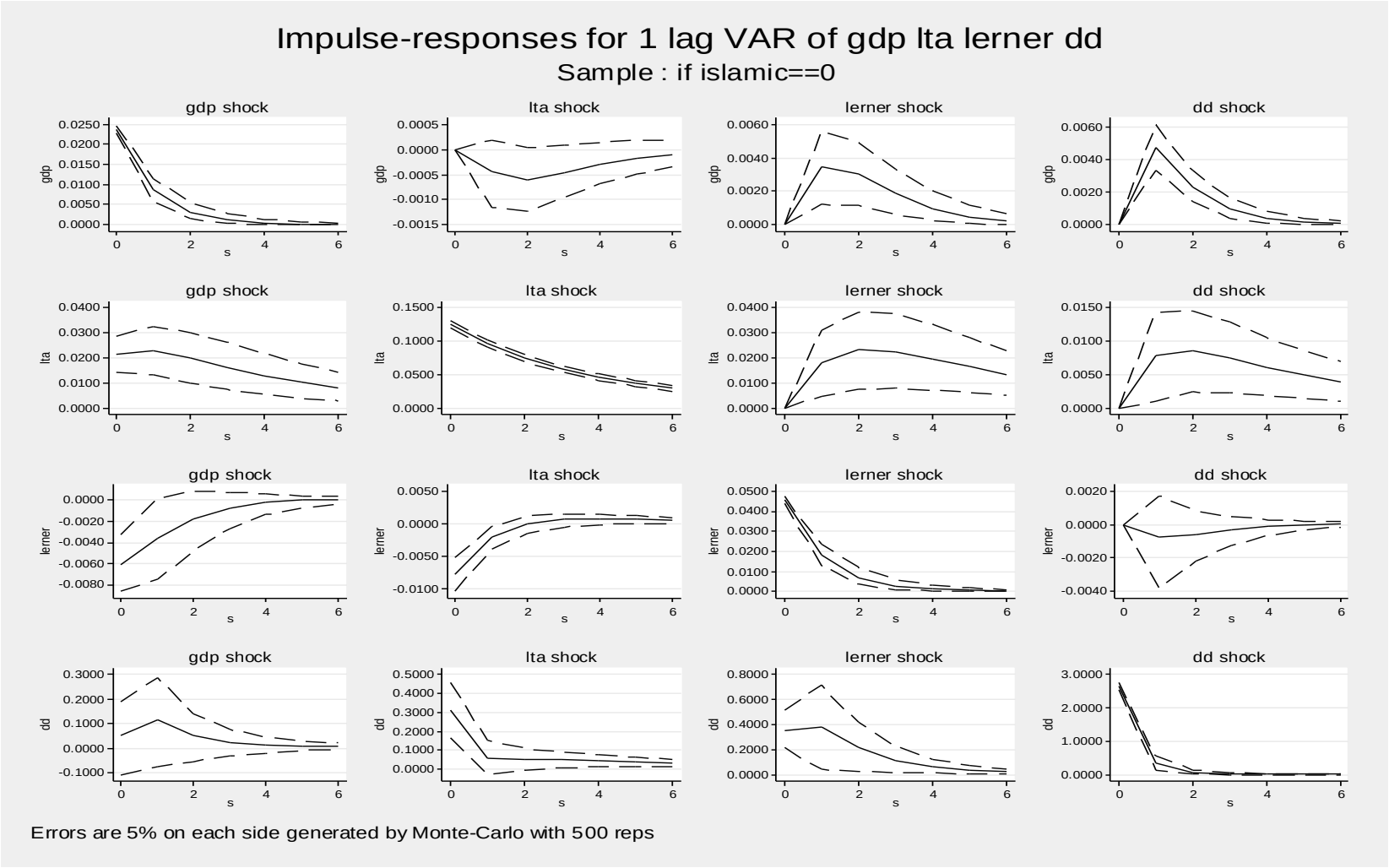
Note: The solid line shows the impulse responses. The dashed lines indicate five standard error confidences around the estimate. Errors generated by Monte-Carlo with 500 repetition

Figure 7: Impulse response function to shocks : Lerner and the DD for all banks



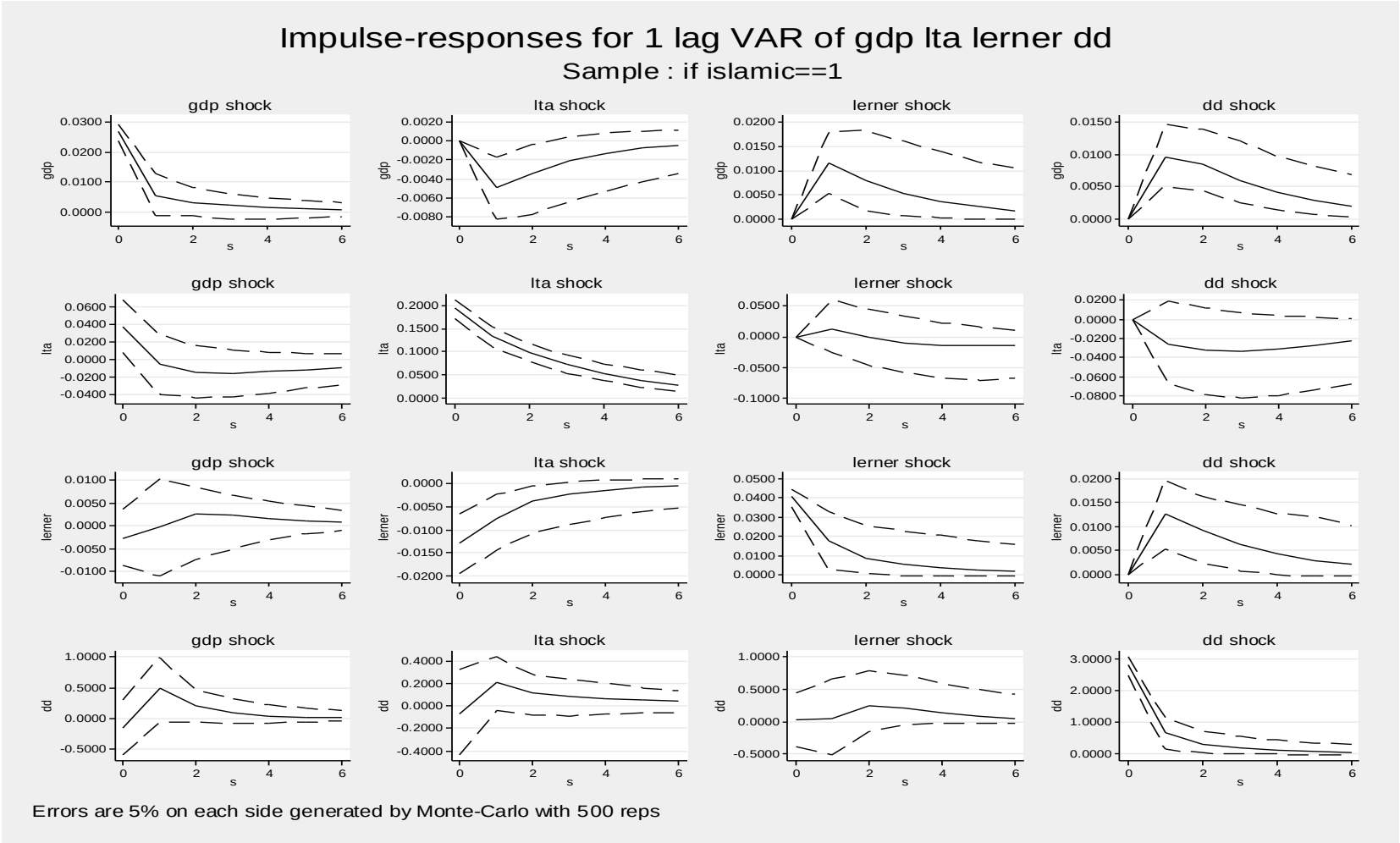
Note: The solid line shows the impulse responses. The dashed lines indicate five standard error confidences around the estimate. Errors generated by Monte-Carlo with 500 repetitions.

Figure 8: Impulse response function to shocks: Lerner and the DD for conventional banks



Note: The solid line shows the impulse responses. The dashed lines indicate five standard error confidences around the estimate. Errors generated by Monte-Carlo with 500 repetitions.

Figure 9: Impulse response function to shocks: Lerner and the DD for Islamic bank



Note: The solid line shows the impulse responses. The dashed lines indicate five standard error confidences around the estimate. Errors generated by Monte-Carlo with 500 repetitions

Figure 10: Quantile regression estimates of Lerner on Z-score for all banks

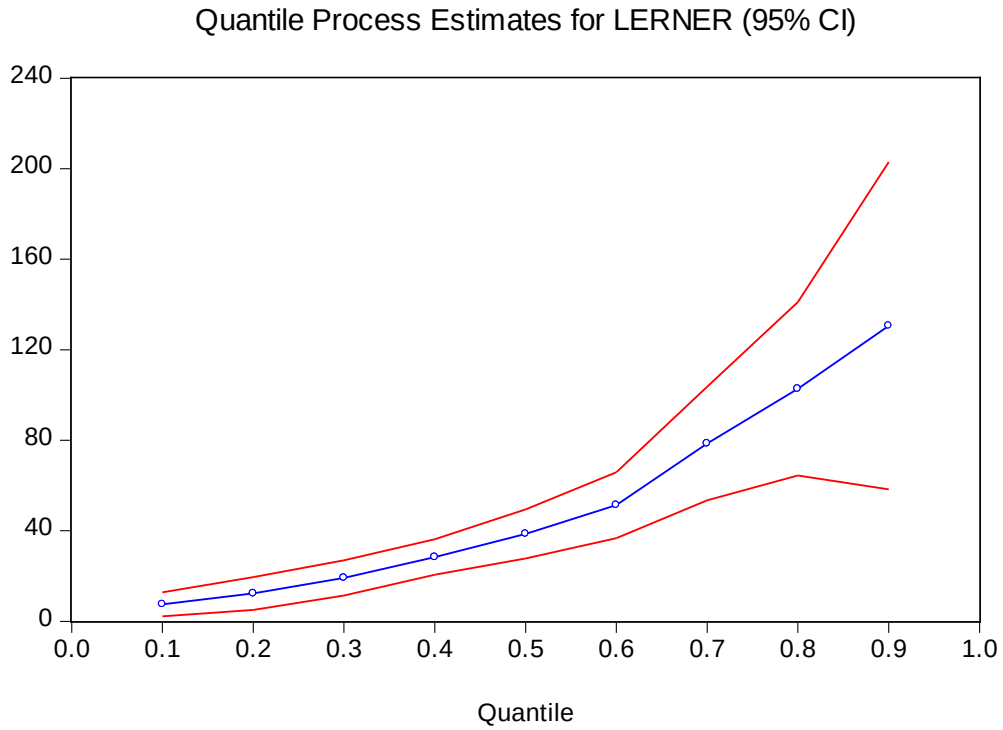


Figure 11: Quantile regression estimates of Lerner on Z-score for conventional banks

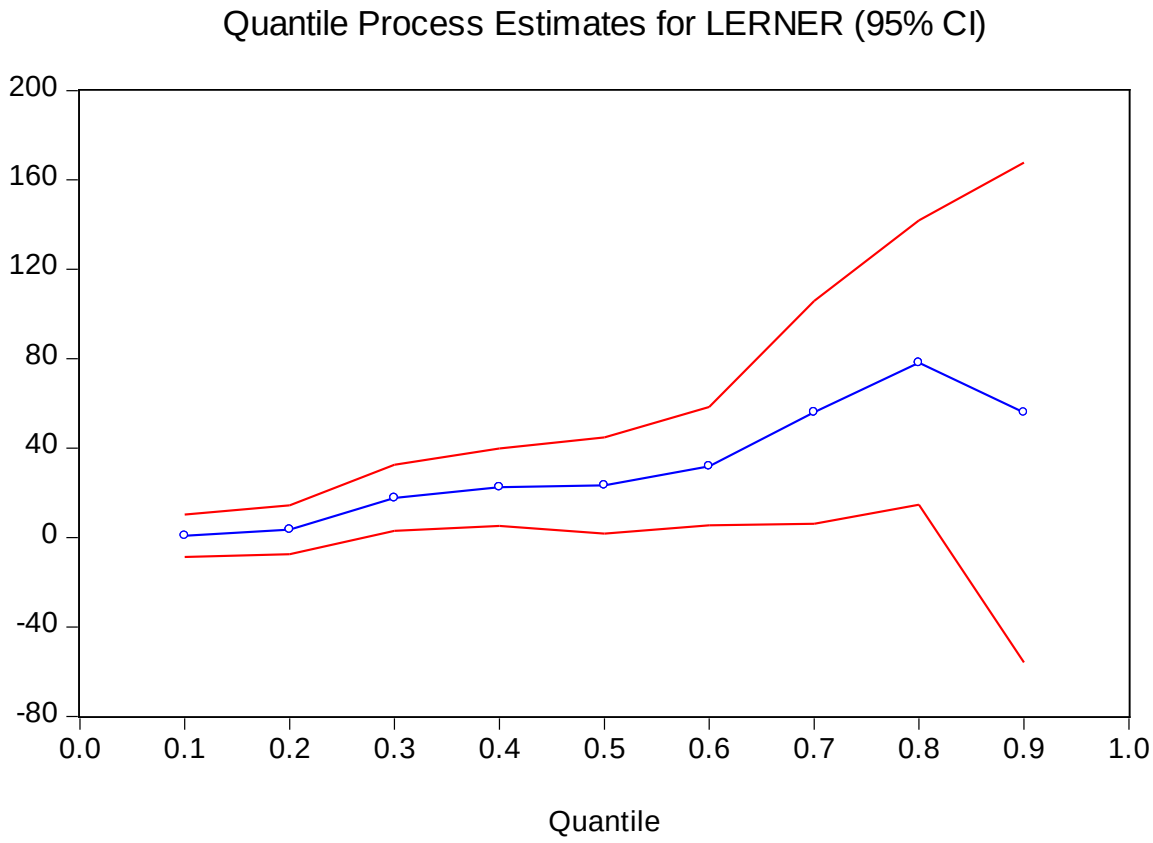


Figure 12: Quantile regression estimates of Lerner on Z-score for Islamic banks

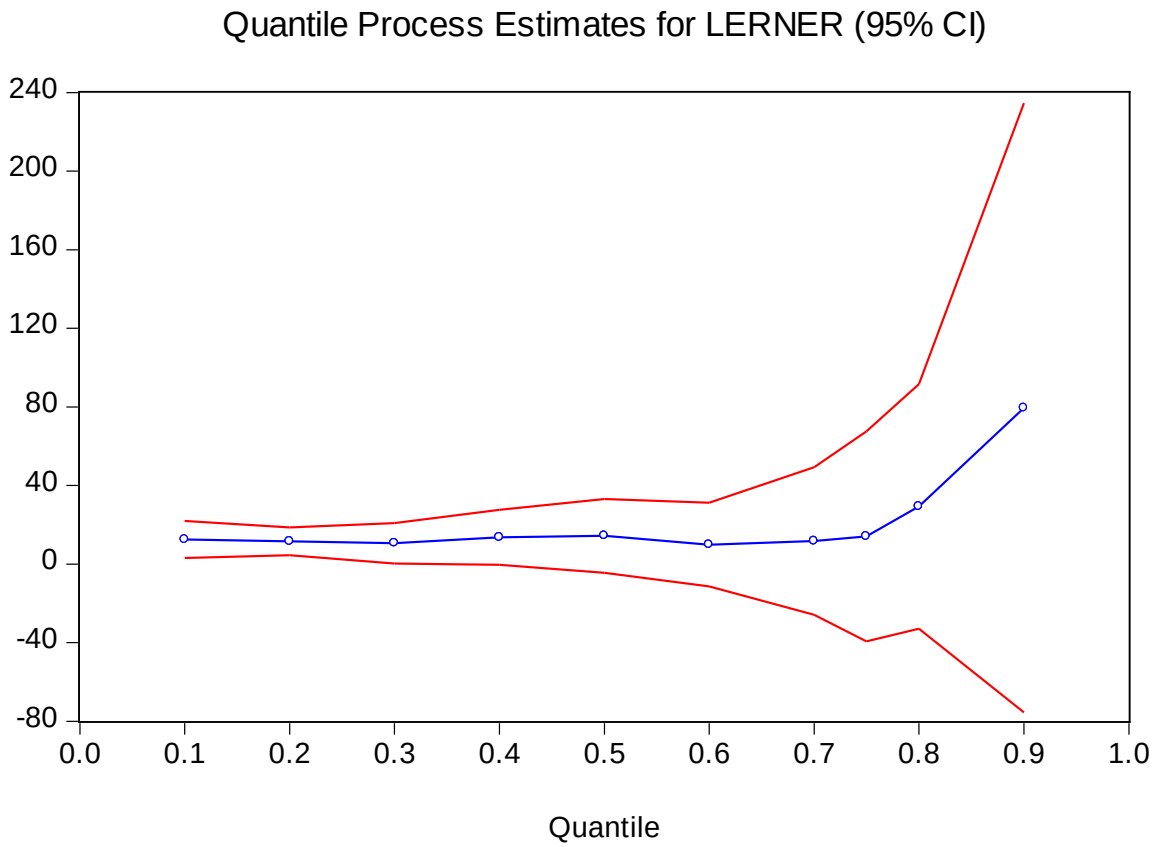


Figure 13: Quantile regression estimates of Lerner on NPL ratio for all banks

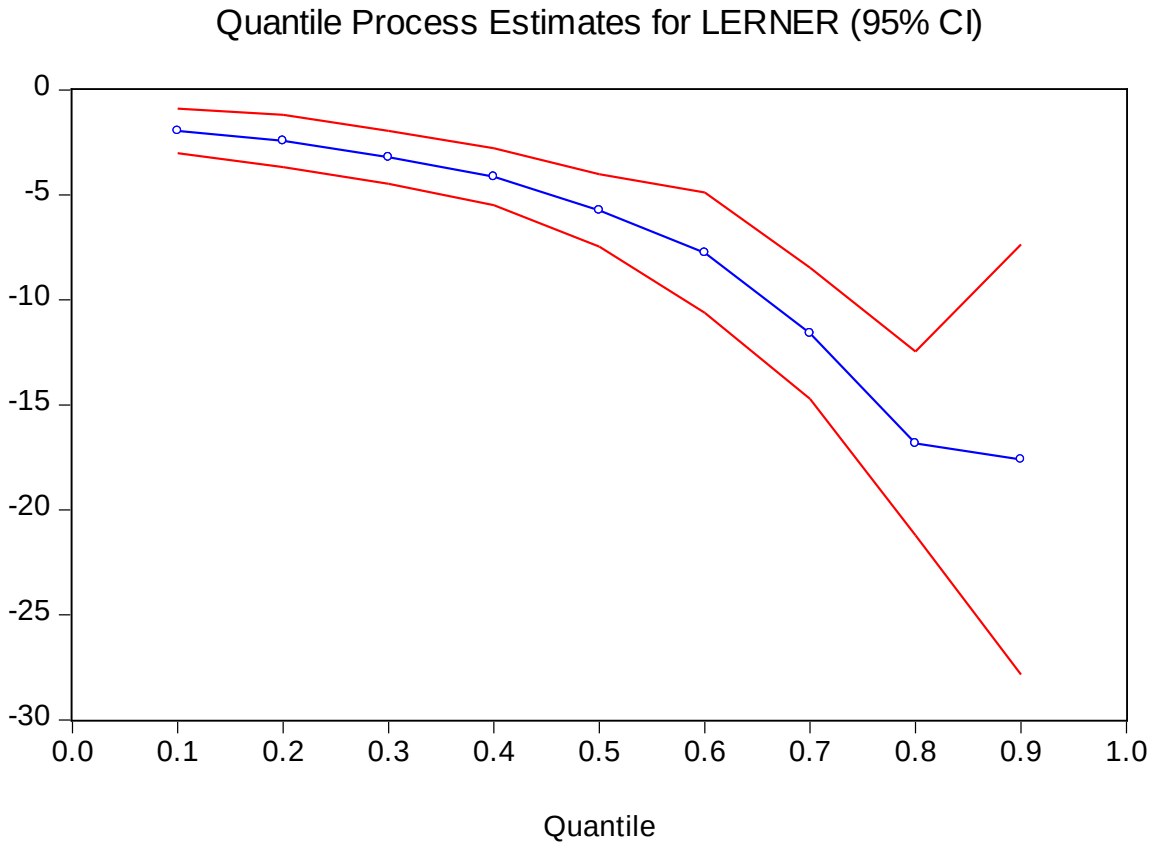


Figure 14: Quantile regression estimates of Lerner on NPL ratio for conventional banks

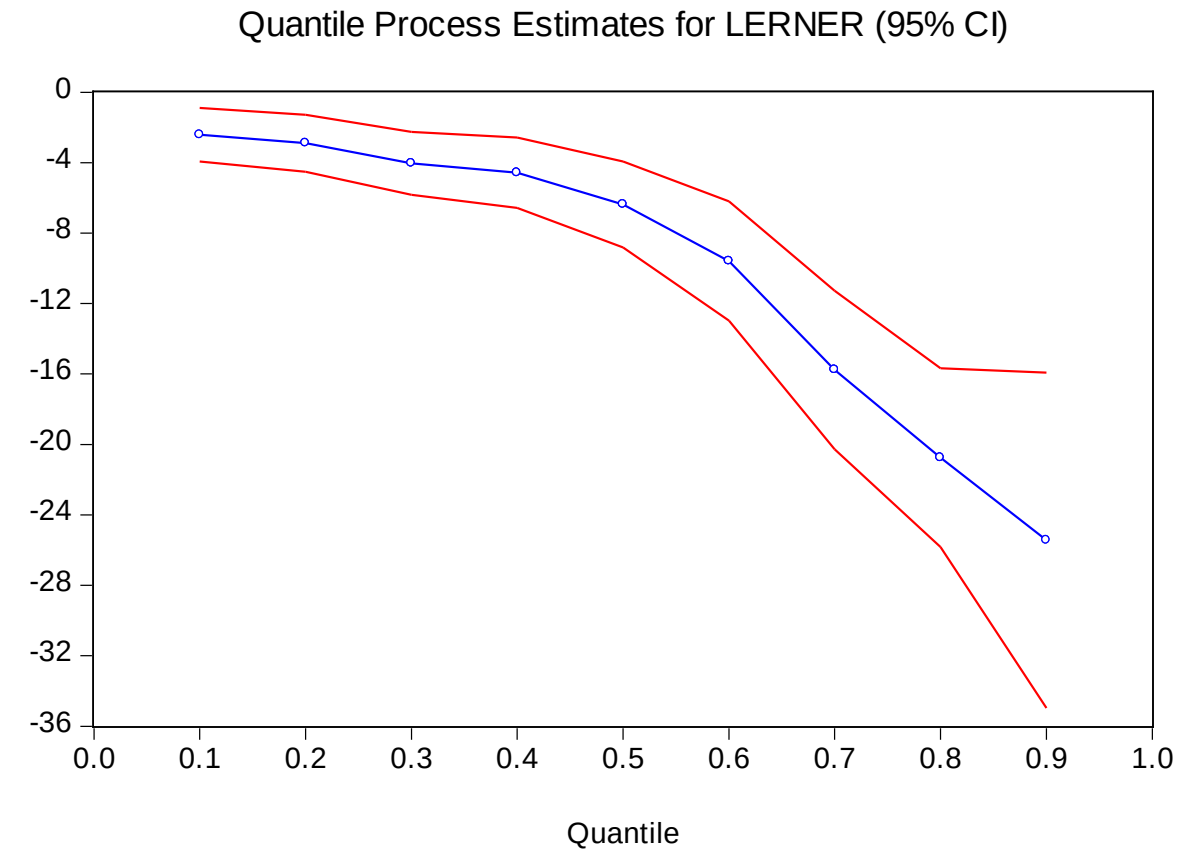


Figure 15: Quantile regression estimates of Lerner on NPL ratio for Islamic banks

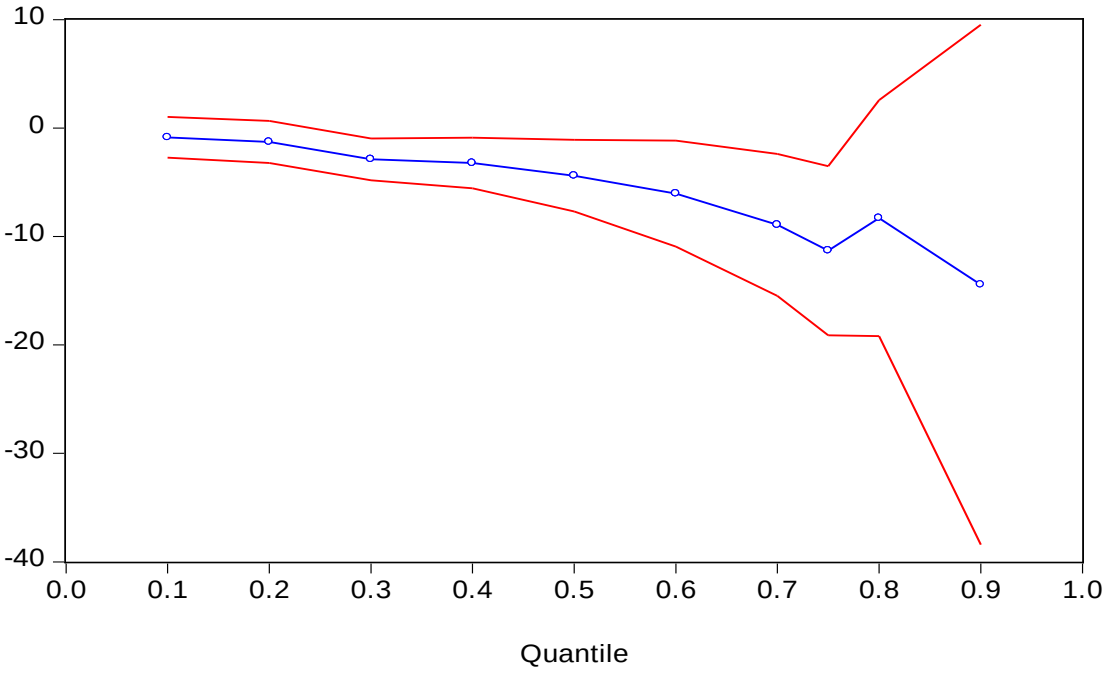


Figure 16: Quantile regression estimates of Lerner on DD score for all banks

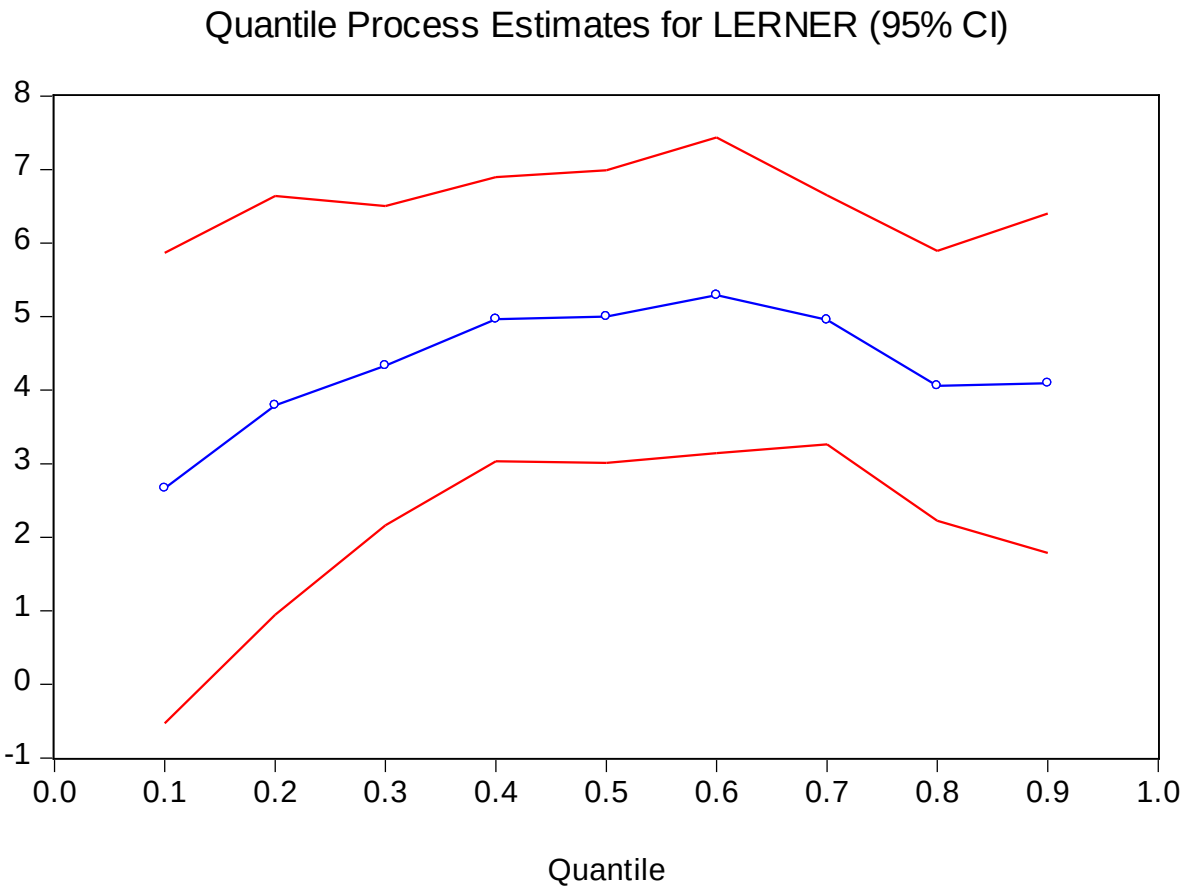


Figure 17: Quantile regression estimates of Lerner on DD score for conventional banks

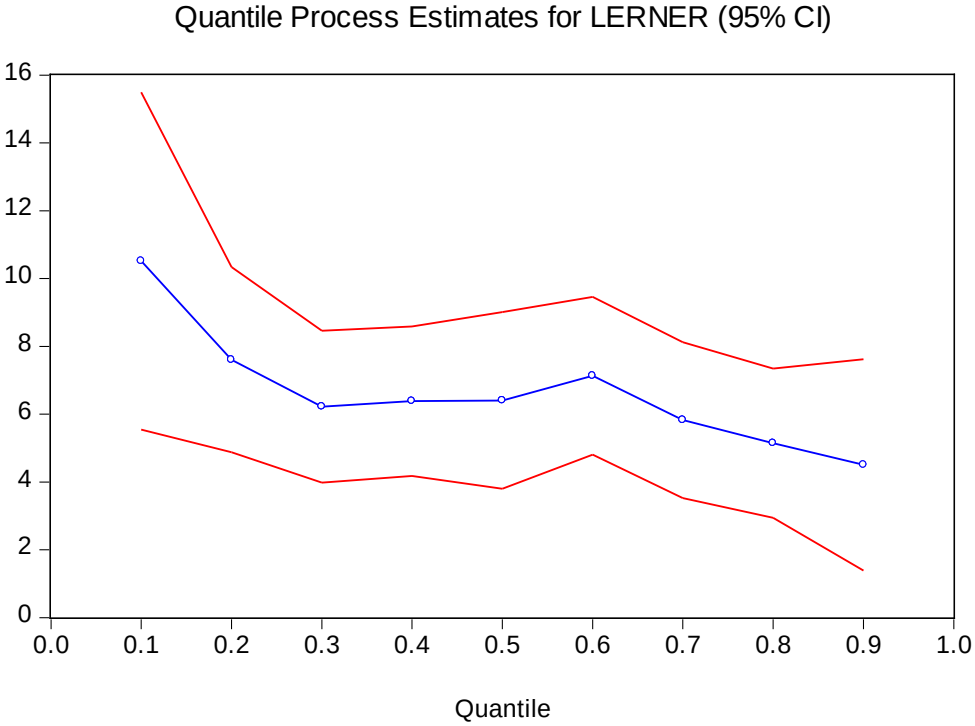


Figure 18:Quantile regression estimates of Lerner on DD score for Islamic banks