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Financial Stability of Islamic and Conventional Banks in Saudi Arabia: a Time Series Analysis

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Abstract

Islamic banks are characterised by the compliance to Islamic laws and practices, the main ones being the prohibition of interest and loans trading. Remarkably, during the 2008-2009 financial crisis, when a large number of conventional banks have announced bankruptcy, no single Islamic bank failure has been reported. However, there is no clear consensus in the literature on question of whether Islamic banks are more or less stable than conventional banks. We study a sample of Saudi banks over a period centred on the 2008 financial crisis. The main conclusions are: (i) the variables typically used in financial stability studies may be non-stationary, a feature ignored in the literature; (ii) individual heterogeneity may matter more than the conventional or islamic nature of the banks.

Key words: Islamic Banks, Financial Crisis, Financial Stability, Z-score Model, Saudi Arabia.

September 2012

1 Introduction

Islamic banks are characterised by the compliance to Islamic laws and practices, the main ones being the prohibition of interest (replaced by profit-and-loss sharing arrangements and goods and service trading; see, *e.g.*, Chapra 2000, Siddiqi 2000), loans trading and derivatives. Although the first Islamic banks have been established only about three decades ago, according to Standard & Poor's Islamic financial institutions currently satisfy 15% of Muslims needs of financial services; this size of assets compatible to Islamic-Shariah reached 400 billion dollars in 2009 (see also CIBAFI, 2010).

Remarkably, during the 2008-2009 financial crisis, when a large number of conventional banks around the world have announced bankruptcy (about 140 in the USA only according to the Federal Deposit Insurance Corporation), no single Islamic bank failure has been reported, so that the adoption of the PLS system by a number of Saudi banks contributed positively to the international financial stability. A possible explanation of this difference may be the only partial integration of Islamic banks in the global financial system, as Islamic banks do not deal with derivatives and loans sale (Hassan, 2006).

However, interestingly enough, there is no clear consensus in the literature on question of whether Islamic banks are more or less stable than conventional banks. This may be partly due to heterogeneity within the Islamic bank sector itself. For instance, Čihák and Hesse (2008), henceforth CH, concluded on the basis of a large-scale panel study that small Islamic banks tend to be more stable than both their conventional counterparts and large Islamic banks, which in turn seem to be less stable than large conventional banks. This suggests that careful case studies of individual banks may provide insights not possible with panel modelling, which requires some homogeneity assumption. The purpose of this paper is precisely studying the individual time series of a sample of Saudi Islamic and conventional banks. The period chosen is 2005:1-2011:12, which will allow us to evaluate the reaction of these two different type of financial institutions to the recent financial crisis. Saudi Arabia provides interesting material for a case study, as the Saudi banking sector at large also apparently was not much affected by the financial crisis: net profits declined only by approximately 2.6% in 2009 after the conservative measures taken by banks[1].

[1] Total reserves have been increased voluntarily over the period January to September 2009 from 1.6 billion Riyals to over 6 billion Riyals.

2 Literature review

Few papers apply quantitative models to analyze financial stability of the Islamic and conventional banks. Beyond the paper by CH quoted in the Introduction, we may mention Kholi (2009), who showed that the Saudi banking sector absorbs successfully the shocks of international financial crisis thanks to both the external intervention of the Saudi Arabian Monetary Agency (SAMA) and by self-protection through credit rationing. The shock absorption contributed to avoid a local financial crisis and its damaging effects on real economy. Hasan and Dridi (2010) examine the effects of recent international financial crisis on the conventional and Islamic banks in eight countries including the GCC countries. Using a range of banking indicators they find the performance of Islamic banks to be better than conventional banks, so that the presence of Islamic banks contribute to increase financial stability. There are however some weaknesses, related to their risk management. Imam and Kpodar (2010) findings show that the average of income per capita and the competitiveness in the banking system have significant positive impacts on the spread of Islamic banks. Also, the decrease in real interest rates increases deposits in Islamic banks. The paper of Turk Ariss (2010) focuses on competitiveness conditions of Islamic and conventional banks on the basis of several indicators. Using yearly data from 2000 to 2006, the findings indicate that traditional banks tend to be more competitive than Islamic banks. Finally, In spite of its good performance, the last financial crisis has revealed some weaknesses of the Saudi banking system, examined by Ghassan *et al.* (2011). The key points are the high concentration of bank loans to a limited number of firms and individuals, the large portion of banks investments in foreign assets with relatively high rates of returns compared to interest rates on domestic assets.

3 Modelling financial stability

We follow the widespread practice of measuring financial stability using the z-score (Altam, 1983), defined as

$$z_t = \frac{k_t + \mu_t}{\sigma_t}$$

where k_t is the ratio of equity capital plus total reserves to assets, μ_t is the average returns/assetts ratio (or alternatively the ratio of the averages of returns and assetts), and σ_t the standard deviation of the returns/assets ratio. The z-score has several advantages over other measures of financial stability, such as Value-at-Risk (VaR) and stress tests. First of all, it is not affected by the nature of the bank activities (CH, Maechler *et al.*, 2005), so that it can be applied to banks using Islamic specific accounting. Second, it measures insolvency risk, while other methods signal liquidity problems. Assuming bank returns are normally distributed, the probability of default is $p(\mu < -k) = \int_{-\infty}^{z} N(0,1)d\mu$, so that the z-score measures the number of standard deviations that returns have to fall in order to deplete equity (Čihak, 2007): the greater the z-score, the lower the likelihood of bank insolvency (bank liabilities exceeding assets).

Standard models relate the z-score to bank-specific, sector-level and macro variables. Invidual variables typically include total assetts (A), credit-assetts ratio (CA), operating cost-income ratio (CI) and income diversity (ID). For conventional banks CA is measured by the loans to assets ratio, while for Islamic banks by the ratio of finance activity to assets. The standard definition of income diversity is $ID = 1-$(net interest income-other operating income)/total other operating income; for Islamic banks we replace interest income (commissions) and interest charges with finance income from the PLS system and finance charges. Sector-level variables usually include the share of Islamic banks, i.e. the ratio of Islamic banks' assets to total assets of the banking sector (IS) and a concentration index. Following Turk Ariss (2010) we shall use an Herfindhal index, H, measuring banks' competitiveness in the range zero (maximum competitiveness)-10000 (minimum competitiveness). Finally, standard macro variables are GDP growth and inflation rate.

Our dataset includes six banks covering about 64% of the Saudi banking sector. Four are conventional banks: Riyad bank (RYD), Saudi Investment bank (SIB), Saud British bank (SBB), and Saudi American bank (SAB). These last two are offshore banks, closely linked to international banks. This will allow us to evaluate the impacts of the international financial crisis on Saudi financial system. The remaining two banks follow Islamic finance: Al-Rajhi (RJH) and AlBilad (BLD). Unfortunately no more Islamic banks could be included in the sample, as Alinma Bank was created only in 2008 and Aljazirah Bank was fully converted from conventional into shariah-compliant banking only in 2007. Using data from the Saudi Stock Market (Tadawul) we could construct data at quarterly frequency[2] for 2005-2011, for a total of 28 observations. Some details on the individual banks are reported in Appendix 5.1.

The visual exam of the plots of the series (Figs. 1-6), an exercise not usually carried out in large panel studies, reveals that many variables show trends or very large swings around their mean levels. In other

[2]Note that most of the data available from the international database BankScope, the standard source for financial stability studies, are at annual frequency, with some series at biannual frequency but no quarterly series.

terms, the typical behaviour of non-stationary series.

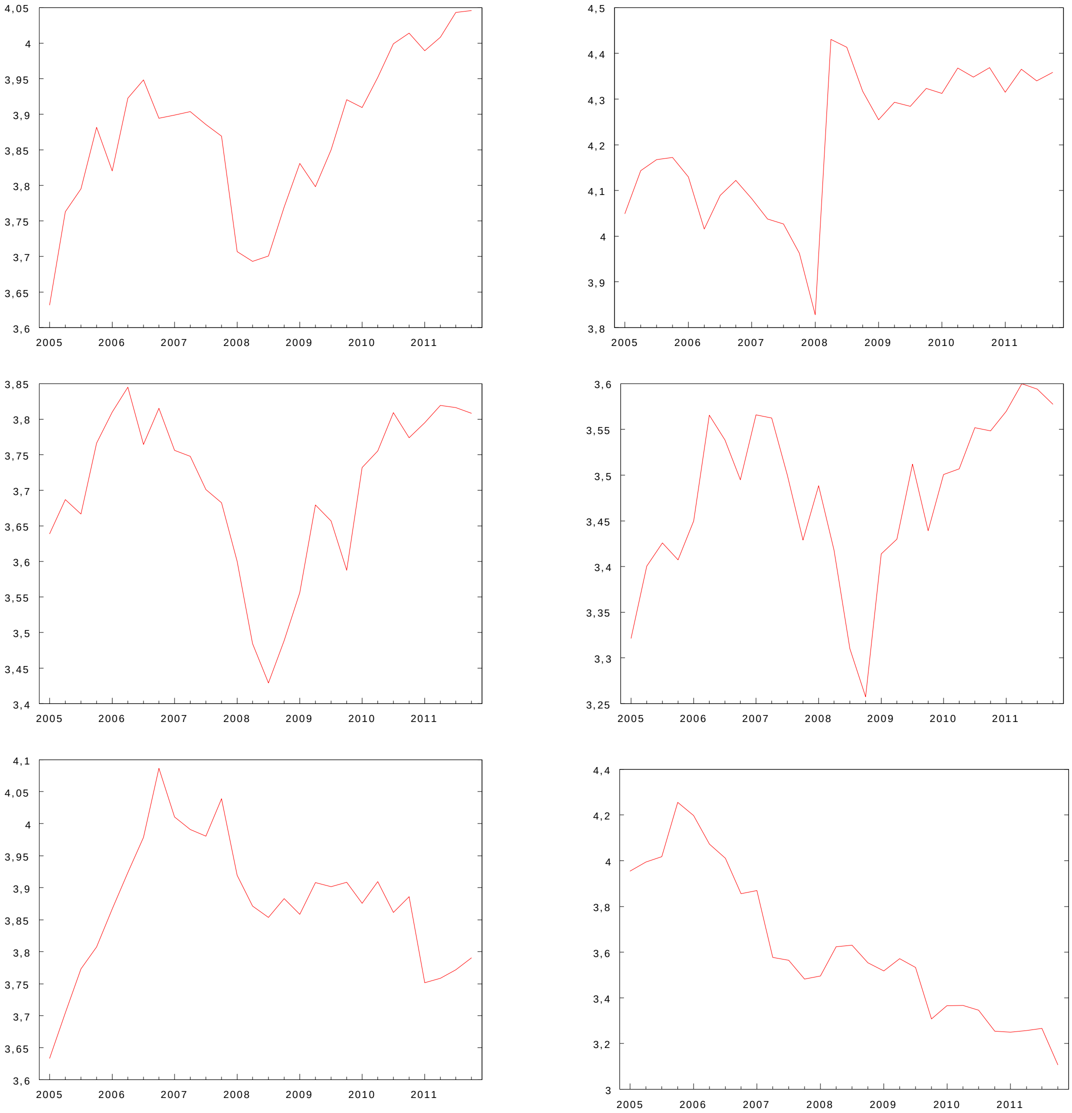

Fig. 1 z-scores 2005:1-2011:12 (logs). Left to right and top to bottom: Saudi American Bank (SAM), Riyad Bank (RYD), Saudi Investment Bank (SAB), Saud British Bank (SIB), Al-Rajhi Bank (RJH), AlBilad Bank (BLD)..

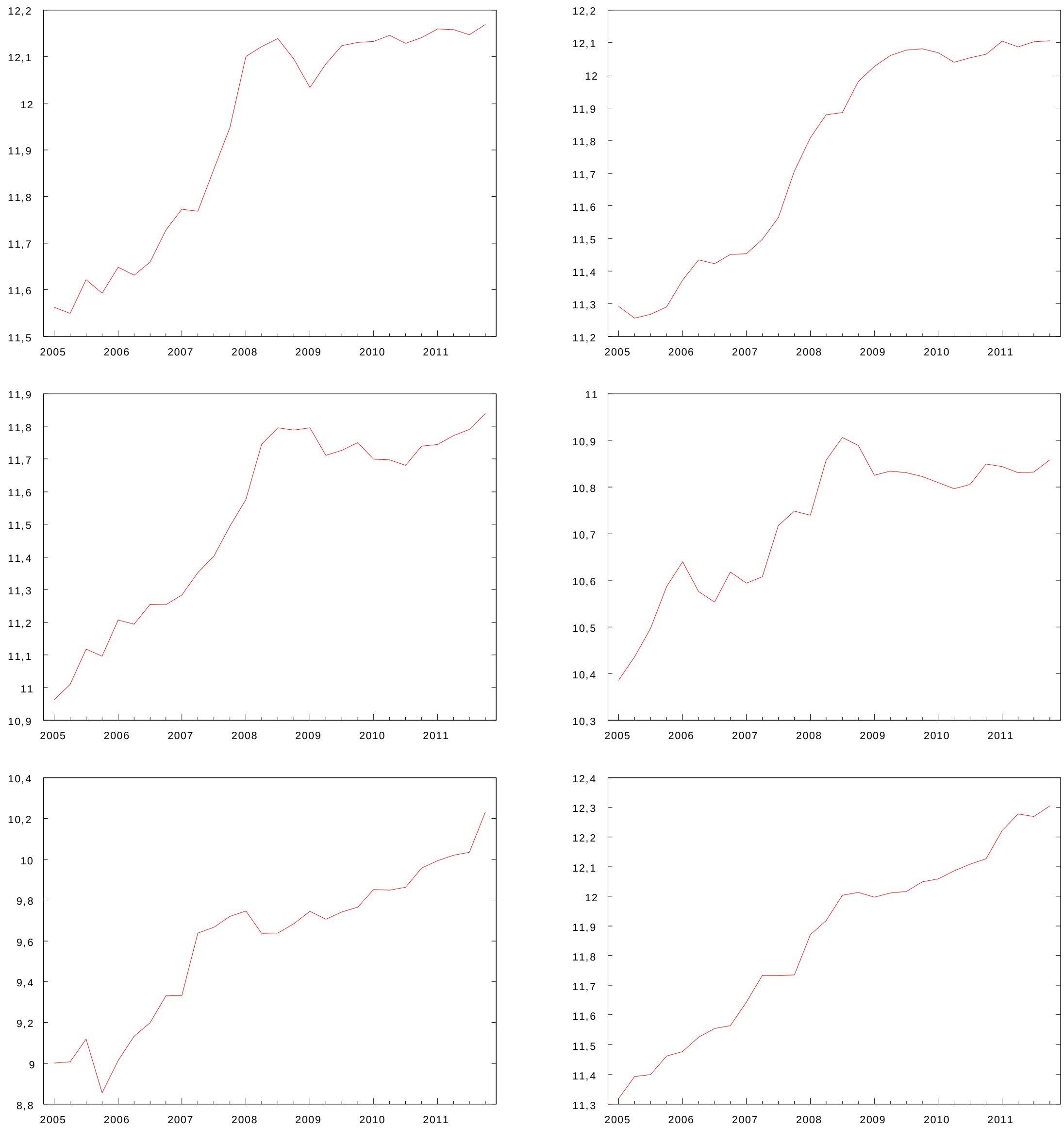

Fig. 2 Total assetts, 2005:1-2011:12 (logs). Left to right and top to bottom: Saudi American Bank (SAM), Riyad Bank (RYD), Saudi Investment Bank (SAB), Saud British Bank (SIB), Al-Rajhi Bank (RJH), AlBilad Bank (BLD)..

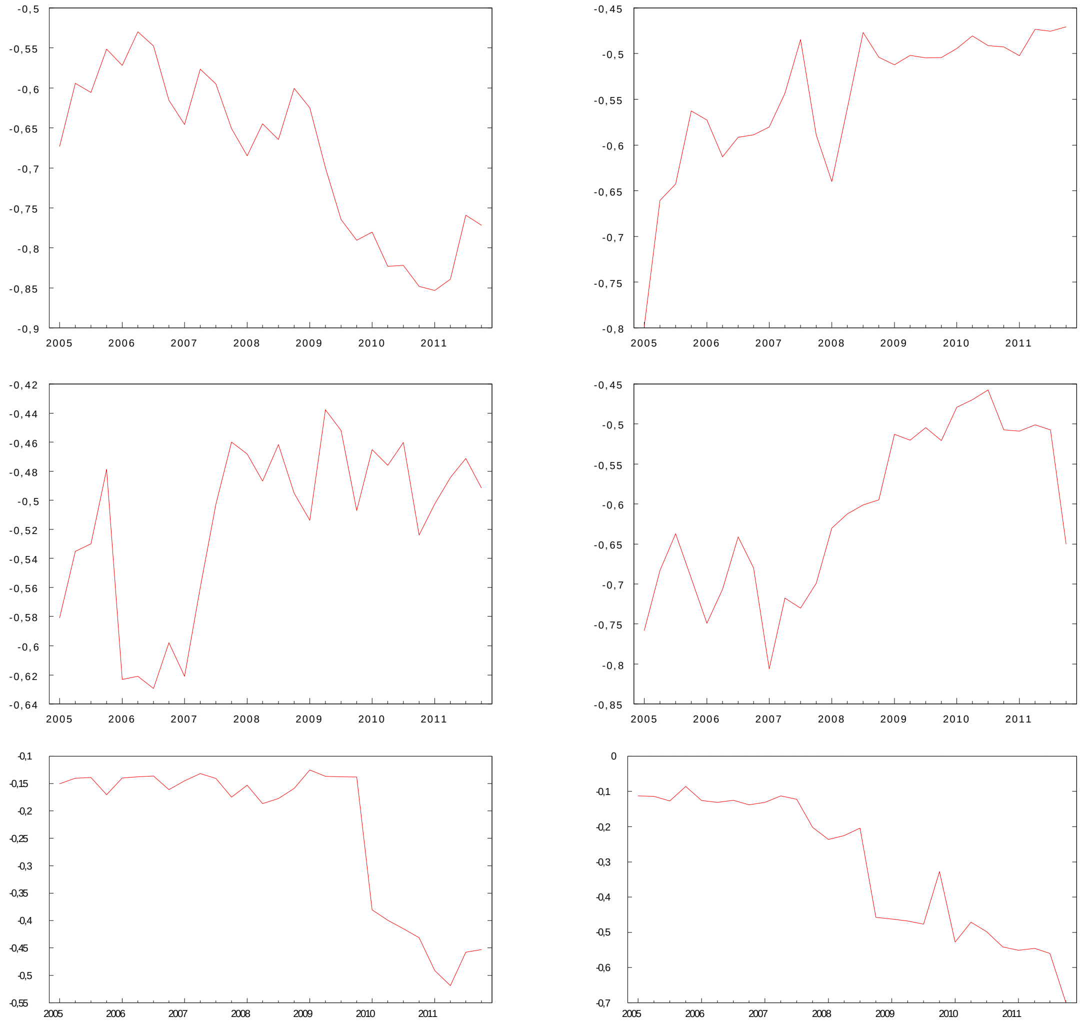

Fig. 3 Credit-assetts ratios, 2005:1-2011:12 (logs). Left to right and top to bottom: Saudi American Bank (SAM), Riyad Bank (RYD), Saudi Investment Bank (SAB), Saud British Bank (SIB), Al-Rajhi Bank (RJH), AlBilad Bank (BLD)..

Fig. 4 Cost-income ratios, 2005:1-2011:12 (logs). Left to right and top to bottom: Saudi American Bank (SAM), Riyad Bank (RYD), Saudi Investment Bank (SAB), Saudi American Bank (SAB), Al-Rajhi Bank (RJH), AlBilad Bank (BLD).

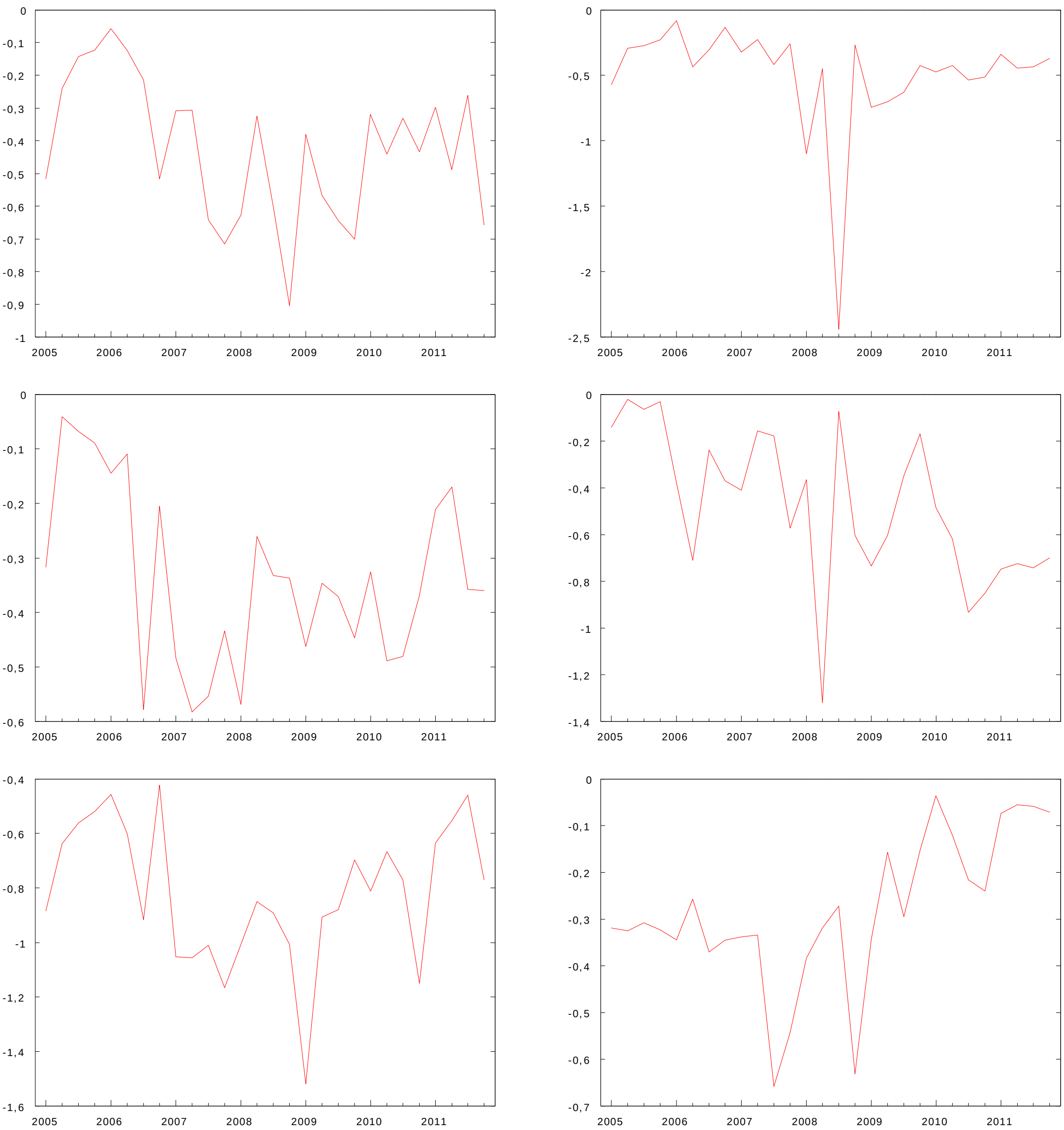

Fig. 5 Income diversity, 2005:1-2011:12 (logs). Left to right and top to bottom: Saudi American Bank (SAM), Riyad Bank (RYD), Saudi Investment Bank (SAB), Saud British Bank (SIB), Al-Rajhi Bank (RJH), AlBilad Bank (BLD).

Fig. 6 Concentration (left) and Share of Islamic banks (right) in the Saudi banking sector, 2005:1-2011:12 (logs)

We thus tested for unit root tests applying the ADF-GLS test by Elliot, Rothenberg and Stock, (1996) to all variables except SIB's z-score, which has a large break in mean at 2008:1 suggesting the use of the test by Perron (1989)[3]. The results (reported in Table 1), largely support the visual impression: with the exception of income diversity (in all banks) and cost-income ratios (in all banks but one), the variables of our dataset seems to be largely non-stationary. Most important, this is the case for the z-scores.

The implications of these results are rather serious. First of all, if the z's are non-ergodic the standard practice of evaluating stability on the basis of sample means of z-scores is obviously not valid. Second, the stationary panel methods widely employed in the literature (inter alia, by CH) are not valid either. Under non-stationarity models may be estimated only after having tested for the existence of a long-run equilibrium relationship, and employing an appropriate procedure. In our case the existence of a long-run equilibrium has an interesting meaning, *i.e.*, that the bank of interest managed to keep under control the deviations of z from its long-run target value.

Now, a delicate point is that in our set-up not all deviations are alike: negative deviations (z falling below its long-run target value, so that the bank is getting closer than desired to default) are different from positive ones (z raising above its long-run target value, so that the bank is getting farther than desired from default, with an excess of caution). Hence, we may expect the adjustment coefficients to be different in the two circumstances, and the error correction mechanism to be asymmetric. Of course, standard cointegration tests, such as Engle-Granger's and

[3]The break is so large and the timing corresponding with the well-known peak of the financial crisis that we could safely assuming the break point to be known.

Johansen's, assume symmetric adjustment. The hypothesis of asymmetric cointegration may instead be tested using the generalisation of the Engle-Granger test by Enders and Siklos (2001). This test entails replacing in the second step of the Engle-Granger procedure the usual autoregressive equation with a threshold autoregressive (TAR) one. In our case the treshold is zero, so that the equation of the second step is defined as follows:

$$\Delta e_t = \begin{cases} \rho_1 e_{t-1} + \sum_{j=1}^{p} \Delta\lambda_j e_{t-j} + \varepsilon_t \text{ if } e_{t-1} \geq 0 \\ \rho_2 e_{t-1} + \sum_{j=1}^{p} \Delta\lambda_j e_{t-j} + \varepsilon_t \text{ if } e_{t-1} < 0 \end{cases} \tag{1}$$

where $z_t = \boldsymbol{\beta}'\mathbf{X}_t + e_t$, with $\mathbf{X}$ a set of explanatory variables and $\boldsymbol{\beta}$ the vector of cointegrating coefficients. Using the Heaviside indicator I_t,

$$I_t = \begin{cases} 1 \text{ if } e_{t-1} \geq 0 \\ 1 \text{ if } e_{t-1} < 0 \end{cases}$$

equation (1) may be compactly written as

$$\Delta e_t = I_t \rho_1 e_{t-1} + (1 - I_t)\rho_2 e_{t-1} + \varepsilon_t$$

and the null hypothesis of no cointegration may be tested using the statistics $t_{\max} = \max(t_1, t_2)$, where t_1 and t_2 are the usual t-tests for the hypothesis $\rho_1 = 0$ and $\rho_2 = 0$, and Φ, the F statistic for the joint hypothesis $\rho_1 = \rho_2 = 0$. The distributions of these tests are non-standard, but tabulated by Enders and Siklos (2001). Unfortunately both tests tend to have poor power even when the true data generating process involves TAR adjustment, as the burden of estimating the extra parameter tends to balance the higher generality of the specification. Hence, Enders and Siklos (2001) suggest to perform a standard no cointegration test as a first step, and then to check for non linearity with the TAR version of the test. We shall thus follow this route, running first standard Engle-Granger tests (more parsimonious, hence more suitable for our dataset than Johansen's system tests) for all banks. In the case of SIB the presence of a clear break in the constant suggested use of a test allowing for varying parameters, namely Carrion-i-Silvestre and Sanso (2006) generalisation of the KPSS test to cointegration with breaks. For all banks we obviously included only non-stationary variables, so that ID was never considered and CI only for RJH. For the same reason real GDP grwth and inflation, obvioulsy stationary, have been dropped from the beginning of the study. In some cases we searched for the best specification, dropping variables with wrong signs or very small coefficients[4].

[4]Given the small sample size irrelevant variables may have non-zero coefficients

The results of the cointegration tests[5], reported in Table 2, are easily summarised: for all banks except SBB cointegration with symmetric adjustment holds. The next step is to run the test allowing for TAR error dynamics. The results (not available for SIB, since the Enders and Siklos tests assume constant parameters) are reported in Table 3. Keeping in mind that with only 28 observations power is likely to be low, and that caution is also suggested by the use of critical values simulated for $T = 50$, we can conclude that the TAR no cointegration tests broadly support the conclusions of the Engle-Granger tests. The hypothesis of symmetric adjustment is never rejected by the F-tests, but this is hardly surprising in view of the small sample size. As a descriptive tool we computed the average number of consecutive observations with the same sign (runs). From Table 4 we can appreciate that Islamic banks as a group have average longer disequilibrium runs (both positive and negative) than conventional ones. However, this is the consequence of one case (BLD) having disequilibrium runs much longer than all the others, while the other (RJH) has runs which are the shortest or nearly so. This is confirmed by the FM-OLS estimates, computed for all the banks in which cointegration holds (Table 5): the constant, which is an estimate of the long-run average z-score, of RJH is the largest of all banks, while BLD's is clearly the smallest along with SIB's. Since RJH is much larger than BLD (see Appendix) these findings are in contrast with CH's, who found small Islamic banks to be more stable than larger ones.

The signs of the coefficients are broadly in line with expectations and the literature: when included in the final specification concentration has a negative impact on stability (this is consistent with e.g., Čihák, Schaeck, and Wolfe, 2006). Size also seems to have a negative influence on stability, more clearly so for conventional banks (which have all very similar coefficients), than for the two islamic ones, which have very different elasticities. Finally, when included in the final specification the market share of Islamic banks has, with one exception, a positive effect on stability.

leading to spurious non-rejections of the no cointegration hypothesis (Fachin, 2007). Suppose two $I(1)$ variables y and x cointegrate, so that $\epsilon_t = y_t - bx_t$ is stationary. Then consider an $I(1)$ variable, w, independent from y; the residual $\epsilon'_t = y_t - b_1x_t - b_2w_t$ will be stationary if, and only if, $b_2 = 0$. This will hold asymptotically, but not necessarily in small samples.

[5] The final specification used for each bank may be checked in Table 5.

Table 1
Unit root tests

	Conventional Banks				*Islamic Banks*	
	SAM	*RYD*	*SAB*	*SIB*	*RJH*	*BLD*
Z^a	-1.08 (0.25)	-2.71[b]	-1.36 (0.16)	-1.73 (0.08)	-1.58 (0.11)	-0.19 (-0.61)
A^c	-1.08	-1.50	-1.92	-1.78	-1.99	-2.27
CA^a	-0.99 (0.29)	-1.64 (0.09)	-2.09 (0.04)	-1.49 (0.13)	-0.40 (0.54)	-0.15 (0.63)
CI^a	-5.16 (0.00)	-2.91 (0.00)	-2.58 (0.01)	-2.52 (0.01)	-1.33 (0.17)	-3.85 (0.00)
ID^a	-3.07 (0.00)	-2.28 (0.02)	-3.25 (0.00)	-3.64 (0.00)	-3.38 (0.00)	-2.30 (0.02)
HH^a	-0.70 (0.41)					
IS^a	-0.53 (0.49)					

[a] : ADF-GLS with constant, except bank 2; p-values in brackets;
[b] : $t_{\tilde{\alpha}}$ (Perron, 1989, model A, break in 2008:1),
critical values (5%,10%): $-3.76, -3.46$;
[c] : ADF-GLS with trend, critical values (5%,10%): $-3.19, -2.89$;
lag length selection: Ng-Perron (t-test on last lag);
all variables in logs.

Table 2
Engle-Granger No-Cointegration tests

Conventional Banks				*Islamic Banks*	
SAM	*RYD*	*SAB*	*SIB*	*RJH*	*BLD*
-5.04 (0.04)	0.03	-3.31 (0.32)	-4.67 (0.08)	-5.04 (0.04)	-3.82 (0.03)

banks 1 and 3-6: Engle-Granger tests, p-values in brackets;
bank 2: cointegration KPSS test with break, H_0 : cointegration;
(Carrion-i-Silvestre and Sanso, 2006, model An);
critical values (5%,19%): 0.087, 0.071.

Table 3
TAR No-Cointegration tests

	Conventional Banks			*Islamic Banks*	
test	*SAM*	*SAB*	*SIB*	*RJH*	*BLD*
$t_{\max}$	-3.48**	-2.06*	-2.61**	-2.37**	-1.79
Φ	9.56**	3.72	7.71**	4.43	6.66**
F	0.03	0.05	0.69	0.06	0.77
	(0.86)	(0.82)	(0.41)	(0.81)	(0.39)

$t_{\max}$: critical values (0.05,0.10): -2.16, -1.92;
Φ : critical values (0.05,0.10): 5.08, 6.18;
F : F-test for $H_{0:}\rho_1 = \rho_2$, $p-$value in brackets;
lag length selected by AIC always equal to 1;
*,**: significant at 0.10,0.05.

Table 4
Average length of disequilibrium runs

	Conventional Banks					*Islamic Banks*		
	SAM	*SAB*	*SIB*	*SAM*	*mean*	*RJH*	*BLD*	*mean*
$\overline{R}^+$	2.0	2.1	2.0	2.5	*2.1*	1.6	4.0	*2.8*
$\overline{R}^-$	1.6	1.9	2.3	2.2	*2.0*	1.7	3.5	*2.7*

R^+: number of consecutive observations s.t. $e_t \geq 0$
R^-: number of consecutive observations s.t. $e_t < 0$

Table 5
FM-OLS estimates

	Conventional Banks			*Islamic Banks*	
	SAM	*SAB*	*SIB*	*RJH*	*BLD*
H	-16.68 (5.60)	-	-18.13 (6.48)	-54.41 (7.52)	-
IS	14.46 (6.13)	-	-17.31 (7.08)	57.35 (8.31)	-
A	-0.33 (0.05)	-0.48 (0.06)	-0.45 (0.08)	-0.03 (0.05)	-0.87 (0.03)
CA	-0.62 (0.12)	0.34 (0.22)	0.30 (0.10)	0.50 (0.11)	-
constant	157.23 (50.79)	9.77 (0.78)	171.79 (58.83)	496.30 (68.17)	11.99 (0.30)
Δ*constant* *after 2008:2*	-	0.51 (0.04)	-	-	-

standard errors in brackets.

4 Conclusions

Our study reached several interesting conclusions. First of all, for our sample of Saudi banks the variables typically used in financial stability studies appear largely non-stationary, a feature ignored in the literature. This suggests that the available results based on stationary panel regressions should be treated with caution. Examining the cointegration properties of the variables we found that all banks of our samples but one managed to keep their z-scores stationary around some long-run desired level determined by total assetts, credit-assetts ratio, concentration of the banking sector and share of islamic banking. The only exception is one conventional bank (Saudi British Bank, SBB), which somehow supports the view of this type of banks as comparatively less stable than islamic ones. However, comparison of the long-run average z-scores as estimated by the constants of FM-OLS regressions of the cointegrating banks suggests that individual heterogeneity may matter more than the conventional or islamic nature of the banks. Further work is needed, *e.g.* GARCH modelling of the volatility of z-score.

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6 Appendix

6.1 Banks identity

1. Riyad Bank (RYD) is a Saudi Joint Stock Company created in 1957. It operates with 237 branches. The RYD provides a full range of banking and investment services. Average assets 2005-2011: 135 billion SAR.

2. Saudi Investment Bank, SAIB (SIB) created in 1976 and owned by the government. It operates with 45 branches. SAIB provides a full range of traditional wholesale, retail and commercial banking products and services in particular for the industrial sectors. Average assets 2005-2011: 46 billion SAR.

3. Saudi British Bank, SABB (SBB) is a Saudi Joint-Stock company created in 1978. SABB is one of the first banks to issue the credit cards in the Saudi Market, use ATMs for equity subscription services. Average assets 2005-2011: 104 billion SAR.

4. Samba Financial Group, SAMBA (SAB) created in 1980 and enjoys an extensive network of branches in Saudi Arabia as well as in UK, Pakistan and Dubai. SAMBA was the first Bank in Saudi Arabia to offer Foreign Exchange Derivatives, Interest Rate Derivatives, Credit Shield Insurance. Average assets 2005-2011: 157 billion SAR.

5. AlRajhi Bank (RJH) is created in 1976. The objectives of RJH are represented in practicing banking and investment activities respecting Islamic law. Average assets 2005-2011: 147 billion SAR.

6. AlBilad Bank (BLD) is a Saudi joint stock company created in 2005. The objectives of BLD are to provide all Islamic Sharia compliant banking services. The bank has Shariah Department to be in charge of the follow-up and monitoring of the implementation of the Sharia decisions issued by the Sharia Committee. Average assets 2005-2011: 16 billion SAR.

6.2 Main Differences between Islamic and Conventional Banks

A. Conventional Banks

Model

- Based on conventional law
- Maximize profits subject to differential interest rates

Risk

- Shifting risk when involved or expected
- Guarantee all its deposits
- Focus on credit-worthiness of the clients

Money and liquidity

- Interests on borrowing from the any market
- Sale of Debts

B. Islamic Banks

Model

- Based on Islamic law (Shariah)
- Maximize profits subj

Risk

- Bearing risks when involved in any transaction

- Guarantee only current account deposits
- Focus on the viability of the projects

Money and liquidity

- Based on Shariah-compliant transactions
- Large restrictions on sale of Debts