# Profitability and stability trade off – IBs vs CBs in Turkey – what differences ?

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26 June 2020

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## Abstract

This paper consider **Turkish banks** case study over the period 2005–2014. To distinguish between interest-free and conventional banks, we use two-sided t-test, Multi-dimension figures, regression comparison method and Dynamic Fixed Effect (**DFE**) model. The **long run** comparison analysis [based on t-test, on regression and on Multi-dimension figures] between interest-free banks (IBs) and conventional banks (CBs) of bank specific factors indicates that there are difference between Islamic and conventional banks behavior. Both first methods show that Interest-free banks are **riskier**, have higher **liquidity** and are more **capitalized**. Univariate analysis (**t-test** based Comparison) shows in addition that interest-free banks are **less stable**, but are **more solvent**. While **regression** based Comparison analysis **show** that IBs are **more profitable**. Multi-dimension figures comparisons analysis show that **Post GFC 2008**, Islamic Banks are less stable, more solvent, and more liquid than CBs. **Large IB**s outperform **Small IB**s in term of **profitability**. But in term of **asset quality** measured by NPL, LTD and LLR, **Small IBs** outperform Large IBs. **Comparing CBs and IBs in DFE model, from GMM results, it is clear that there is no bilateral directional relationship between stability (Z-score) and profitability (ROA). Stability is significantly sensitive to the increase of profitability only for CBs, while Profitability is significantly sensitive to the increase of Z-score only for IBs. Post GFC, IBs are more stable while CBs are less profitable. Size has positive effect on profitability outcome for IBs. Depreciation of Turkish money and inflation have negative effect on CBs' profitability**.

**JEL classification:** G01 G21 G28 G32 Z12.
**Keywords:** Financial stability, Profitability, interest-free banking, **GFC, GMM,** Multi-dimension figures comparisons, PVAR, SURE, Dynamic Fixed Effect (**DFE**) model.

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# I. Introduction

(Rivard & Thomas, 1997) suggest that bank **profitability** is best measured by Return on assets **ROA** since it is not distorted by high equity. **ROA** shows the profit earned per dollar of assets and reflects the management ability to utilize the bank's financial and real investment resources to generate profits (Hassan & Bashir, 2003). For any bank, ROA depends on the *bank's policy decisions* as well as uncontrollable factors relating to the *economy and government regulations*. Furthermore, Many regulators believe ROA is the best measure of bank profitability (Hassan & Bashir, 2003).

Studies examining the **performance** of the banking sectors in *developing* economies are relatively scarce.

(Guru, Staunton, & Balashanmugam, 2002) investigated the determinants of bank profitability in **Malaysia** from 1986 to 1995. They divide the **profitability** determinants into two main categories, namely the **internal** determinants (liquidity, capital adequacy, and expenses management) and the **external** determinants (ownership, firm size, and **economic conditions**).[2] Among the **macro indicators**, high *interest* ratio was associated with low bank profitability and *inflation* was found to exert a *positive* impact on bank performance. (Chantapong, 2005) investigated the performance of *domestic and foreign* banks in **Thailand** from 1995 to 2000. All banks were found to have reduced their credit exposure during the *crisis years* and have gradually improved their **profitability** during the *post-crisis* years.[3] (Hosono, Sakai, & Tsuru, 2006) observed that in the **Japan** case, the banks that are less profitable and cost efficient could be a target for a larger bank.

In a study on the **Tunisian** banking sector, (Ben Naceur & Goaied, The determinants of commercial bank interest margin and profitability: evidence from Tunisia, 2008) examine the impact of **bank characteristics**, **financial structure**, and **macroeconomic** conditions on **Tunisian** banks' net-interest margin and

[2] The findings revealed that efficient expenses management was one of the most significant in explaining high bank profitability.

[3] The results indicate that foreign banks' profitability are higher than the average profitability of the domestic banks although importantly, during the post-crisis period, the gap between foreign and domestic banks' profitability has closed, suggesting that the financial restructuring program has yielded some positive results.

profitability from 1980 to 2000. They suggest that banks that hold a relatively high amount of capital and higher overhead expenses tend to exhibit higher net-interest margin and **profitability** levels, while *size* is *negatively* related to bank *profitability*. During the period under study, they find that *stock market development* has positive impact on bank **profitability**.[4] The results suggest also that *macroeconomic conditions* have no significant impact on Tunisian banks' **profitability**.

(Heffernan & Fu, 2010) examined the performance of *different types* of banks operating in the **Chinese** banking sector from 1999 to 2006.[5] Some **macroeconomic** variables and financial ratios are *significant with the expected signs*. Though *the type* of bank is influential, bank **size** is not. Neither the percentage of *foreign ownership* nor *bank listings* has discernable effects. (Sufiana & Habibullah, 2012) conclude that the *success* of the **Chinese** banking sector between 2000 and 2007 depends on *its efficiency, profitability, and competitiveness*. Market capitalization seems to exert regressive impact on the **profitability**.[6] The empirical findings suggest that the *well capitalized banks* tend to be *more profitable*, while *expense preference* behavior exerts *negative* impact on bank profitability levels in China. The impact of **GDP growth** seems to support for the argument of the association between economic growth and the **performance** of the banking sector.[7]

According to (Fiordelisi & Mare, 2013), **profit** maximization has a significant impact on the *probability of survival* of banks and further to *financial **stability***.

Two of the most commonly used models for identifying the **vulnerability** of a corporation, according to (Altman, 2000), are represented by **Z-Score** model and ZETA credit risk model. According to (Čihák, 2007), the main advantage of **Z-Score-** the microeconomic financial stability measure- is represented by the easily

[4] The empirical findings suggest also that private banks are relatively more profitable than their state owned counterparts.

[5] The results suggest that economic *value added* and the *net interest margins* do better than the more conventional measures of profitability, namely return on assets (ROA) and return on equity (ROE).

[6] In Examining different components of economic globalization, they found that greater economic integration via **higher trade flows**, cultural proximity, and greater political **globalization** have significant and *positive* influence on bank **profitability** levels.

[7] The impact of inflation rate is also positive, but only when we control for actual flows, personal contacts, and political globalization.

computation for a financial institution or corporation.[8] Also, the idea of using a more simplified measure for assessing the financial stability motivated (Mercieca, Schaeck, & Wolfe, 2007) to develop the Z-score.

(Diaconua & Oaneab, 2014) analyses the main determinants of financial stability for two main important bank groups from Romania: commercial banks and co-operative banks for the period between the years 2008 and 2012.[9] The financial stability of co-operative banks is found to be influenced by two factors represented by **GDP growth** and *interbank* offering *rate for 3 months*.

We aim through this paper to analyze the main determinants and driven factors for financial stability and profitability of two main important groups of banks from Turky : islamic and conventional banks. For this paper we choose to apply the Z-score ratio to compare the financial stability of Islamic and Conventional banks during period 2005-2014. And, following (Sufiana & Habibullah, 2012) and (Ben Naceur & Omran, 2011) among others, the second dependent variable used in this study is profitability measered by return on assets ratio (ROA).[10] Figure based comparisons analysis, one sample t-test, and regression based comparison are applied to examine the difference in term of significant factors. Then quantitative analysis is conducted to predict Profitability and Stability trade off for both type of banks.

The paper proceeds as follows. After a brief introduction on measures of profitability and stability, and their determinants, Section II provides a selected overview on profitablity and stability comparison between IBs and CBs. Section III presents both descriptive and regression based comparison analysis between Islamic and conventional banks in Turky during period 2005-2014. Section IV presents a quantitatve analysis and a **bivariate Panel VAR-X** model, and offers an econometric analysis of trade off between profitability and stability for Turkish IBs and CBs. Section V provides a discussion of policy options and conclusions.

[8] On the other side, the main disadvantage of this method is represented by the fact that it does not catch the correlation between financial institutions (contagion relation).
[9] 14 banks, namely: one co-operative bank – CreditCoop Bank and 13 commercial banks.
[10] ROA and return on equity (ROE) have been used in most bank performance studies.

# I. Selected Review on Profitability and Stability Comparison

Different researchers used different technique to measure profitability. (Bashir, 1999) conducted a study on two Islamic banks in **Sudan**; Faisal Islamic Bank and Tadamon Islamic Bank, to examine the relationship between the **profitability** and market valuation (dependent variables) of the Islamic banks and the **size** of the Islamic bank (independent variable). The results indicate that the growth of the size has a **positive** and strong relationship with the **profitability** of any bank. Later, (Hassan & Bashir, 2003) conducted a research to find out the determinants of the profitability of the Islamic banks in the **Middle East**. "Controlling for macroeconomic environment, financial market structure, and taxation, the results indicate that high capital-to-asset and loan-to-asset ratios lead to **higher profitability** of Islamic banks from eight countries.

(Demirgüç-Kunt & Huizinga, 2000) justified higher results for Islamic banks in **Pakistan** by exploring that the financial systems which are under developed show **more profitability** but lower efficiency levels. The regression results showed that the greater bank development lowers the profits of the banks but improves the efficiency as the competition between the banks increase. The similar findings were revealed in a study by (Hassoune, 2002).[11] Also (Rashid, 2007) studied the performance of Islamic banks in **Pakistan**. Using three ratios for the profitability; Return on Assets, Return on Equity and Profit Expense Ratio, he found that the CBs are **more profitable** than the islamic ones and the *Return on Asset* ratio is almost the **double** for the CBs during the period 1999–2006. Later, (Siddiqui, 2008) studied the performance of Islamic banks in **Pakistan**. His results revealed that the profitability measures (Return on Assets and Return on Equity ratios) for two Islamic banks in Pakistan (i.e. Meezan and Albaraka) were **better** than the **average** for the banking industry. The ratio analysis technique is used in a study of comparison between Islamic and conventional banking in **Pakistan** by (Awan, 2009). The **profitability ratios** calculated of Islamic banks showed positive results that show high returns to the bank and its shareholders (Salman & Nawaz, 2018).[12]

[11] Findings were based on the analysis of the ROE and ROA ratios' comparison. Islamic conventional banks from Gulf Cooperation Councils' region were compared.

[12] Although Islam has allowed the profits, but the pre-determined fix amount of returns is not allowed.

A **profitability** comparison, using empirical techniques, between the Islamic and conventional banks and finance companies **in Malaysia** was conducted by (Rosly & Bakar, 2003). They found that the ratios (Return on Assets and Return on Deposits) results are significantly **higher** for the Islamic banks than the mainstream interest-based banks. An other comparison between the both types of banking was done by (Abdul-Majid, Nor, & Said, 2005) who compared the efficiency aspect of the Islamic conventional banking in **Malaysia**. They found that there is no significant statistical difference between the both, but Islamic banks' results were **better than** the conventional ones. (Suyanto, 2009) used the ratios to compare profitability, liquidity, risk and solvency of the **Bank Muamlat Indonesia** (BMI) with the conventional banks in **Indonesia**. The results revealed that there is no significance difference among the profitability of the BMI and the interest-based banks. (Indriani, 2008) picked 25 banks of **Indonesia** from which 2 banks were full-fledged Islamic banks to analyze the *profitability* performance of the both types of banks. The research concludes that the Islamic banks are showing **better performance** than the conventional ones.

The **profitability** between the Islamic and conventional banks all over the **world** was compared by (Ariss, 2010) who built a sample of banks from **thirteen** countries of the world. The study concluded that the Islamic banks have shown more **resilience** to the financial crises around the world because they invest more in the *real assets* rather than the financial assets [because in Shariah, there is a law that you cannot sell the things that you do not own].[13] This paper concludes also that there is **no significant difference** between the **profitability** of the two types of banking [i.e. the Islamic banks are not more profitable than the conventional banks].[14]

In regards to **stability**, (Kuran, 2004) finds that Islamic banks are not superior over conventional banks. Similarly, (Kassim, Majid, & Shabri, 2009) show in the context of **Malaysian** banking *industry* that the balance sheet of Islamic banks is more sensible to *monetary policy shocks* than the conventional banks. (Ergeç & Arslan, 2013) find that Islamic banks in **Turkey** are visibly more sensitive to *interest rate change* than their conventional counterparts. While, (Beck,

[13] The 2008 Global Financial Crisis (GFC) is the result of the interest-based economies.

[14] But the Islamic banks have more credit (portfolio) risk because its asset base is comprised of loans and advances mostly. The reason is may be that Islamic banking is still as its evolutionary stage and does not have attained its full potential. The study also concluded that Islamic banks are showing less competition in the global financial markets.

Demirguc -Kunt, & Merrouche, 2013) and (Khediri, Charfeddine, & Youssef, 2015) show that Islamic banks are *more liquid and better capitalized* which implies that this class of banks is *more stable*. This finding is supported by (Abedifar, Molyneux, & Tarazi, 2013) for a data of 553 banks from 24 countries and (Rahim & Zakaria, 2013) for **Malaysian** case.[15] In contrast, (Kabir & Worthington, 2017) find that Islamic banks are more risky than conventional banks, and they find no difference in credit risk between the set of clustered banks during the global financial crisis. In another study, (Kabir & Worthington, 2017) analyzing data from 16 **developing economies** over the period 2000 to 2012 show that Islamic banks are *less stable* than the conventional banks

## II. Data and variables

Our sample contains 21 banks (17 conventional and 4 Islamic). List of Turkish banks is given at Appendice, see **Table A 1**. We have 210 observations, or bank-years of data, for banks operating in Turky for the calendar years 2005–2014.[16] There are 170 observations for conventional banks (CB) and 40 observations for Islamic banks (IB). 12 financial ratios are used in this study. All are defined in **Table 1**. We classify these ratios into six general categories: **profitability** ratios (ROA, and ROE), **liquidity** ratios (CTA, and CTD),[17] **credit** risk (LLR, NPL, LTA, LTD), **insolvency risk** ( DTA), **Reglementary risk** (CAP), and asset **structure** ratios (FAA, OBSIA).[18] To ensure that our results were not driven by the presence of some outliers, we do correct all variables (we did not eliminate extreme values).[19] We use also the Z-score as measure of bank **stability**;

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[15] (Louati & Boujelbene, 2015) attribute higher stability of Islamic banks to increased *competition and size*. Similarly, (Ghosh, 2016) suggests that *capital adequacy ratios and reserver equirements* are the primary determinants of bank's stability.

[16] Source : Bankscope. Panel data are unbalanced.

[17] Liquidity means how quickly a bank can convert its assets into cash at face value to meet the cash demands of the depositors and borrowers.

[18] Regarding the later ratios, we use fixed assets to assets ratio, and off-balance sheet items to assets ratio to account for the operating leverage, and off-balance sheet activities, respectively. These ratios are used in the previous empirical banking literature (see (Srairi, 2010) and (Ben Khediri, Charfeddined, & Ben Youssef, 2015)).

[19] To control for the remaining outliers, we'll use a robust estimation technique (an alternative method) as a superior estimation method, less sensitive to outliers, proposed by (Rousseeuw, Hampel, Ronchetti, & Stahel, 1986).

$$\text{Z-score}_{it} = \frac{ROA_{it} + (EQ/TA)_{it}}{\sigma_{ROA}}$$

where ROA is the standard measure of return on asset, Equity to Assets ratio (ETA= EQ/TA), and $\sigma_{ROA}$ is the fluctuation of ROA indicated by the standard deviation.[20] . The **higher** the Z-score the **lower** is the bank's default risk.

Table 1: Definition of variables and expected signs.[21]

| Ratios | Definitions | Expected sign for Zscore |
|---|---|---|
| **Profitability** | | |
| ROA | Return on assets = Net income/Total assets | + |
| ROE | Return on equity = Net income/Stockholders' equity | + |
| **Liquidity** | | |
| CTA | Cash to assets = Cash/Total assets | |
| CTD | Cash to deposits = Cash/Total customer deposits | |
| **Credit risk** | | |
| LLR | Loans loss reserves to gross loans | - |
| NPL | Non-performing loans to gross loans | - |
| LTA | Loans to assets = Loans/Total assets | - |
| LTD | Loans to deposits = Loans/Total customer deposits | - |
| **Reglementary risk** | | |
| CAP | Capital adequaty ratio | |
| **Insolvency risk** | | |
| DTA | Deposits to assets = Deposits/Total assets | |
| **Asset structure** | | |
| FAA | Fixed assets to assets = Fixed assets/Total assets | |
| OBSIA | Off-balance sheet items to assets = Off-balance sheet items/Total assets | |
| **Dummies and Interactions** | | |
| IB | Dummy variable equal to 1 if the bank is Islamic, 0 otherwise (i.e. Conventional banks (CB)) | - |
| Large | Dummy variable equal to 1 if bank is large (size>median), 0 otherwise | |
| Large_CB | Inetraction term between large bank and conventional bank.[22] | |
| Large_IB | Inetraction term between large bank and islamic bank.[23] | |
| ***D2008*** | Dummy variable equal to 1 if year > 2008 | |
| ***Bank caracteristics*** | | |

[20] Z-score (which has been widely used in the literature [see for example (Laeven & Levine, 2009), (Houston, Lin, Lin, & Ma, 2010), etc), etc) indicates the multiple of a **bank's equity buffer** before it falls into the state of default.

[21] (Ben Khediri, Charfeddined, & Ben Youssef, 2015)).

[22] Give a dummy variable equal to 1 if conventional bank is big, 0 otherwise (small bank).

[23] Give a dummy variable equal to 1 if islamic bank is big, 0 otherwise (small bank).

| | |
|---|---|
| ***Size*** | Log(Total asset) |
| ***Age*** | Number of years since the bank was incorporated |
| ***Growth*** | Log(Total assets/Total assets$_{-1}$) |
| ***Share*** | ***Market share :*** percentage of comparison between Islamic banks total asset and banks.[24] |
| **Macro-economic variables** | |
| **GDPG** | Gross Domestic Product Growth (annual % change) |
| **INF** | Annual country inflation rate in percentage measured by annual % change in consumer prices |
| **Exrate** | Exchange rate |

## A. Descriptive analysis

The present study is conducted to find out the difference between the two areas of banking, that is, Islamic and conventional banking in Turkey over the period 2005 to 2014.

### 1. Univariate analysis: Tow sided t-test comparison

At **Table 9** (see Annexe section Tables B), we present **descriptive statistics** (average value for conventional and interest-free banks for each variable, number of observation, as well as standard deviation) and the p-value of a two-sided t-test. The univariate analysis shows that IB are significantly **different** from conventional banks at 5% level with respect to the most variables used in this study. Difference is significant for Cash to assets CTA, Cash to deposits CTD, Loans to assets LTA, Debt to assets DTA, Z-score, Size, AGE, Fixed assets to assets FAA, Off-balance sheet items to assets OBSIA, and Share.

Differences in **liquidity** between IB and CBs are significant, interest-free **banks are more liquid.** We find that IBs hold more cash to deposits (cash to asset), CTD averages **15.141**% for IBs versus **8.79** % for conventional banks (CTA averages **10.9** % for IB versus **5.51** % for conventional banks). The difference is statistically significant at the 1% level and then supports the **better liquidity** performance for the Interest free banks.

[24] Market share=Islamic bank total assets /Country banks total assets x 100%
See (Purboastuti, Anwar, & Suryahani, 2015) and (Aminah, Soewito, & Khairudin, 2019).

Regarding the credit risk exposure, the average loans to assets ratio (LTA) of IBs stands at **65.66** % versus **53.81**% for CBs. The difference is statistically significant only for the LTA ratio at 1% level and then suggest **greater risk** for Interest free banks.

**High debt** to assets ratio (DTA) is assumed to be indicator of **high** leverage and therefore **higher risk** of insolvency. Hence, a **low** value of DTA implies that the bank is more capitalized and so **more solvent.** Here the difference in insolvency **risk,** in term of dept to asset ratio (DTA), between IBs and CBs is significant, IB have lower average (**2.598**%) than conventional bank (**9.61**%). This implies that the interest-free bank is **more capitalized** and then **more solvent**.

We also consider the importance of **stability**. The higher the Z-score is the lower is the bank's default risk. The pairwise analysis suggests that overall, **conventional** banks are on average significantly **more stable** as indicated by **Z-scores**, and also have a lower probability of default than IBs over the entire period. **Z-scores** of IBs stands at **1424.824 %** versus **1938.936** % for CBs. The difference is statistically significant at 5% level and then in line with most empirical studies, CBs are more **stable** than IBs.

## 2. Multi-dimension analysis: Figures based comparisons

In order to investigate the evolving behavior of IB and CB (large vs small bank) and to check sensitivity of our results, we repeat the univariate analysis over the pre-crisis period (2005–2008) and the post-crisis period (2009–2015).

**Figure 2** to **Figure 16** illustrate comparison of means for all ratios Pre and Post Global Finance crisis (GFC) beween **IB and CB** (see **Annexe** section Figures A)**.** Moreover, mean comparisons for each ratio or variable is done in several dimensions: IB vs CB, Large_IB vs Small_IB, Large_CB vs Small_CB, Pre vs Post GFC 2008 for all Banks, Pre vs Post GFC 2008 for IB banks, between year, and between Quatarian banks (ID).

From a brief look at **Figure 2,** we conclude that : **Z-score average** evolution from 2005 to 2014 for islamic banks (IB) is different from one's of conventional banks (CB). The pattern of latter path is **decreasing** from **2008** (post GFC) and

increasing pre GFC, while the former has a s**tationary** path pre and post GFC. CB have higher Z-score in mean than IB during period of study.

From **Figure 3**Erreur ! Source du renvoi introuvable.**,** mean of **Zscore** comparisons in different dimensions say that: IB are less stable than CB**, Islamic Banks are less stable Post GFC 2008**, while no difference to depect between Large and Small IB,[25] and between Large and Small CB in term of stability. For all Banks no difference in term of stability Pre and Post GFC is depected. Between year comparison show that Zscore in mean has recently (2014) the **lowest** values, and between Turkish banks (ID),[26] 3 ≡ Akbank T.A.S. is the **more** stable bank while 2 ≡ T.C. Ziraat Bankasi A.S. is the **less** stable bank in average.

Regarding the **insolvency** risk, evidence shows that leverage as measured by debt to assets ratio DTA is **lower** for interest-free banks than CB and for also post GFC periods (see **Figure 4**). **IBs are more solvent than CBs post GFC**. In CBs, 2 ≡ T.C. Ziraat Bankasi A.S. is the less solvent bank in average.

From **Figure 5**, mean of cash to assets CTA evolution from 2005 to 2014 for islamic banks (IB) is not very different from one's of CB from 2013. Both have **increasing** evolution during period of study. The pattern of latter path is **decreasing** from 2013. From **Figure 6**, IB are more **liquid than CB and Post GFC**. 10 ≡ ING Bank A.S (**CB**) is the most liquid bank. 21 ≡ Tekstilbank-Tekstil Bankasi A.S. (CB) is the most capitalized bank in average.

From **Figure 7** (**Figure 8**), evidence shows that the **liquidity** (Capital adequaty) of IB, measured by cash to deposits ratio CTD (CAP), is **higher** than CB (no difference) during the **two** periods (before and after GFC). 12 ≡ Asya Katilim Bankasi AS-Bank Asya (**IB**) is the most liquid bank in average.

Based on the mean of the ROA, we conclude that the CB **outperform** the IB before (and post) the financial crisis (see **Figure 9**). **Large IB (Large CB) (do not) outperform Small IB (Small CB)**. 10 ≡ ING Bank A.S (**CB**) is the most profitable bank in average.

NPL evolution in average from 2005 to 2014 for both type of banks is stationary. Based on the mean of the NPL, we conclude that the CB **outperform** the IB post 2013 (see **Figure 10**).

[25] A bank is said to be large if its size > median.

Regarding the **credit rik**, evidence shows that **asset quality** measured by NPL, LTD and LLR, are higher for CBs (**and Large IBs**) than interest-free banks (**small IBs**), while Large CBs have lower **credit rik** than small CBs [see **Figure 11**, **Figure 12**, and **Figure 13**].

## B. Regression based Comparisons analysis

**In Turky, compaired to conventional banks -with univariate analysis- in average, interest-free banks are riskier and less stable, but have a higher liquidity, and are solvent** and **more capitalized.**

While univariate comparisons show significant differences between IB and CB, these differences could be driven by other bank characteristics. This is to be done within **regression estimation**. Different regression models are considered in this section. First, we Compare interest-free and CBs controlling for *bank characteristics*. Second, we do analyse *cross IB* difference.

Focusing on a sample of banks with both types allows us to control for unobserved time-variant bank-specific effects by introducing **bank and year** dummies, thus a clearer identification of such differences than when comparing banks from different types.

## 3. Controlling for bank caracteristics

To assess differences in Profitability, Liquidity, Credit risk, Insolvency, and stability across different bank types, we therefore run the following regression:

$$Y_{i,t} = \mu + \boldsymbol{\gamma IB_i} + \mu_t Y_t + \mu_i B_i + \boldsymbol{\delta}\, X_{i,t} + \pi D2008 + u_{it} \quad \text{(A1)}$$

where $X_{i,t}$ is vector of Bank **caracteristics**,

$$X_{i,t} = (\text{AGE}_{i,t}\ , \text{Size}_{i,t}, \text{Growth}_{i,t}, FAA_{i,t}, \text{OBSIA}_{i,t})',$$

where

Age = Number of years since the bank was incorporated,

Size = Log(Total asset),

Growth = Log(Total assets) - Log(Total assets$_{-1}$ ),

$Y_{i,t}$ is one of our measures of Profitability, Liquidity, Credit risk, Insolvency, and stability of bank i, in year t, $B_i$ are **Bank-fixed effects,** $Y_t$ are **year-fixed effects,** $IB_i$ is a **dummy** taking the value one for interest-free **banks**, $D2008$ is a dummy

variable for GFC (taking the value one from year > 2008), and $u_{it}$ is an error term. We thus compare IBs and CBs.

The results in **Table 10** show that IBs have higher Return on assets ROA, higher Return on equity ROE, higher Cash to assets (CTA), higher Loans to asset (LTA), lower Loans to deposits (LTD), higher Loans loss reserves (LLR), higher Non-performing loans (NPL), and higher Capital adequaty ratio (CAP). IBs are then more profitable, more capitalized and show higher liquidity, and higher credit risk. The magnitude of these differences is also meaningful, with IB having a 2.71% point higher Return on assets and 17.93% point higher Return on equity, 9.516% point higher Cash to assets, 16.97% point higher Loans to asset, 25.033% point lower Loans to deposits, 15.759% point higher Loans loss reserves, 33.55% point higher Non-performing loans, and 90.65% point higher Capital adequaty ratio (see Annexe section Tables B).

**IBs show then higher liquidity and credit risk, are more capitalized, and are more profitable.**

## 4. Cross-IB variation

To controll for individual **IB** caracteristic in assessing the differences across different bank types, we therefore run the following regression:

$$Y_{i,t} = \mu + \boldsymbol{\gamma_i IB_i} + \mu_t Y_t + \mu_i B_i + \delta\, X_{i,t} + \pi D2008 + u_{it} \quad \text{(A2)}$$

where $X_{i,t}$ is vector of Bank **caracteristics**,

$$X_{i,t} = (\mathrm{AGE}_{i,t}\ , \mathrm{Size}_{i,t}, \mathrm{Growth}_{i,t}, FAA_{i,t}, \mathrm{OBSIA}_{i,t})',$$

$D2008$ is a dummy variable for GFC (taking the value one from year > 2008), IB is an IB indicator, and $u_{it}$ is an error term.

OLS results of regression (A2) for each group of considered measures are given at **Table 11** (see Annexe section Tables B). Having four islamic banks, we can say that is each IB has significant **higher** Loans to asset **LTA** (except 14 ≡ Turkiye Finans Katilim Bankasi AS has lower), significant higher Loans loss reserves (**LLR**), significant higher Non-performing loans (**NPL**), significant higher Capital adequaty ratio (**CAP**), significant higher Return on assets **ROA** (except 14 has lower), and significant higher Cash to assets **CTA** (except 14 has not significant effect). In addition :

13 ≡ Kuveyt Turk Katilim Bank Turkowait has significant higher Return on equity **ROE** and significant lower **Loans to deposits LTD,**

14 ≡ Turkiye Finans Katilim Bankasi AS, has significant higher Cash to deposits **CTD,**

16 ≡ Albaraka Turk Participation Bank has significant higher Return on equity **ROE** and significant lower Loans to deposits **LTD.**

**Again, IBs show then higher liquidity and credit risk, are more profitable and are more capitalized.**

All previous results can be summed up in the following Table.

Table 2: Comparison analysis IB vs CB; a sum up.

| | Univariate analysis | Regression analysis | | Multi-dimentional analysis | | | |
|---|---|---|---|---|---|---|---|
| | | Bank caracteristic | Across IB 13 14 16 | ALL period | Post GFC | Small IB | Small CB |
| **Credit risk** | + | + | - - | - | - | - | + |
| Liquidity | + | + | + | + | + | | |
| **Capitalization** | + | + | + | | | | |
| **Solvency** | + | | | + | + | | |
| **Stability** | - | | | - | - | | |
| Profitability | | + | + + | - | - | - | + |

Note : Islamic banks are : 13 ≡ Kuveyt Turk Katilim Bank Turkowait, 14 ≡ Turkiye Finans Katilim Bankasi AS, 16 ≡ Albaraka Turk Participation Bank. Empty cells suggest that the determinant was not significant.

## III. Quantitative analysis and Results

The **Pearson correlation** test reveals the correlation among the variables.[27] The test result shows positive relationship of **Z-score** with Return on Asset ROA.

From Table A 2 (see Annexe), we can have three principal lineaire relations

Z-score = F (**ROA, ROE**, CAP, CDT, Size, Share),

ROE = F (CTD, LTA, LTD, LLR, NPL, Z-score, OBSIA)

[27] It indicates how the variables are related with each other and also to what extent.

and

$$\text{ROA} = \text{F (ROE, CTA, CTD, DTA, CAP, Z-score, Growth).}$$

Significant relationship is found between ROA and ROE ratios in the correlation matrix. So it can not be assumed that the data set is not free from Multicollinearity problem (see Table A 2 in Annexe).

The simple correlation does not imply anything regarding the causality amongst the variables. To find out the causal relationship between two variables **Granger** (1969) causality test is implemented between variables. From Table A 3 in Annexe, we deduce that **Z-score** = G (**ROA**, GDPG, **CTA**), while **ROA** = G (CTD, **CTA**, INF).[28]

All the variables under the study must be stationary otherwise spurious regression may be found. Henceforth, Fisher-type unit-root test for PANEL data based on augmented Dickey-Fuller tests has been implemented to ensure that all the bank specific variables in the regression equation are stationary. The result is shown in Table A 4 (see Annexe). All considered bank specific variable are stationary. Unit root tests results for Macroeconomic series (given also at Table A 4) are not fiable since PP and ADF tests for time series are asymptotic tests and we need at least 30 observations for each variable (we have only 10 observations for each series). However, from Figure B 1 (see Annexe), we conclude that INF, GDPG, and EXrate can be considered stationary series in level.

To avoid problem of *multicolinearity* and for a ageneralization of pairwise Granger Causality regression, we propose the **bivariate Panel VAR-X** model based on the following specification (with no contemporaneous terms):[29]

$$Y_{it} = \boldsymbol{\Gamma_0} + \sum_{k=1}^{p} \Gamma_k \, Y_{i,t-k} + \beta X_{jit} + \mu \, IB_i + \alpha \, D2008 + u_{it} \quad (0),$$

$Y_{it}$ is a **vector** of K=2 endogenous variables

$$Y_{it} = [\text{Zscore}_{it}, ROA_{it}]',$$

$X_{0it}$ is the vector of exogenous explicative variables

$$X_{0i,t} = (\text{INF}_t \, , \text{Exrate}_t)',$$

[28] Three macro economic variables are considered in this study : Gross Domestic Product Growth (GDPG), inflation rate (INF), and Exchange rate (Exrate).

[29] For good introductions to VARs, (L¨utkepohl, 2005), (Hamilton, 1994 ), (Stock & Watson, 2001), and (Becketti, 2013).

.

$ROA_{it}$ is the Return on assets ratio, INF is the inflation rate, EXrate is the exchange rate, $IB_i$ is a **dummy** taking the value one for interest-free **banks**, $D2008$ is a dummy variable for 2008 GFC (taking the value one from year > 2008), p is the optimal lag parameter to be determined, $\mathbf{\Gamma_0}$ is Kx1 real parameter vector, $\Gamma_k$ are KxK real parameter matrix, k = 1, …, p, and $u_{it}$ are the idiosyncratic errors independent and identically distributed (i.i.d.).

Before estimation, **lag order** for **PVAR** model should be chosen through minimizing the value of usual information criteria. Akaike information criterion (AIC), Schwarz information criterion (SC), and Hannan-Quinn information criterion (H-Q) have been employed for lag selection (See **Table 3**). From **Table 3** all information criterion AIC, SC and H-Q are recommending **p = 1** as optimal lag.

From Table 4 (Maximum likelihood results for model (0)),[30] the regression coefficient of **Z-score-1** is **0.980326, and** - 0.000131, which affects the Z-score positively and affects negatively the ROA though the result is not statistically significant at 5% significance level for ROA. The regression coefficient of **ROA-1** is **1.086382** (and 9.3098 of **Z-score)** which affects significantly the ROA (which is not significant). Diagnostic tests (in Table 5) suggest adequate specifications as the models show free autocorrelation errors.

This result implies that **no bilateral or unilateral directional** relationship between stability (Z-score) and profitability (ROA). ***Stability* (*Profitability*) *is significantly sensitive only to the increase of previous Z-score* (*ROA*). *IBs are less profitable than CBs. Post 2008 GFC, all Turkish banks are less profitable. In addition, for Macroeconomic stability factors, inflation INF* (*exchange rate EXrate*) *has significant negative* (*positive*) *effect on profitability.***

[30] Statistical inference are based on panel-robust standard errors.

Table 3: VAR Lag Order Selection Criteria for Equation (0).

| Lag | LogL | LR | FPE | AIC | SC | HQ |
|---|---|---|---|---|---|---|
| **0** | -188.8970 | NA | 0.072701 | 3.054352 | 3.099605 | 3.072735 |
| **1** | -14.48129 | 340.4594* | 0.004757* | **0.327701*** | **0.463460*** | **0.382852*** |
| **2** | -11.26948 | 6.166672 | 0.004818 | 0.340312 | 0.566577 | 0.432231 |
| **3** | -6.626667 | 8.765625 | 0.004770 | 0.330027 | 0.646798 | 0.458714 |

Table 4: PVAR-X(1) estimation results for Equation (0).[31]

| | Z_SCORE | ROA |
|---|---|---|
| **Z_SCORE(-1)** | **0.980326** | -0.000131 |
| | **(0.02701)** | (8.2E-05) |
| | **[ 36.2953]** | [-1.58732] |
| **ROA(-1)** | 9.309781 | **1.086382** |
| | (31.1812) | **(0.09501)** |
| | [ 0.29857] | **[ 11.4341]** |
| **INF** | -0.007088 | **-0.000911** |
| | (0.17384) | **(0.00053)** |
| | [-0.04077] | **[-1.71995]** |
| **EXRATE** | 1.077772 | **0.009550** |
| | (1.04340) | **(0.00318)** |
| | [ 1.03294] | **[ 3.00366]** |
| **IB** | -0.964447 | **-0.006323** |
| | (0.88140) | **(0.00269)** |
| | [-1.09422] | **[-2.35419]** |
| **D2008** | -1.488695 | **-0.006926** |
| | (1.04978) | **(0.00320)** |
| | [-1.41811] | **[-2.16528]** |
| **$R^2$** | **0.891407** | **0.454838** |
| **Adj. $R^2$** | 0.888055 | 0.438012 |
| **F-statistic** | 265.9611 | 27.03189 |
| **Log likelihood** | | 17.86691 |

Note : Standard errors in ( ) & t-statistics in [ ].

Table 5: Dignostic tests : VAR Residual Serial Correlation LM Tests from Equation (0) model « PVAR-X(1) ».

| Lag | LRE* stat | df | Prob. | Rao F-stat | df | Prob. |
|---|---|---|---|---|---|---|
| **1** | 6.214759 | 4 | **0.1837** | 1.564070 | (4, 316.0) | **0.1837** |
| **2** | 6.696781 | 4 | **0.1528** | 1.686667 | (4, 316.0) | **0.1528** |

Note : Null hypothesis: No serial correlation at lag h.

[31] This done by Eviews 10.

The dynamic behavior of model (0) will be assessed using **impulse response functions**, which describe the reaction of one variable in the system to innovation in the other variable in the system. From Figure 1, we deduce that:

- ✓ Response of Z-scores to shocks in ROA ratio: An increase of one percentage point in ROA ratio leads to a cumulative **increase** of only 1 percentage point in Z-scores, (in the 10 subsequent year, Figure 1 in right head corner).
- ✓ Response of ROA ratio to shocks in Z-score ratio: an increase of one percentage point in Z-score ratio leads to a cumulative **decrease** of only 0.1 percentage point in ROAs (in the 10 subsequent year, Figure 1 in left bottom corner).
- ✓ Response of ROA ratio to shocks in ROA ratio: an increase of one percentage point in ROA ratio leads to a cumulative **decrease** of 2.3 percentage point in ROAs (in the 10 subsequent year).

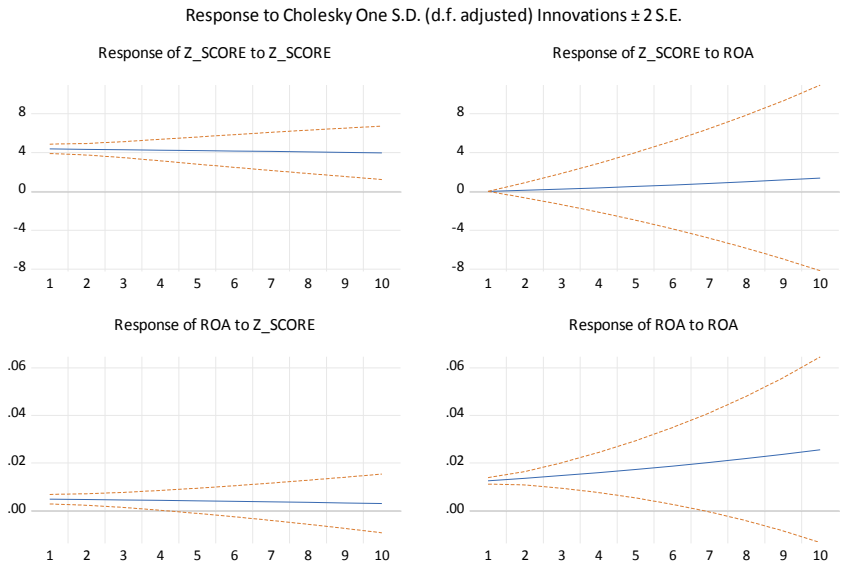


Figure 1: Impulse response function from PVAR-X(1).

These results shows that there is **no bilateral or unilateral directional** relationship between stability (Z-score) and profitability (ROA). Then, other statistical models will be built on some equations to predict the differences of financial performance between Islamic banks (IBs) and conventional banks (CBs) with respect to stability and profitability. We consider the following seemingly

unrelated regressions (**SUR) dynamic equation** model (in its **reduced form**, with no contemporaneous feedback terms):[32]

$$\begin{cases} Zscore_{it} = \boldsymbol{\alpha_0} + \varphi_1 Zscore_{i,t-1} + \gamma \mathrm{ROA}_{it-1} + \beta \mathrm{X}_{jit} + \mu IB_i + \alpha D2008 + \mathrm{u}_{it} \quad (j) \\ \mathrm{ROA}_{it} = \boldsymbol{\alpha"_0} + \varphi"_1 ROA_{i,t-1} + \gamma" Zscore_{it-1} + \beta" \mathrm{X}_{jit} + \mu" IB_i + \alpha" D2008 + \mathrm{u}"_{it} \quad (j"), \end{cases}$$

where dependent variables are

$$\mathrm{y}_{it} \equiv Zscore_{it} \; \boldsymbol{or} \; ROA_{it},$$

and $X_{jit}$ is a vector of exogenous explicative variables :

$$\mathrm{X}_{jit} = (\text{MACRO variables, BANK specific variables}),\ \mathrm{j}, \mathrm{j}'' = 1, \ldots, 6,$$

$$\text{MACRO variables} = (GDPG_t, \mathrm{INF}_t, \mathrm{Exrate}_t),$$

$$\text{BANK specific variables} = (CTD_{it}, \mathrm{Growth}_{i,t}, \mathrm{Share}_{i,t}, AGE_{it}, \mathrm{Size}_{i,t}).$$

So, we propose six dynamic panel models with

$$X_{1i,t} = (GDPG_t, \mathrm{INF}_t, \mathrm{Exrate}_t,)',$$
$$X_{2i,t} = (CTD_{it}, \mathrm{Growth}_{i,t})',$$
$$X_{3i,t} = (X_{2i,t}, \boldsymbol{\mathrm{Share}_{i,t}, AGE_{it}, \mathrm{Size}_{i,t}})',$$
$$X_{4i,t} = (X_{1i,t}, X_{2i,t})',$$
$$X_{5i,t} = (X_{4i,t}, \boldsymbol{B_2}, \ldots, \boldsymbol{B_{21}})',$$

and

$$X_{6i,t} = (X_{5i,t}, \boldsymbol{\mathrm{Share}_{i,t}, AGE_{it}, \mathrm{Size}_{i,t}})',$$

where, $B_i$ are for **Bank-fixed effects,** $IB_i$ is a **dummy** taking the value one for interest-free **banks,** $D2008$ is a dummy variable for 2008 GFC (taking the value one from year > 2008), $CTD_{it}$ is the Cash to deposits ratio, GDPG is the gross domestic product growth, INF is the inflation rate, Exrate is the exchange rate,

$$\mathrm{Growth}_{i,t} = \mathrm{Log}(\text{Total assets/Total assets}_{-1}),$$
$$\mathrm{Share}_{i,t} = \text{Islamic bank total assets / banks total assets x 100\%},$$
$$AGE_{it} = \text{Number of years since the bank was incorporated},$$
$$Size_{it} = \mathrm{Log}(\text{Total asset}),$$

and $u_{it}$ (and $u''_{it}$) are the idiosyncratic errors independent and identically distributed (i.i.d.). The regressions may be related because the (contemporaneous)

[32] The SUR model was proposed by (Zellner, 1962). The term seemingly unrelated regressions is deceptive, as clearly the equations are related if the errors $\mathrm{u}_{it}$ and $\mathrm{u}"_{it}$ in different equations are correlated.

errors associated with the dependent variables may be correlated. For the SUR model, the relationship between $Zscore_{it}$ and $ROA_{it}$ is indirect; it may comes through correlation in the errors across different equations. We consider three alternative estimation techniques.[33] The **first** one is the **SURE** for SUR models (1) to (5),[34] and the second is the Two-stage least-squares regression (2LS) method.[35] While these approaches are rather simple and intuitive, it give rise to "dynamic panel bias" which results from the possible endogeneity of the lagged variables and the **fixed effects** (in the error term). This can be avoided by applying a **third** method (for **each** equation of model (6)): the "**system GMM**" developed by (Arellano & Bover, 1995) and (Blundell & Bond, 1998) which give more precise results than "**difference GMM**" method of (Arellano & Bond, 1991) which transforms the data to **first differences** to remove the fixed effect element and uses the lagged levels of the right hand-side variables as instruments (including $y_{it-1}$).[36]
As given in

Table 12 (see Annexe), SURE is applied for SUR dynamic models : **model (1) to model (4)** and to SUR **Dynamic Fixed Effect (DFE):[37] equation (5)**. For **model (1) to model (4),** SUR **estimator is biased but consistent since** $y_{it-1}$ are not related to $u_{it}$ and $u''_{it}$ [see (Neifar, 2011, pp. 209-223)]**.** The results presented at

[33] The reduced form can be consistently estimated by OLS.
[34] It is the OLS on the entire system of equation. As might be expected a priori, if the only link across equations is the error and the errors are treated as being uncorrelated then joint estimation (SURE) reduces to single-equation estimation (OLS on each equation). In the **structural form**, due to the presence of endogenous variables OLS and SUR estimators are inconsistent. Consistent estimation methods are placed in the context of GMM estimation (Cameron & Trivedi, 2005).
[35] Seemingly unrelated regression estimator (SURE) is considered for Equation (1) to Equation (5). **Fixed effects** (FE) is used in equation (5) to control for omitted variables that *differ between banks but are constant over time.*
[36] By transforming the regressors in **first difference**, the Bank fixed-effect is removed, but a new bias is potentially introduced: the new error term can be correlated with the lagged dependent variable. Under the assumption that the error term is not serially correlated and that the explanatory variables are weakly exogenous, (Arellano & Bond, 1991) define the **two-step** GMM procedure. In the first step of their GMM estimator, error terms are assumed to be homoskedastic and independent over time and across banks. Then, in the second step residuals obtained in the first step are used to build a consistent estimate of the variance–covariance matrix. Assumptions of independence and homoskedasticity are then relaxed, making the two-step estimator asymptotically **more efficient** than the first-step one.
[37] Individual-specific effects (such as banks) is controlled for. Generally imposes homogeneity of all slope coefficients, allowing only the intercepts to vary across banks.

Table 12 broadly confirm that both bank-level and macroeconomic factors play a role in affecting the banks' stability and profitability quality. Diagnostic tests (in **Table 13,** see Annexe) suggest **not adequate** specifications as we reject the hypothesis that correlation between residuals $u_{it}$ and $u''_{it}$ is zero for each considered model.[38] However, all these estimation results are presented only for reference since for correlated residuals case, we have better to use the feasible GLS estimator,[39] or pooled **2LS** method. 2LS estimation results will be reported here (see **Table 6**). A Sum up of sign of significant variables from **Table 6** are given at **Table 7** here after**. From Table 7, contrary** to model (0) results**,** we depict here some **bilateral directional relationship** between stability (Z-score) and profitability (ROA). Looking at **Table 7 or Table 7,** this result implies that **stability** is significantly sensitive both to the increase of previous Z-score and to decrease of previous profitability. **Profitability** is also sensitive both to an increase of previous Profitability and stability. IBs are less stable than CBs. In addition, Post 2008 GFC, Turkish banks are less stable and less profitable. For **Macroeconomic** stability factors, inflation INF (exchange rate EXrate) has significant negative (negative) effect on profitability. GDPG has significant negative effect on stability and profitability. While Cash to deposit (CTD) has a positive effect on profitability but Growth has negative effect on stability and profitability. Again, all estimation results for models with **fixed effect** cases are presented here only for reference also since for dynamic models system GMM estimation is the consistent estimation method. **System GMM** results for the more general DFE model (**dynamic model (6)**) for **each dependent variable** are given at **Table 14 (see Annexe)**.[40] For either stability or profitability side, results are given for All banks, for IBs, and for CBs. A sum up of sign for significant variables are collected in **Table 8** given below. Looking at **Table 8, in comparing CBs and IBs,** it is clear that **there is no bilateral directional** relationship between stability (Z-score) and profitability (ROA). **Stability** is significantly sensitive to the increase of profitability only for CBs, while **Profitability** is significantly sensitive to the increase of Z-score only for IBs. Post GFC, IBs are

[38] However, each model show global signification. In addition, for model (5), individual effects are significant.

[39] This estimator is generally more efficient than systems OLS, though it can be shown to collapse to OLS if the errors are uncorrelated across equations or if exactly the same regressors appear in each equation (see (Cameron & Trivedi, 2005, p. 210)). This estimator is asymptotically normal.

[40] GMM is applicable to the cases in which the number of periods is small relative to the number of cross-sectional observations (T < or = N). Otherwise - asymptotic imprecision and biases may arise.

more stable while CBs are less profitable. Size has positive effect on profitability outcome for IBs. Depreciation of Turkish money and inflation have negative effect on CBs' profitability.

## I. Conclusion

This paper consider **Turkish banks** case study over the period 2005–2014. The first aim of the current paper was to compare between the features of Interest free banks (IBs) and conventional banks (CBs) in Turky using selected financial ratios. 12 financial ratios are used in this study. We classify these ratios into six general categories: **profitability** ratios (ROA, and ROE), **liquidity** ratios (CTA, and CTD), **credit** risk (LLR, NPL, LTA, LTD), **insolvency risk** (DTA), **Reglementary risk** (CAP), and asset **structure** ratios (FAA, OBSIA). We use also the Z-score as measure of bank **stability**. Our sample contains 21 banks (17 conventional and 4 Islamic. We have 210 observations, or bank-years of data, for banks operating in Turky. The **long run** comparison analysis (based on regression and on t-test) between interest-free banks (IBs) and conventional banks (CBs) of bank specific factors indicates that there are difference between Islamic and conventional banks behavior. Both methods show that Interest-free banks are **riskier**, have higher **liquidity** and are more **capitalized**. Univariate analysis **(t-test** based Comparison) *show in addition that* interest-free banks are **less stable**, but are **solvent**. While **regression** based Comparison analysis ***show*** *that IBs are* ***more profitable***. *Specifically*, profitability is driven by Kuveyt Turk Katilim Bank and Albaraka Turk Participation Bank. Multi-dimension figures show that **Post GFC 2008,** Islamic Banks are **less stable, more solvent, and more liquid than CBs.** Large IBs outperform Small IB in term of **profitability**. But in term of **asset quality** measured by NPL, LTD and LLR, **Small IBs** outperform **Large IBs**. **In comparing CBs and IBs in DFE model, from GMM results,** it is clear that **there is no bilateral directional** relationship between stability (Z-score) and profitability (ROA). **Stability** is significantly sensitive to the increase of profitability only for CBs, while **Profitability** is significantly sensitive to the increase of Z-score only for IBs. Post GFC, IBs are *more stable* while CBs are *less profitable*. **Size** has positive effect on profitability outcome for **IB**s. Depreciation of Turkish money and inflation have *negative* effect on CBs' profitability (the macroeconomic dimension of financial stability and CBs' performance are strongly linked).

Table 6: 2LS estimation results.

| | Zscore | | | | | ROA | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Variable** | **(1)** | **(2)** | **(3)** | **(4)** | **(5)** | **(1)** | **(2)** | **(3)** | **(4)** | **(5)** |
| **Zscore $_{-1}$** | **.98055455*** ** | **1.0054186*** ** | **.99178582*** ** | **1.0056124*** ** | **.58554106*** ** | **-.00013024** | **.00008279** ** | .00005461 | **.00008295** ** | **.00044081*** ** |
| **ROA$_{-1}$** | 4.3243715 | **-79.444904** ** | **-102.88011*** ** | **-68.753297*** | -59.601451 | **1.0804031*** ** | **.57440085*** ** | **.50172817*** ** | **.58322903*** ** | -.00422389 |
| **GDPG** | -.24848045*** | | | **-.16373027*** ** | **-.10116853** ** | -.00030195 | -.00014132 | -.00014063 | **-.00027651*** ** | **-.00027926*** ** |
| **INF** | -.18969422 | | | -.06877852 | -.08127497 | -.00112816 | **-.00055875*** | **-.00057021*** | **-.00061554*** | **-.00057178** ** |
| **EXRate** | 1.7073919 | | | 2.0213768 | 1.8480387 | **.01033702** ** | -.00402711 | **-.00532695*** | -.00235804 | **-.01235447*** ** |
| **IB** | -.97691677 | .10675094 | .77759761 | -.19106533 | **-3.8477286*** ** | **-.00633699** ** | .00055819 | **.00264049*** | .00031228 | -.00263293 |
| **D2008** | **-2.3264792** ** | **-1.3728213** ** | **-1.2319524*** | **-2.1130362*** ** | -.73690924 | **-.00794251** ** | **-.00609773*** ** | **-.00587185*** ** | **-.00670893*** ** | **-.00536078*** ** |
| **CTD** | | -3.1988158 | -4.8347214 | -2.4916197 | -6.7755766 | | .00812028 | .00611663 | .00870422 | **.01363839*** |
| **Growth** | | **-20.733711*** ** | **-20.016152*** ** | **-16.616334*** ** | **-15.74421*** ** | | **-.03036862*** ** | **-.02964202*** ** | **-.02696886*** ** | **-.01642058** ** |
| **Share** | | | 16.165594 | | | | | .02056106 | | |
| **AGE** | | | .01051739 | | | | | **.00003767** ** | | |
| **size** | | | -.16764271 | | | | | .00028855 | | |
| **Bank** | | | | | | | | | | |
| **2** | | | | | -12.316078*** | | | | | .00965235* |
| **3** | | | | | 6.3787325*** | | | | | -.0050485 |
| **4** | | | | | -6.0564204*** | | | | | .00200255 |
| **5** | | | | | -7.3974756*** | | | | | .0070171** |
| **6** | | | | | 3.7330341* | | | | | -.01217047*** |
| **7** | | | | | -1.1797431 | | | | | -.00467046* |
| **8** | | | | | 3.0291105* | | | | | -.00639346** |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **9** | | | | | -2.1010916 | | | | | -.00973996*** |
| **10** | | | | | -12.651126*** | | | | | -.00401026 |
| **11** | | | | | -6.8701685*** | | | | | -.00174211 |
| **12** | | | | | -5.1232694** | | | | | .00752906* |
| **13** | | | | | -1.541295 | | | | | -.00229792 |
| **14** | | | | | -2.7725515 | | | | | .00468079 |
| **15** | | | | | -.83137902 | | | | | -.00691589*** |
| **16** | | | | | (omitted) | | | | | (omitted) |
| **17** | | | | | -11.392243*** | | | | | .00123347 |
| **18** | | | | | -7.7600457*** | | | | | -.00236093 |
| **19** | | | | | -2.4143897* | | | | | .00195724 |
| **20** | | | | | -3.8402346** | | | | | -.0148185*** |
| **21** | | | | | -11.878409*** | | | | | -.0075394** |
| **_cons** | 2.540997 | 4.8019909*** | 4.2488861*** | 3.0434751 | 14.587866*** | .00300559 | .02313108*** | .02386289*** | .02167906*** | .04092088*** |

Table 7: Sum up of sign for significant results for Equations (1), (2), (3), (4), and (5) from Table 6**.**

| | Zscore | | | | | ROA | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Variable | (1) | (2) | (3) | (4) | (5) | (1) | (2) | (3) | (4) | (5) |
| Zscore -1 | + | + | + | + | + | | + | | + | + |
| ROA-1 | | - | - | - | | + | + | + | + | |
| GDPG | - | | | - | - | | | | - | - |
| INF | | | | | | | - | - | - | - |
| EXRate | | | | | | + | | | | - |
| CTD | | | | | | | | | | + |
| Growth | | - | - | - | - | | - | - | - | - |
| Share | | | | | | | | | | |
| AGE | | | | | | | | + | | |
| Size | | | | | | | | | | |
| IB | | | | | - | - | | + | | |
| D2008 | - | - | - | - | | - | - | - | - | - |
| Bank | | | | | | | | | | |
| 13 | | | | | | | | | | |
| 14 | | | | | | | | | | |
| 16 | | | | | | | | | | |

Note : Only islamic bank effects are reported in this table; 13 ≡ Kuveyt Turk Katilim Bank Turkowait, 14 ≡ Turkiye Finans Katilim Bankasi AS, 16 ≡ Albaraka Turk Participation Bank. Note: Empty cells suggest that the determinant was not significant.

Table 8 : Sum up of GMM results for model (6) (see **Table 14)**

| | Z-score | | | | ROA | | |
|---|---|---|---|---|---|---|---|
| Variable | ALL | CBs | IBs | Variable | ALL | CBs | IBs |
| Zscore-1 | | + | + | Zscore | + | | + |
| Zscore-2 | | + | | | | | |
| ROA | + | + | | ROA-1 | - | + | |
| CTD | | | | CTD | | | |
| GDPG | | | | GDPG | - | - | |
| INF | | | | INF | - | - | |
| EXRate | + | + | | EXRate | - | - | |
| Growth | | - | | Growth | | - | - |
| Share | | | | Share | | | |
| AGE | | | | AGE | | + | - |
| Size | - | | | Size | | | + |
| IB | | | | IB | | | |
| D2008 | | | + | D2008 | | - | |

Note: Empty cells suggest that the determinant was not significant.

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# ANNEXE

## Bank List

## Table A 1: List of Turkish banks covered in this study.[41]

| **Conventional Banks** | **Islamic Banks** | ***Islamic window or Branch*** |
|---|---|---|
| • 1 Turkiye Garanti Bankasi A.S,<br>• 2 T.C. Ziraat Bankasi A.S.,<br>• 3 Akbank T.A.S.,<br>• 4 Yapi Ve Kredi Bankasi A.S.,<br>• 5 Turkiye Halk Bankasi A.S.,<br>• 6 Turkiye Vakiflar Bankas TAO-,<br>• 7 Denizbank A.S.,<br>• 8 Finansbank A.S.,<br>• 9 Turk Ekonomi Bankasi A.S.,<br>• 10 ING Bank A.S.,<br>• 11 HSBC Bank A.S.,<br>• 15 Sekerbank T.A.S.,<br>• 17 Alternatifbank A.S.,<br>• 18 Citibank A.S.,<br>• 19 Anadolubank A.S.,<br>• 20 Burgan Bank AS,<br>• 21 Tekstilbank-Tekstil Bankasi A.S., | • 12 Asya Katilim Bankasi AS-Bank Asya,<br>• 13 Kuveyt Turk Katilim Bank Turkowait ,<br>• 14 Turkiye Finans Katilim Bankasi AS,<br>• 16 Albaraka Turk Participation Bank | 2 T.C. Ziraat Bankasi A.S<br>(2014) |

[41] Source : Islamic financial instituitions, Global investment and Business Center , USA 2009

# Tables A : descriptive analysis.

## Table A 2 : Correlation matrix

| | ROA | ROE | CTA | CTD | LTA | LTD | LLR | NPL | DTA | CAP | Zscore | FAA | OBSIA | size | Growth |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ROA | 1.0000 | | | | | | | | | | | | | | |
| ROE | 0.2728* | 1.0000 | | | | | | | | | | | | | |
| CTA | **0.6161*** | -0.0328 | 1.0000 | | | | | | | | | | | | |
| CTD | -0.1591* | -0.1903* | 0.9258* | 1.0000 | | | | | | | | | | | |
| LTA | 0.1174 | -0.1842* | 0.2972* | 0.2023* | 1.0000 | | | | | | | | | | |
| LTD | 0.0016 | -0.2715* | 0.0180 | 0.2949* | 0.8055* | 1.0000 | | | | | | | | | |
| LLR | 0.0470 | -0.1607* | -0.0473 | -0.0450 | 0.1565* | 0.1511 | 1.0000 | | | | | | | | |
| NPL | 0.0325 | -0.2699* | 0.0251 | -0.0679 | 0.1662* | 0.1692* | 0.9433* | 1.0000 | | | | | | | |
| DTA | 0.2193* | 0.0702 | -0.1574* | -0.0693 | -0.3842* | 0.0932 | -0.0739 | -0.0028 | 1.0000 | | | | | | |
| CAP | **0.4277*** | -0.0317 | 0.3018* | -0.0318 | 0.1651* | 0.1024 | 0.2982* | 0.3737* | -0.0865 | 1.0000 | | | | | |
| **Zscore** | **0.2159*** | **0.1443*** | **0.1168** | **-0.2268*** | **-0.0786** | **0.0788** | **0.1213** | **0.0628** | **0.0027** | **0.2537*** | **1.0000** | | | | |
| FAA | -0.0705 | 0.1163 | -0.0815 | -0.2237* | 0.1566 | -0.0923 | 0.1345 | 0.2206* | -0.2044* | 0.0820 | 0.0120 | 1.0000 | | | |
| OBSIA | -0.0632 | 0.1527* | 0.0269 | 0.1014 | 0.3615* | 0.0571 | -0.0247 | 0.1108 | -0.1986* | 0.0351 | -0.0596 | 0.4711* | 1.0000 | | |
| size | -0.0617 | 0.0261 | -0.1129 | -0.1050 | 0.1936* | 0.2105* | -0.0579 | -0.1961* | -0.0622 | -0.0511 | 0.3111* | 0.0316 | -0.1532* | 1.0000 | |
| Growth | -0.4156* | 0.0106 | -0.3696* | 0.0861 | 0.0640 | 0.0943 | -0.2806* | -0.1736* | -0.0312 | -0.1518* | -0.1424 | -0.0051 | 0.1287 | 0.0251 | 1.0000 |

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| | Share | AGE | GDPG | INF | EXRate | Size | OBSIA | FAA | Zscore | DTA | CAP |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Share | 1.0000 | | | | | | | | | | |
| AGE | 0.2428* | 1.0000 | | | | | | | | | |
| GDPG | 0.0662 | 0.0113 | 1.0000 | | | | | | | | |
| INF | 0.0131 | -0.0228 | -0.0023 | 1.0000 | | | | | | | |
| EXRate | -0.0781 | 0.0752 | 0.1295 | -0.2414* | 1.0000 | | | | | | |
| Size | 0.7860* | 0.1749* | 0.0472 | -0.0417 | 0.1249 | 1.0000 | | | | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| OBSIA | -0.1332 | -0.2649* | -0.1120 | 0.0384 | -0.4766* | -0.1532* | 1.0000 | | | | |
| FAA | 0.1093 | -0.1372 | -0.1854* | 0.1316 | -0.6053* | 0.0316 | 0.4711* | 1.0000 | | | |
| **Zscore** | **0.4463*** | **0.0126** | **-0.0279** | **-0.0224** | **-0.0535** | **0.3111*** | **-0.0596** | **0.0120** | **1.0000** | | |
| DTA | 0.0369 | 0.2638* | 0.0894 | 0.0055 | 0.1179 | -0.0622 | -0.1986* | -0.2044* | 0.0027 | 1.0000 | |
| CAP | -0.1117 | -0.1249 | -0.0382 | -0.0452 | 0.1113 | -0.0511 | 0.0351 | 0.0820 | 0.2537* | -0.0865 | 1.0000 |

Table A 3: Pairwise Granger causality tests results (all banks).

| **Null Hypothesis:** | **F-Statistic** | **Prob.** |
|---|---|---|
| ROA does not Granger Cause Z_SCORE | 6.88319 | 0.0014 |
| GDPG does not Granger Cause Z_SCORE | 2.72298 | 0.0691 |
| Z_SCORE does not Granger Cause CTD | 2.52553 | 0.0846 |
| CTA does not Granger Cause ROA | 5.76213 | 0.0039 |
| CTD does not Granger Cause ROA | 3.54833 | 0.0321 |
| CTA does not Granger Cause CTD | 5.04075 | 0.0080 |
| CTA does not Granger Cause Z_SCORE | 10.0673 | 8.E-05 |
| ROA does not Granger Cause CTD | 3.04915 | 0.0514 |
| ROA does not Granger Cause INF | 5.19681 | 0.0066 |

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| Null Hypothesis: | F-Statistic | Prob. | Null Hypothesis: | F-Statistic | Prob. |
|---|---|---|---|---|---|
| **CTA does not Granger Cause Z_SCORE** | 10.0673 | 8.E-05 | ROA does not Granger Cause CTA | 4.19828 | 0.0169 |
| **Z_SCORE does not Granger Cause CTD** | 2.52553 | 0.0846 | CTD does not Granger Cause ROA | 3.54833 | 0.0321 |
| **GDPG does not Granger Cause Z_SCORE** | 2.72298 | 0.0691 | ROA does not Granger Cause CTD | 3.04915 | 0.0514 |
| Z_SCORE does not Granger Cause GROWTH | 2.40365 | 0.0947 | DTA does not Granger Cause ROA | 2.65549 | 0.0738 |
| **LLR does not Granger Cause Z_SCORE** | 3.84956 | 0.0244 | **ROA does not Granger Cause EXRATE** | 4.63083 | 0.0112 |
| **NPL does not Granger Cause Z_SCORE** | 4.15517 | 0.0182 | **ROA does not Granger Cause GDPG** | 6.94012 | 0.0013 |
| **Z_SCORE does not Granger Cause NPL** | 2.81085 | 0.0644 | **ROA does not Granger Cause GROWTH** | 3.05047 | 0.0510 |
| **ROA does not Granger Cause Z_SCORE** | 6.88319 | 0.0014 | **ROA does not Granger Cause INF** | 5.19681 | 0.0066 |

| | | | | | |
|---|---|---|---|---|---|
| Z_SCORE does not Granger Cause SHARE | 3.17857 | 0.0446 | LTA does not Granger Cause ROA | 3.25127 | 0.0425 |
| Z_SCORE does not Granger Cause SIZE | 3.74231 | 0.0261 | ROA does not Granger Cause LTA | 2.73686 | 0.0692 |
| NPL does not Granger Cause CAP | 2.61162 | 0.0778 | LTD does not Granger Cause ROA | 3.66682 | 0.0287 |
| **CTA does not Granger Cause NPL** | 3.66198 | 0.0288 | ROA does not Granger Cause SIZE | 3.57912 | 0.0305 |
| **EXRATE does not Granger Cause NPL** | 7.47452 | 0.0009 | **CTA does not Granger Cause CTD** | 5.04075 | 0.0080 |
| **INF does not Granger Cause NPL** | 9.78219 | 0.0001 | **CTA does not Granger Cause EXRATE** | 3.96405 | 0.0211 |
| **NPL does not Granger Cause INF** | 3.70708 | 0.0273 | CTA does not Granger Cause FAA | 3.80236 | 0.0246 |
| **LLR does not Granger Cause NPL** | 4.45751 | 0.0136 | CTA does not Granger Cause GDPG | 2.72440 | 0.0690 |
| **NPL does not Granger Cause LLR** | 3.70841 | 0.0274 | CTA does not Granger Cause GROWTH | 3.50756 | 0.0330 |
| **LTA does not Granger Cause NPL** | 2.94917 | 0.0562 | **CTA does not Granger Cause LLR** | 2.38912 | 0.0966 |
| **NPL does not Granger Cause LTA** | 3.19094 | 0.0446 | **ROA does not Granger Cause CTA** | 4.19828 | 0.0169 |
| **NPL does not Granger Cause LTD** | 3.51485 | 0.0328 | **CTA does not Granger Cause ROA** | 5.76213 | 0.0039 |
| **NPL does not Granger Cause ROA** | 2.82601 | 0.0634 | CTA does not Granger Cause SIZE | 3.92478 | 0.0219 |
| **NPL does not Granger Cause ROE** | 3.07088 | 0.0503 | CTA does not Granger Cause SHARE | 2.84583 | 0.0614 |
| **CTA does not Granger Cause ROA** | 5.76213 | 0.0039 | | | |

Table A 4: Unit root tests results.

| | **Z_SCORE** | | **CAP** | | **NPL** | | **CTA** | | **CTD** | | **ROA** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Series:** | Statistic | p-value | Statistic | p-value | Statistic | p-value | Statistic | p-value | Statistic | p-value | Statistic | p-value |
| **Ho: All panels contain unit roots** | | | | | | | | | | | | |
| **Ha: At least one panel is stationary** | | | | | | | | | | | | |
| **Inverse chi-squared(42) P** | 78.9930 | 0.0005 | 76.3052 | 0.000 | 159.9065 | 0.0000 | 91.0724 | 0.0000 | 69.9588 | 0.0043 | 99.4212 | 0.0000 |
| **Inverse normal Z** | -4.0240 | 0.0000 | -3.9393 | 0.000 | -8.3097 | 0.0000 | -5.0600 | 0.0000 | -3.0788 | 0.0010 | -4.7356 | 0.0000 |
| **Inverse logit t(109) L*** | -3.9141 | 0.0001 | -3.7761 | 0.000 | -9.4172 | 0.0000 | -4.8923 | 0.0000 | -3.0084 | 0.0016 | -4.7903 | 0.0000 |
| **Modified inv. chi-squared Pm** | 4.0363 | 0.0000 | 3.7430 | 0.000 | 12.8647 | 0.0000 | 5.3542 | 0.0000 | 3.0506 | 0.0011 | 6.2652 | 0.0000 |

| Series: | LLR | | LTA | | LTD | | DTA | | Size | | ROE | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Statistic | p-value | Statistic | p-value | Statistic | p-value | Statistic | p-value | Statistic | p-value | Statistic | p-value |
| **Ho: All panels contain unit roots**<br>**Ha: At least one panel is stationary** | | | | | | | | | | | | |
| **Inverse chi-squared(42) P** | 144.4197 | 0.0000 | 239.0403 | 0.000 | 202.3963 | 0.0000 | 115.4939 | 0.0000 | 105.5019 | 0.0000 | 130.8295 | 0.0000 |
| **Inverse normal Z** | -7.6806 | 0.0000 | -10.8462 | 0.000 | -9.6884 | 0.0000 | -6.0215 | 0.0000 | -5.2145 | 0.0000 | -7.0558 | 0.0000 |
| **Inverse logit t(109) L*** | -8.4232 | 0.0000 | -14.1487 | 0.000 | -11.9846 | 0.0000 | -6.4931 | 0.0000 | -5.5464 | 0.0000 | -7.4739 | 0.0000 |
| **Modified inv. chi-squared Pm** | 11.1749 | 0.0000 | 21.4989 | 0.000 | 17.5007 | 0.0000 | 8.0188 | 0.0000 | 6.9286 | 0.0000 | 9.6921 | 0.0000 |

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| | | | | |
|---|---|---|---|---|
| | | | **UNIT ROOT TEST TABLE (PP)** | |
| | **At Level** | | | |
| | | **EXRATE** | **GDPG** | **INF** |
| With Constant | t-Statistic | 3.8501 | -2.2551 | -3.8358 |
| | Prob. | 1.0000 | 0.2025 | 0.0223 |
| | | n0 | n0 | ** |
| | **At First Difference** | | | |
| Without Constant & Trend | t-Statistic | -1.6627 | -4.5763 | -8.8147 |
| | Prob. | 0.0896 | 0.0006 | 0.0000 |
| | | * | *** | *** |
| | | | **UNIT ROOT TEST TABLE (ADF)** | |
| | **At Level** | | | |
| | | EXRATE | GDPG | INF |
| With Constant | t-Statistic | 1.5661 | -2.2936 | -1.1894 |
| | Prob. | 0.9968 | 0.1924 | 0.6210 |
| | | n0 | n0 | n0 |
| | | n0 | n0 | n0 |
| | **At First Difference** | | | |
| Without Constant & Trend | t-Statistic | -1.6688 | -3.1622 | -9.3590 |
| | Prob. | 0.0886 | 0.0061 | 0.0001 |
| | | * | *** | *** |

Notes: (*) Significant at the 10%; (**) Significant at the 5%; (***) Significant at the 1%. and (no) Not Significant
*MacKinnon (1996) one-sided p-values.[42]

# Tables B : Comparaisons analysis.

## Table 9 : Descriptive statistics and Student t-test.

| | **ALL** | | | **CB** | | | **IB** | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **n** | **mean** | **sd** | **n** | **mean** | **sd** | **n** | **mean** | **sd** | **P-value** |
| ROA | 193 | .0193576 | .0259189 | 156 | .0206264 | .0277494 | 37 | .0140081 | .0152008 | 0.1632 |
| ROE | 190 | .1388358 | .1210041 | 155 | .1417093 | .1210887 | 35 | .1261106 | .1215544 | 0.4924 |
| **CTA** | **193** | **.0652268** | **.09778** | **157** | **.0551287** | **.1026173** | **36** | **.1092659** | **.0553279** | **0.0025** |
| **CTD** | **158** | **.1007801** | **.0704179** | **126** | **.0879228** | **.0648006** | **32** | **.1514057** | **.0697414** | **0.0000** |
| **LTA** | **169** | **.560567** | **.2096241** | **137** | **.5381456** | **.1914332** | **32** | **.6565587** | **.256189** | **0.0037** |

[42] This Result is The Out-Put of Program Has Developed By
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Qassim University-KSA

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| LTD | 170 | .9484259 | .3783962 | 138 | .9624246 | .3847613 | 32 | .8880562 | .3488561 | 0.3179 |
| **LLR** | **167** | **.0345241** | **.0248195** | **135** | **.0362872** | **.0265981** | **32** | **.0270859** | **.0130363** | **0.0591** |
| **NPL** | **174** | **.0356351** | **.0335987** | **140** | **.0365693** | **.0364189** | **34** | **.0317882** | **.0176753** | **0.4583** |
| CAP | 195 | .1228891 | .0797092 | 159 | .124583 | .0876871 | 36 | .1154075 | .0208739 | 0.5342 |
| **DTA** | **189** | **.0835103** | **.1264901** | **155** | **.0961298** | **.1355694** | **34** | **.0259801** | **.0349729** | **0.0032** |
| **Zscore** | **190** | **18.44231** | **13.21694** | **155** | **19.38936** | **14.1414** | **35** | **14.24824** | **6.562992** | **0.0373** |
| **size** | **195** | **.7539522** | **1.331144** | **159** | **.867895** | **1.309969** | **36** | **.2507048** | **1.324976** | **0.0116** |
| Growth | 173 | .0806047 | .2565585 | 141 | .075053 | .2820979 | 32 | .1050668 | .0711306 | 0.5517 |
| **AGE** | **209** | **42.36842** | **32.46986** | **170** | **48.32353** | **33.03461** | **39** | **16.41026** | **8.203715** | **0.0000** |
| **FAA** | **193** | **.0102442** | **.0088522** | **157** | **.0096438** | **.0084388** | **36** | **.0128626** | **.0101879** | **0.0488** |
| **OBSIA** | **181** | **.3466323** | **.2807703** | **145** | **.3031737** | **.2031026** | **36** | **.5216738** | **.4431312** | **0.0000** |
| **Share** | **195** | **.0512821** | **.0377879** | **159** | **.0563752** | **.0393879** | **36** | **.0287873** | **.0165219** | **0.0001** |
| GDPG | | 5.533961 | 4.379833 | | | | | | | |
| INF | | 8.350525 | 1.243829 | | | | | | | |
| EXRate | | 1.599256 | .2776358 | | | | | | | |

Table 10 : Comparing **IB** and **CB**, Controlling for bank caracteristics (Equation (A1)).

| | **Profitability** | | **Liquidity** | | |
|---|---|---|---|---|---|
| **Variable** | **Return on assets ROA** | **Return on equity ROE** | **Cash to assets CTA** | **Cash to deposits CTD** | **Loans to assets LTA** |
| IB | **.0271333*****| **.17932051***** | **.09516815**** | .00534336 | **.16969299***** |
| Size | -.06630188*** | -.09661668 | -.12973542 | .18980719** | -.30814304** |
| AGE | .00293712*** | .00910014** | .00395183 | -.00569576* | .00925899* |
| Growth | -.03465697 | .11772032 | -.20396646 | .10795743 | -.16937439 |
| FAA | -.47457229 | 2.6342023 | -3.8235729 | 1.3833103 | 1.3241565 |
| OBSIA | .0195969 | -.02122544 | .0331041 | .02660155 | -.00630036 |
| _cons | -.02845603 | -.15487398 | .07899595 | .02340712 | .49960141*** |
| N | 159 | 159 | 161 | 132 | 128 |
| $R^2$ | .56988564 | .43818629 | .50346486 | .65042365 | .83659155 |
| F | 2.5084962 | 8.3427349 | 3.2608104 | 14.934238 | . |

(suite)

| | | **Credit risk** | | **Reglementary risk** | **Insolvency** | **Stability** |
|---|---|---|---|---|---|---|
| **Variable** | **Loans to deposits LTD** | **Loans loss reserves to gross loans LLR** | **Non-performing loans to gross loans NPL** | **Capital adequaty ratio CAP** | **Debt to assets DTA** | **Zscore** |
| IB | **-.25033395**** | **.1575922**** | **.3355371*** | **.9065175**** | -.02843441 | 40.727202 |
| Size | .19391233 | -.03836427*** | -.08089682** | -.17426484** | -.01579491 | -10.129109* |
| AGE | -.00328416 | .0193789** | .04393319* | .12215414** | .00869137 | 3.8545281 |
| Growth | .27324308 | -.01464263 | .02277159 | .10413754 | .02338494 | -6.721993 |
| FAA | 1.3040811 | .2245825 | -.22726153 | -2.5657667* | -1.8931406 | -237.04071 |
| OBSIA | -.05105111 | .00574731 | -.00445966 | .03072488* | .08866465* | 3.7633983 |
| Trend | | .00354395** | .00822303* | .02352681** | .00145193 | .59665264 |
| _cons | 1.0794779*** | -1.0791208** | -2.4828857* | -6.9492389** | -.39771221 | -185.49768 |
| N | 130 | 126 | 134 | 161 | 158 | 159 |
| $R^2$ | .53812368 | .67913552 | .55066914 | .49586129 | .34475533 | .87135263 |
| F | 11.03766 | 10.468849 | 11.337814 | 3.7636723 | 3.2651938 | 87.268742 |

legend: * p<.1; ** p<.05; *** p<.01.

Table 11 : Comparing Islamic and conventional banks, testing for **cross-IB** variation ; Equation (A2).

| | Profitability | | Liquidity | | Credit risk | |
|---|---|---|---|---|---|---|
| **Variable** | **Return on assets ROA** | **Return on equity ROE** | **Cash to assets CTA** | **Cash to deposits CTD** | **Loans to assets LTA** | **Loans to deposits LTD** |
| IB | | | | | | |
| 12 | .05722303** | .18924429 | .13286497* | -.0707209 | .36183473** | -.23744181 |
| 13 | .04131399*** | .1820295*** | .09489755** | -.03747574 | .20513132*** | -.26752226* |
| 14 | -.10643381** | .0991874 | -.21204656 | .46744645*** | -.47192103** | .38284487 |
| 16 | .0271333*** | .17932051*** | .09516815** | .00534336 | .16969299*** | -.25033395** |
| Size | -.06630188*** | -.09661668 | -.12973542 | .18980719** | -.30814304** | .19391233 |
| AGE | .00293712*** | .00910014** | .00395183 | -.00569576* | .00925899* | -.00328416 |
| Growth | -.03465697 | .11772032 | -.20396646 | .10795743 | -.16937439 | .27324308 |
| FAA | -.47457229 | 2.6342023 | -3.8235729 | 1.3833103 | 1.3241565 | 1.3040811 |
| OBSIA | .0195969 | -.02122544 | .0331041 | .02660155 | -.00630036 | -.05105111 |
| Trend | | | | | | |
| _cons | -.02845603 | -.15487398 | .07899595 | .02340712 | .49960141*** | 1.0794779*** |
| N | 159 | 159 | 161 | 132 | 128 | 130 |
| $R^2$ | .56988564 | .43818629 | .50346486 | .65042365 | .83659155 | .53812368 |
| F | 2.5084962 | 8.3427349 | 3.2608104 | 14.934238 | . | 11.03766 |

(suite)

| | Credit risk | | Reglementary risk | Insolvency | Stability |
|---|---|---|---|---|---|
| **Variable** | **Loans loss reserves to gross loans LLR** | **Non-performing loans to gross loans NPL** | **Capital adequaty ratio CAP** | **Debt to assets DTA** | **Zscore** |
| IB | | | | | |
| 12 | .5441893** | 1.2333434* | 3.3809929** | .10960636 | 95.341813 |
| 13 | .36580977** | .82669134* | 2.2322796** | .11382118 | 72.999468 |
| 14 | .51866667** | 1.2057987* | 3.4417946** | .10200073 | 93.335277 |
| 16 | .1575922** | .3355371* | .9065175** | -.02843441 | 40.727202 |
| Size | -.03836427*** | -.08089682** | -.17426484** | -.01579491 | -10.129109* |
| AGE | .0193789** | .04393319* | .12215414** | .00869137 | 3.8545281 |
| Growth | -.01464263 | .02277159 | .10413754 | .02338494 | -6.721993 |
| FAA | .2245825 | -.22726153 | -2.5657667* | -1.8931406 | -237.04071 |
| OBSIA | .00574731 | -.00445966 | .03072488* | .08866465* | 3.7633983 |
| Trend | .00354395** | .00822303* | .02352681** | .00145193 | .59665264 |
| _cons | -1.0791208** | -2.4828857* | -6.9492389** | -.39771221 | -185.49768 |
| N | 126 | 134 | 161 | 158 | 159 |
| $R^2$ | .67913552 | .55066914 | .49586129 | .34475533 | .87135263 |
| F | 10.468847 | 11.337323 | 3.7636718 | 3.2651937 | 87.268761 |

Legend: * p<.1; ** p<.05; *** p<.01. Note : 12 Asya Katilim Bankasi AS-Bank Asya, 13 Kuveyt Turk Katilim Bank Turkowait , 14 Turkiye Finans Katilim Bankasi AS, 16 Albaraka Turk Participation Bank.

# Tables C : Quantitative analysis results

Table 12: SURE estimation results for Equation (j) and (j′′), j, j′′ = 1, …, 5.[43]

| | Zscore | | | | | ROA | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Variable** | **(1)** | **(2)** | **(3)** | **(4)** | **(5)** | **(1)** | **(2)** | **(3)** | **(4)** | **(5)** |
| **Zscore$_{-1}$** | .98055455*** | 1.0054186*** | .99178582*** | 1.0056124*** | **.58554106*** ** | -.00013024 | .00006351 | .00002508 | .00008295** | **.00044081*** ** |
| **ROA$_{-1}$** | 4.3243715 | -79.444904** | -102.88011*** | -68.753297* | -59.601451 | 1.0804031*** | .5983041*** | .53441056*** | .58322903*** | -.00422389 |
| **GDPG** | -.24848045*** | | | -.16373027*** | **-.10116853**** | -.00030195 | | | -.00027651*** | **-.00027926***** |
| **INF** | -.18969422 | | | -.06877852 | -.08127497 | -.00112816 | | | -.00061554* | **-.00057178**** |
| **EXRate** | 1.7073919 | | | 2.0213768 | 1.8480387 | .01033702** | | | -.00235804 | **-.01235447***** |
| **IB** | -.97691677 | .10675094 | .77759761 | -.19106533 | | -.00633699** | .00061245 | .00259308* | .00031228 | |
| **D2008** | -2.3264792** | -1.3728213** | -1.2319524* | -2.1130362*** | -.73690924 | -.00794251** | -.00592402*** | -.00572695*** | -.00670893*** | **-.00536078***** |
| **CTD** | | -3.1988158 | -4.8347214 | -2.4916197 | -6.7755766 | | .00145932 | -.00265248 | .00870422 | **.01363839*** |
| **Growth** | | -20.733711*** | -20.016152*** | -16.616334*** | **-15.74421***** | | -.03316682*** | -.0317287*** | -.02696886*** | **-.01642058**** |
| **Share** | | | 16.165594 | | | | | .03061393 | | |
| **AGE** | | | .01051739 | | | | | .00003303* | | |
| **Size** | | | -.16764271 | | | | | .00006228 | | |
| **Bank** | | | | | | | | | | |
| **2** | | | | | -12.316078*** | | | | | .00965235* |
| **3** | | | | | 6.3787325*** | | | | | -.0050485 |
| **4** | | | | | -6.0564204*** | | | | | .00200255 |
| **5** | | | | | -7.3974756*** | | | | | .0070171** |

[43] This is done by STATA 15.

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **6** | | | | | 3.7330341* | | | | | -.01217047*** |
| **7** | | | | | -1.1797431 | | | | | -.00467046* |
| **8** | | | | | 3.0291105* | | | | | -.00639346** |
| **9** | | | | | -2.1010916 | | | | | -.00973996*** |
| **10** | | | | | -12.651126*** | | | | | -.00401026 |
| **11** | | | | | -6.8701685*** | | | | | -.00174211 |
| **12** | | | | | -8.9709979*** | | | | | .00489613 |
| **13** | | | | | -5.3890235*** | | | | | -.00493085* |
| **14** | | | | | -6.6202801*** | | | | | .00204786 |
| **15** | | | | | -.83137902 | | | | | -.00691589*** |
| **16** | | | | | -3.8477286*** | | | | | -.00263293 |
| **17** | | | | | -11.392243*** | | | | | .00123347 |
| **18** | | | | | -7.7600457*** | | | | | -.00236093 |
| **19** | | | | | -2.4143897* | | | | | .00195724 |
| **20** | | | | | -3.8402346** | | | | | -.0148185*** |
| **21** | | | | | -11.878409*** | | | | | -.0075394** |
| **Statistics** | | | | | | | | | | |
| **N** | 168 | 137 | 137 | 137 | 137 | 168 | 137 | 137 | 137 | 137 |
| **r2** | | | | | | | | | | |
| **r2_a** | | | | | | | | | | |
| **F** | | | | | | | | | | |

Note : legend: * p<.1; ** p<.05; *** p<.01.

Table 13: Diagnostic tests from Seemingly unrelated regression (SURE) of models (j) and ($j''$), j, $j''$ = 1, ...,5.

| **Equation 1** | **Obs** | **Parms** | **RMSE** | **R-sq** | **chi2** | **P** | Breusch-Pagan test of residual independence: chi2(1)[44] |
|---|---|---|---|---|---|---|---|
| **Zscore** | 168 | 7 | 4.146021 | 0.8990 | 1495.92 | 0.0000 | 19.671, Pr = 0.0000 |
| **ROA** | 168 | 7 | .0130287 | 0.4609 | 143.63 | 0.0000 | |
| **Equation 2** | **Obs** | **Parms** | **RMSE** | **R-sq** | **chi2** | **P** | |
| **Zscore** | 137 | 6 | 2.867188 | 0.9497 | 2586.87 | 0.0000 | 33.323, Pr = 0.0000 |
| **ROA** | 137 | 6 | .0054867 | 0.4807 | 126.83 | 0.0000 | |
| **Equation 3** | **Obs** | **Parms** | **RMSE** | **R-sq** | **chi2** | **P** | |
| **Zscore** | 137 | 9 | 2.835129 | 0.9508 | 2648.82 | 0.0000 | 31.312, Pr = 0.0000 |
| **ROA** | 137 | 9 | .0053217 | 0.5115 | 143.45 | 0.0000 | |
| **Equation 4** | **Obs** | **Parms** | **RMSE** | **R-sq** | **chi2** | **P** | |
| **Zscore** | 137 | 9 | 2.771555 | 0.9530 | 2778.09 | 0.0000 | 29.844, Pr = 0.0000 |
| **ROA** | 137 | 9 | .0052474 | 0.5250 | 151.44 | 0.0000 | |
| **Equation 5** | **Obs** | **Parms** | **RMSE** | **R-sq** | **chi2** | **P** | |
| **Zscore** | 137 | 28 | 2.385373 | 0.9652 | 3798.37 | 0.0000 | 41.056, Pr = 0.0000 |
| **ROA** | 137 | 28 | .0041978 | 0.6960 | 313.72 | 0.0000 | |

[44] Empirical Correlation between residuals $u_{it}$and $u"_{it}$ is equal to 0.3422, 0.4932, 0.4781, 0.4667, and 0.5474 for respectively equation (1) to equation (5).

Table 14 : Dynamic panel-data estimation, **one-step difference GMM** results for **all banks**.

| | Z-score | | | ROA | |
|---|---|---|---|---|---|
| **Variable** | **Coef.** | **t** | **Variable** | **Coef.** | **t** |
| **Zscore-1** | .00424296 | 0.969 | **Zscore** | **.00114902*** ** | 5.16 |
| **ROA** | **280.4331*** ** | 5.20 | **ROA-1** | **-.18378232** ** | 0.027 |
| **CTD** | -7.2816801 | -0.85 | **CTD** | .0150208 | 1.24 |
| **GDPG** | -.00355209 | -0.08 | **GDPG** | **-.00015181*** | -1.83 |
| **INF** | .16719901 | 1.18 | **INF** | **-.00053141** ** | -2.38 |
| **EXRate** | **7.503768*** ** | 3.05 | **EXRate** | **-.020135*** ** | -2.89 |
| **Growth** | 3.8787125 | 0.52 | **Growth** | -.00543375 | -0.45 |
| **Share** | -181.54572 | -1.36 | **Share** | .01571606 | 0.10 |
| **AGE** | 1.2390468 | 1.26 | **AGE** | -.00055172 | -0.33 |
| **Size** | **-16.954858*** | -1.90 | **Size** | .01043883 | 0.63 |
| **D2008** | 1.2395578 | 1.42 | **D2008** | **-.00445545*** | -1.84 |
| **N** | 116 | | **N** | 116 | |
| **F** | 30.997066 | | **F** | 11.22145 | |
| **Sargan/Hansen** | 12.96 (1.000) | | **Sargan/Hansen** | 18.23 (0.991) | |
| **AB(1) for AR(1)** | -2.03 (0.042) | | **AB(1) for AR(1)** | -2.37 (0.018) | |
| **AB(2) for AR(2)** | -0.87 (0.383) | | **AB(2) for AR(2)** | -0.76 (0.445) | |

legend: * p<.1; ** p<.05; *** p<.01. Note : p-values are reported for Sargan/Hansen test, and AB(1) and AB(2) tests. Fisher global significant test statistic. AB(1) statistic is the Arellano-Bond tests for first ordrer autocorrelation and AB(2) statistic is for second order autocorrelation. The Hansen /Sargan-test suggests that the instruments used are uncorrelated with the residuals, and the Arellano-Bond tests rejects the hypothesis that the errors are not autocorrelated in the first order (AR(1)), but cannot reject this hypothesis for the second order (AR(2)).

(suite **Table 14**) Dynamic panel-data estimation, **one-step system GMM**

| Z-score | | | | | ROA | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | CB | | IB[45] | | | CB | | IB | |
| **Variable** | **Coef.** | **t** | **Coef.** | **t** | **Variable** | **Coef.** | **t** | **Coef.** | **t** |
| **Zscore-1** | **.75668265*** ** | 8.06 | **.44204813*** ** | 5.05 | **Z-score** | .00008436 | 1.09 | **.00077834** ** | 5.81 |
| **Zscore-2** | **.27590444** ** | 2.69 | | | | | | | |
| **ROA** | **197.14442*** | 1.88 | 107.33129 | 1.46 | **ROA-1** | **.40012511*** ** | 3.13 | .41945993 | 1.95 |
| **GDPG** | -.05839565 | -0.47 | -.06829913 | -1.43 | **GDPG** | **-.00022609*** | -1.76 | -.00007255 | -0.30 |
| **INF** | .13211539 | 0.70 | .35178383 | 1.60 | **INF** | **-.0007107*** | -1.93 | -.00002934 | -0.05 |
| **EXRate** | **4.2814188*** | 2.01 | -4.7414248 | -1.34 | **EXRate** | -.00492754 | -0.97 | -.00990485 | -0.77 |
| **CTD** | -2.9293257 | -0.33 | -3.886086 | -0.62 | **CTD** | .01156788 | 1.17 | .02688319 | 0.74 |
| **Growth** | **-28.583898*** | -1.85 | -6.4456993 | -0.72 | **Growth** | **-.03625121*** | -1.96 | -.04110295 | -1.61 |
| **Share** | -39.643269 | -0.66 | -47.099825 | -0.60 | **Share** | .02892957 | 0.40 | **-.68243412*** ** | -6.17 |
| **AGE** | -.03601899 | -1.52 | 1.5204563 | 1.36 | **AGE** | **.00006803*** ** | 3.05 | **-.00106594** ** | -3.87 |
| **Size** | .85529556 | 0.56 | -9.4022339 | -1.12 | **Size** | .00047553 | 0.27 | **.01293582*** ** | 10.72 |
| **IB** | | | | | **IB** | | | .04900614 | 2.24 |
| **D2008** | -1.0016993 | -1.11 | **1.6175743*** ** | 12.17 | **D2008** | **-.00735877*** ** | -4.39 | -.00130232 | -1.04 |
| **_cons** | -4.6185983 | -0.81 | | | **_cons** | .02504627** | 2.57 | 0 | |
| **N** | 93 | | 23 | | **N** | 110 | | 27 | |
| **F** | 444.66632 | | 2.5747678 | | **F** | 23.527918 | | 68.092647 | |
| **Sargan/Hansen** | 49.42 (0.172) | | 0.00 (1.00) | | **Sargan/Hansen** | 5.10 (1.00) | | 20.01 (0.130) | |
| **AB(1) for AR(1)** | -2.31 (0.021) | | -1.73 (0.084) | | **AB(1) for AR(1)** | -2.62 (0.009) | | -1.62 (0.105) | |
| **AB(2) for AR(2)** | -1.65 (0.098) | | -0.95 (0.341) | | **AB(2) for AR(2)** | -0.07 (0.948) | | -0.85 (0.393) | |

[45] One-step **difference** GMM is used.

Figures A : Mean comparaisons.

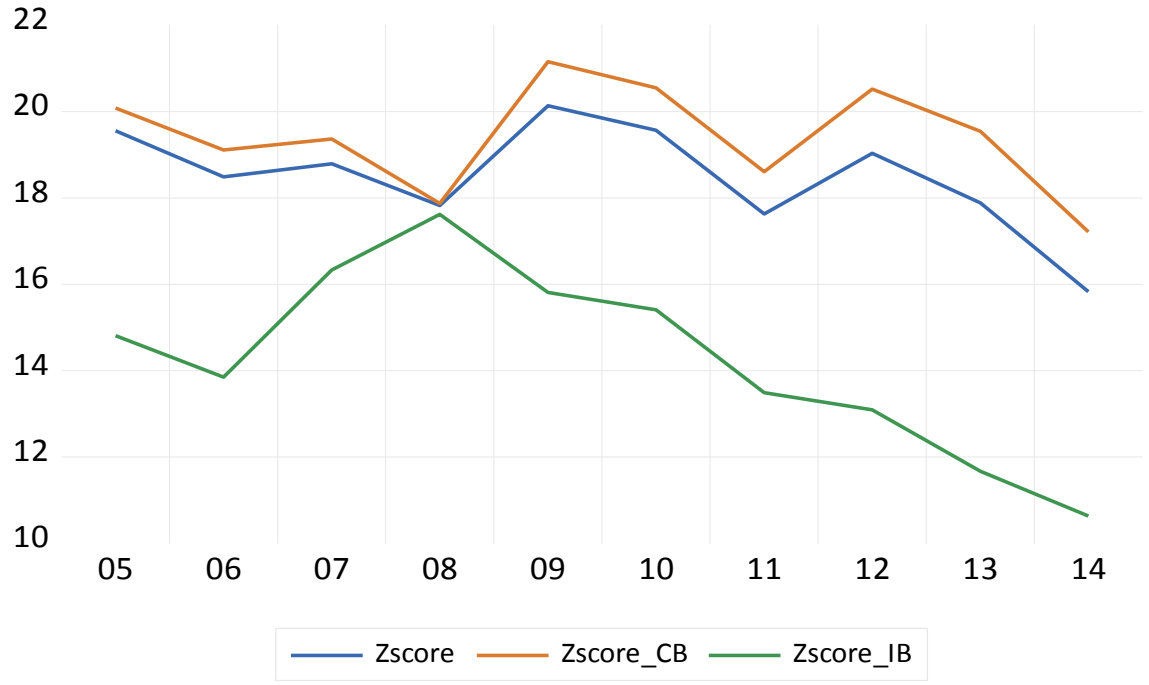


Figure 2 : Turkish Zscore average evolution 2005-2014.

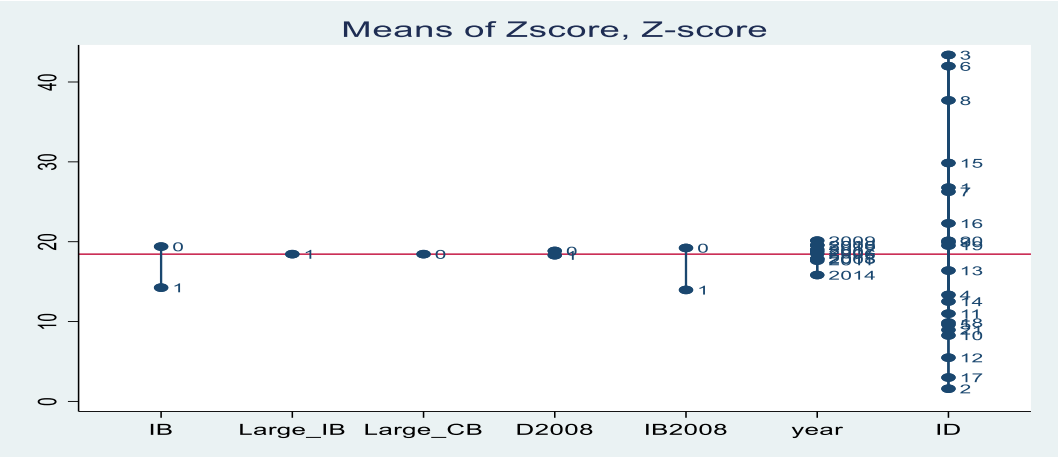


Figure 3 : **Mean of Zscore comparisons** : IB vs CB, Large_IB vs Small_IB , Large_CB vs Small_CB, Pre vs Post GFC 2008 for all Banks, Pre vs Post GFC 2008 for IB banks, between year, and between Quatarian banks (ID).

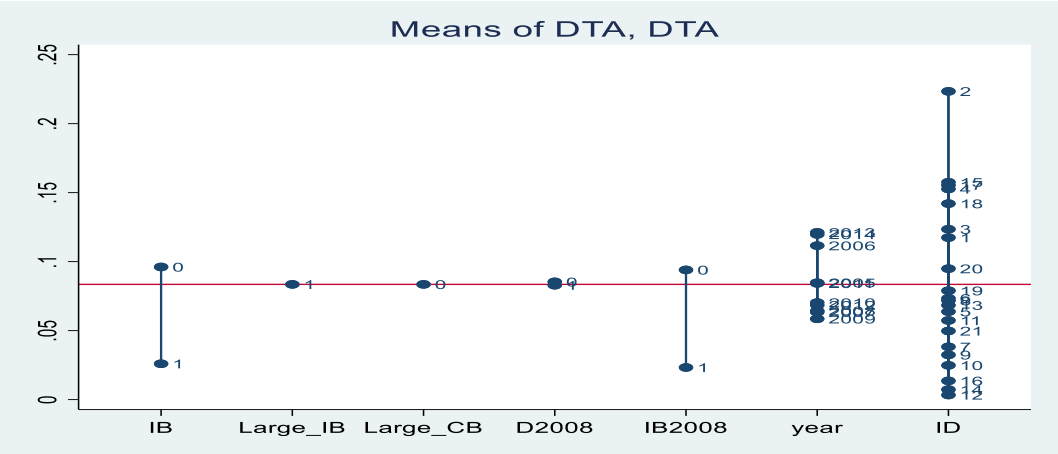


Figure 4 : **Mean of DTA comparisons** : IB vs CB, Large_IB vs Small_IB , Large_CB vs Small_CB, Pre vs Post GFC 2008 for all Banks, Pre vs Post GFC 2008 for IB banks, between year, and between Quatarian banks (ID).

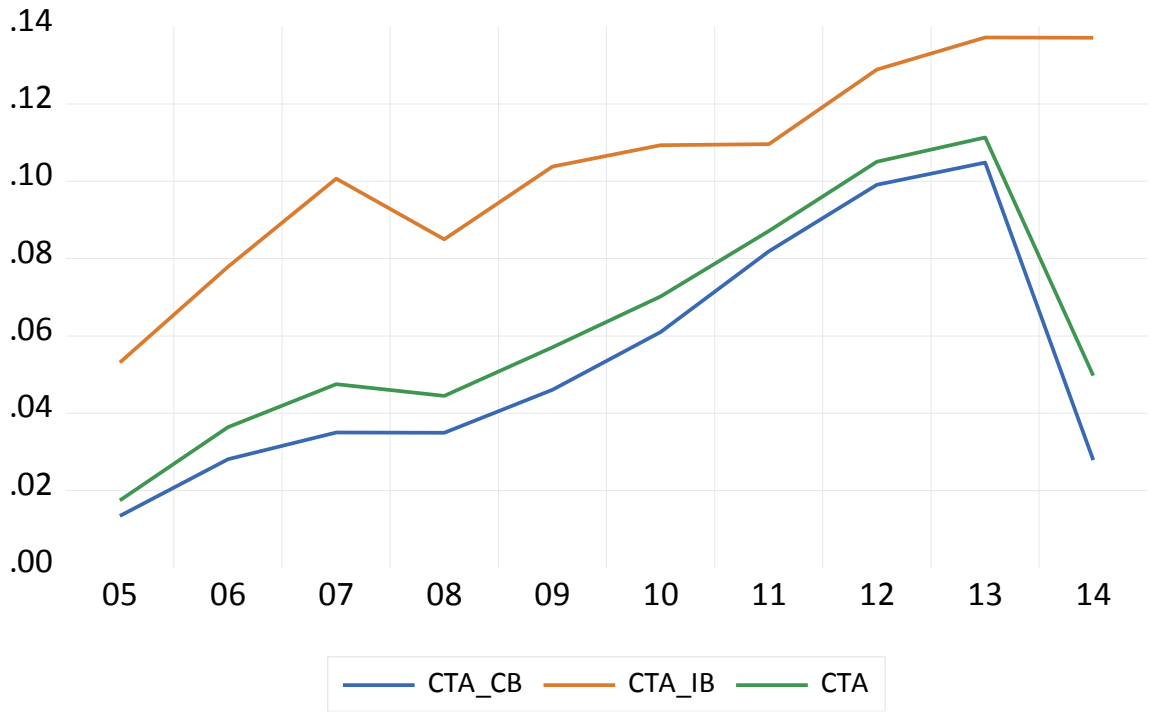


Figure 5 : Turkish CTA average evolution 2005-2014.

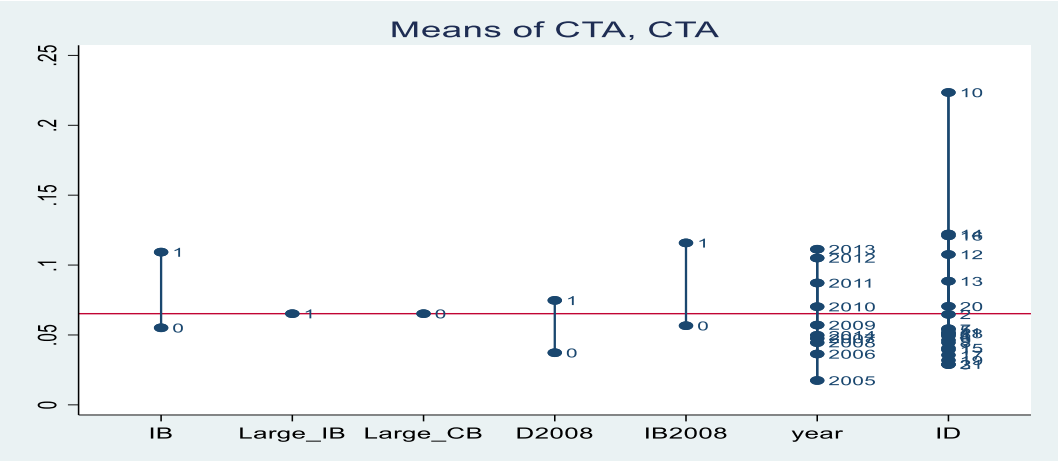


Figure 6 : **Mean of CTA comparisons** : IB vs CB, Large_IB vs Small_IB , Large_CB vs Small_CB, Pre vs Post GFC 2008 for all Banks, Pre vs Post GFC 2008 for IB banks, between year, and between Quatarian banks (ID).

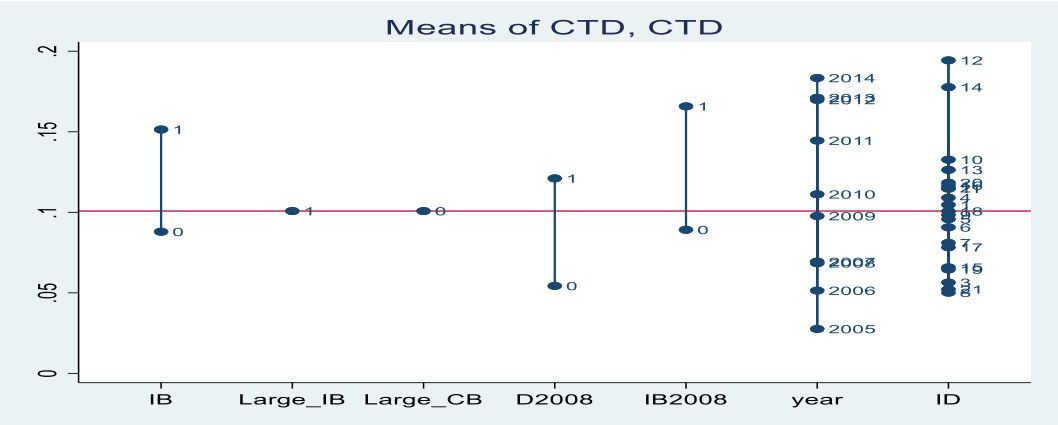


Figure 7 : **Mean of CTD comparisons** : IB vs CB, Large_IB vs Small_IB , Large_CB vs Small_CB, Pre vs Post GFC 2008 for all Banks, Pre vs Post GFC 2008 for IB banks, between year, and between Quatarian banks (ID).

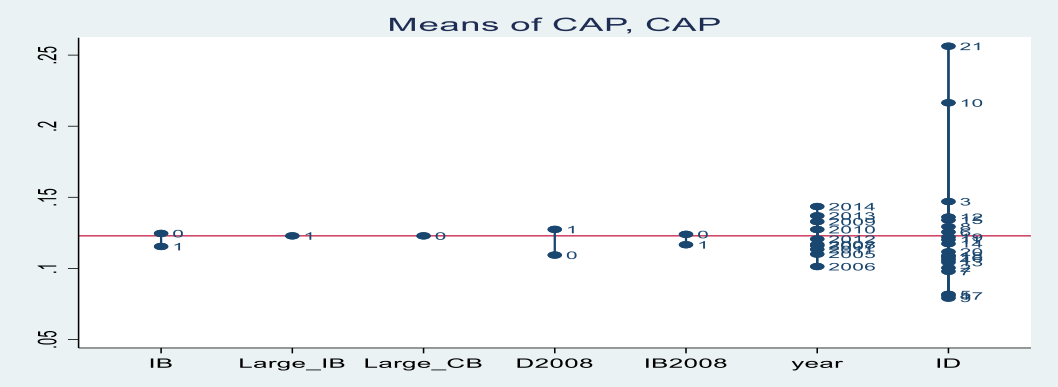


Figure 8 : **Mean of CAP comparisons** : IB vs CB, Large_IB vs Small_IB , Large_CB vs Small_CB, Pre vs Post GFC 2008 for all Banks, Pre vs Post GFC 2008 for IB banks, between year, and between Quatarian banks (ID).

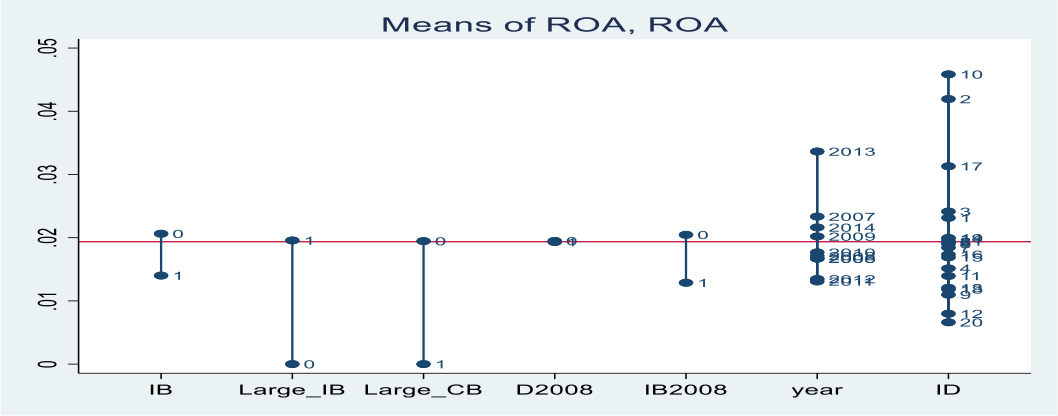


Figure 9 : **Mean of ROA comparisons** : IB vs CB, Large_IB vs Small_IB , Large_CB vs Small_CB, Pre vs Post GFC 2008 for all Banks, Pre vs Post GFC 2008 for IB banks, between year, and between Quatarian banks (ID).

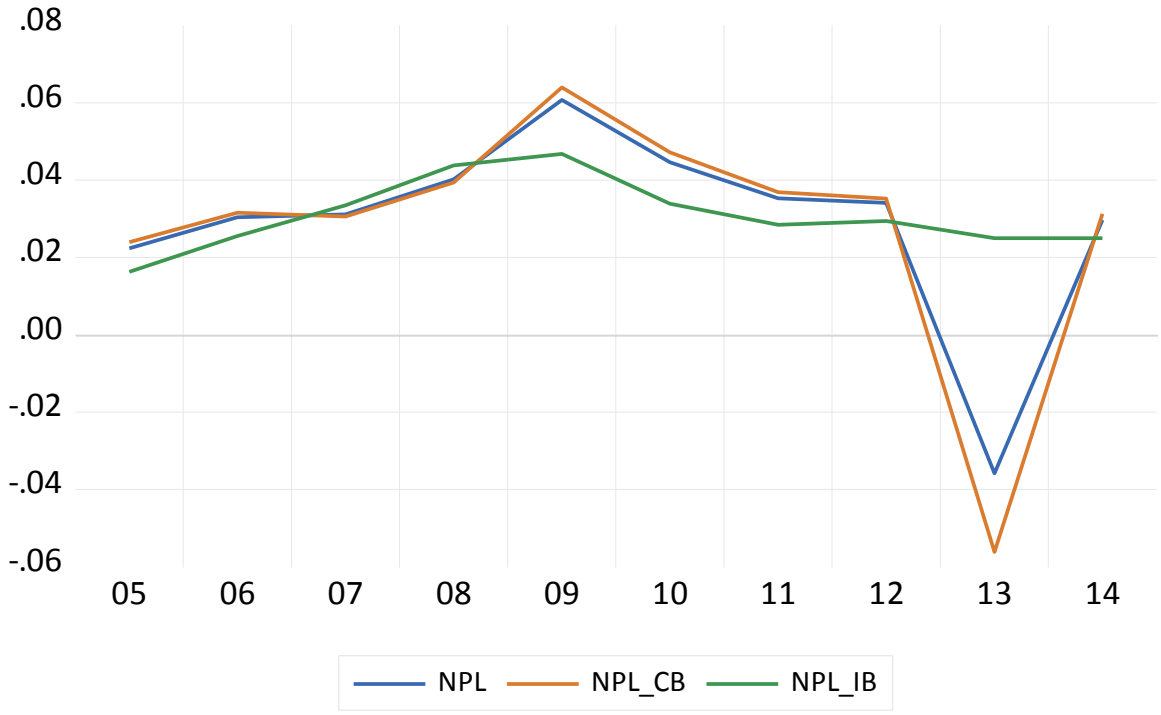


Figure 10 : Turkish NPL average evolution 2005-2014

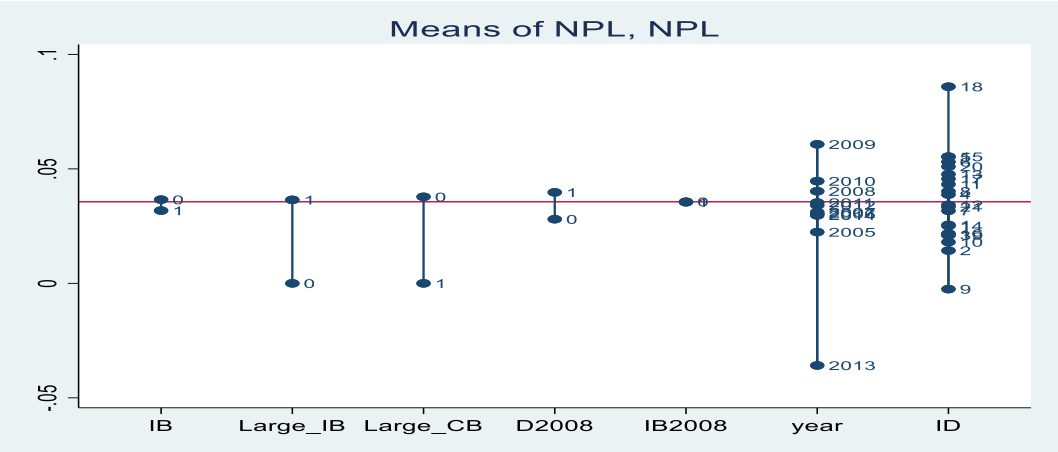


Figure 11 : **Mean of NPL comparisons** : IB vs CB, Large_IB vs Small_IB , Large_CB vs Small_CB, Pre vs Post GFC 2008 for all Banks, Pre vs Post GFC 2008 for IB banks, between year, and between Quatarian banks (ID).

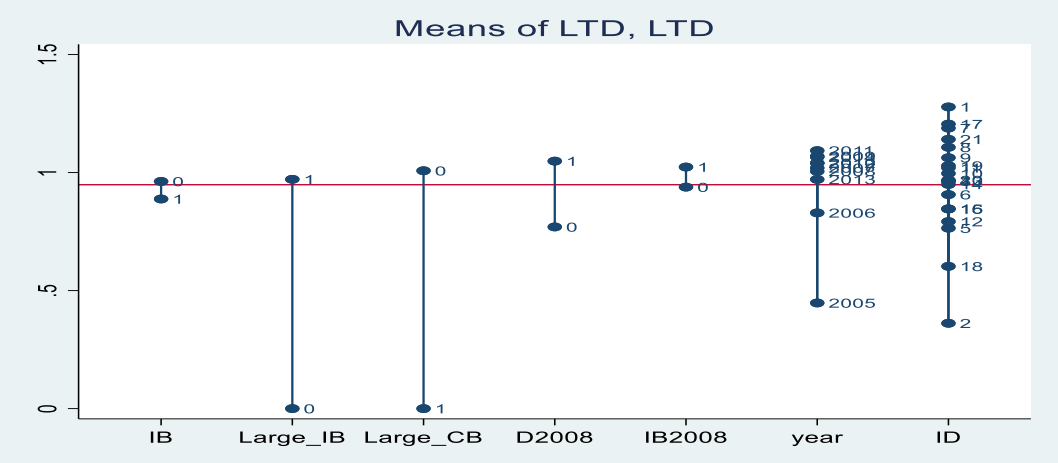


Figure 12 : **Mean of LTD comparisons** : IB vs CB, Large_IB vs Small_IB , Large_CB vs Small_CB, Pre vs Post GFC 2008 for all Banks, Pre vs Post GFC 2008 for IB banks, between year, and between Quatarian banks (ID).

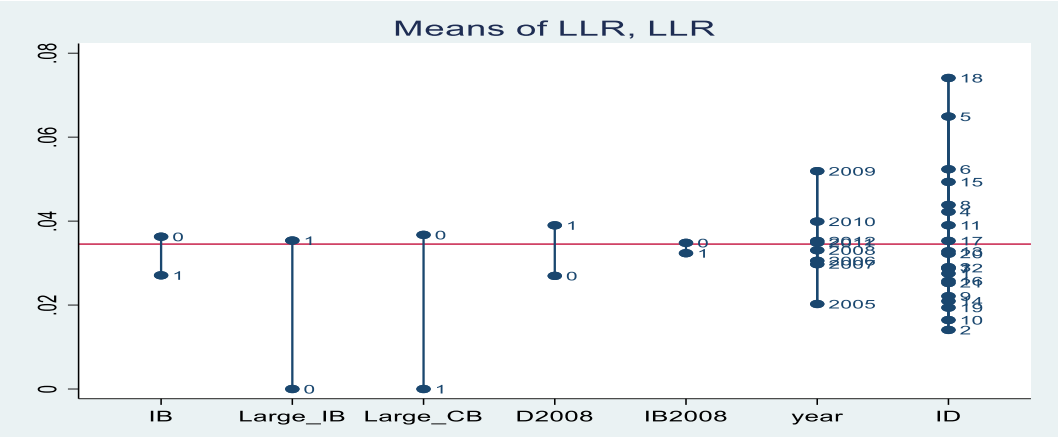


Figure 13 : **Mean of LRR comparisons** : IB vs CB, Large_IB vs Small_IB , Large_CB vs Small_CB, Pre vs Post GFC 2008 for all Banks, Pre vs Post GFC 2008 for IB banks, between year, and between Quatarian banks (ID).

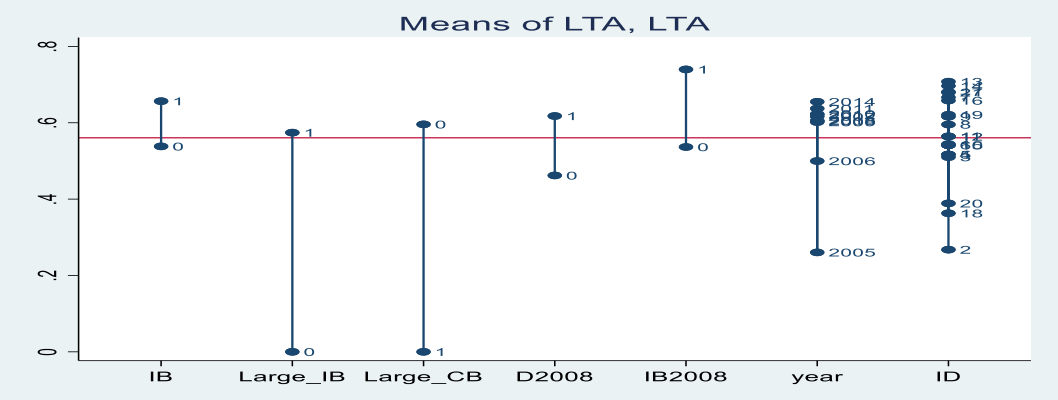


Figure 14 : **Mean of LTA comparisons** : IB vs CB, Large_IB vs Small_IB , Large_CB vs Small_CB, Pre vs Post GFC 2008 for all Banks, Pre vs Post GFC 2008 for IB banks, between year, and between Quatarian banks (ID).


Figure 15 : **Mean of Size comparisons** : IB vs CB, Large_IB vs Small_IB , Large_CB vs Small_CB, Pre vs Post GFC 2008 for all Banks, Pre vs Post GFC 2008 for IB banks, between year, and between Quatarian banks (ID).

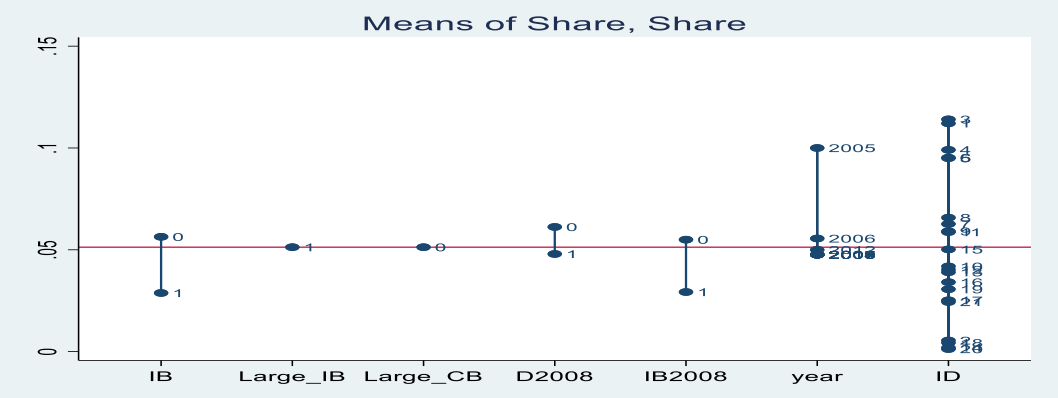


Figure 16 : **Mean of Share comparisons** : IB vs CB, Large_IB vs Small_IB , Large_CB vs Small_CB, Pre vs Post GFC 2008 for all Banks, Pre vs Post GFC 2008 for IB banks, between year, and between Quatarian banks (ID).

## Figures B

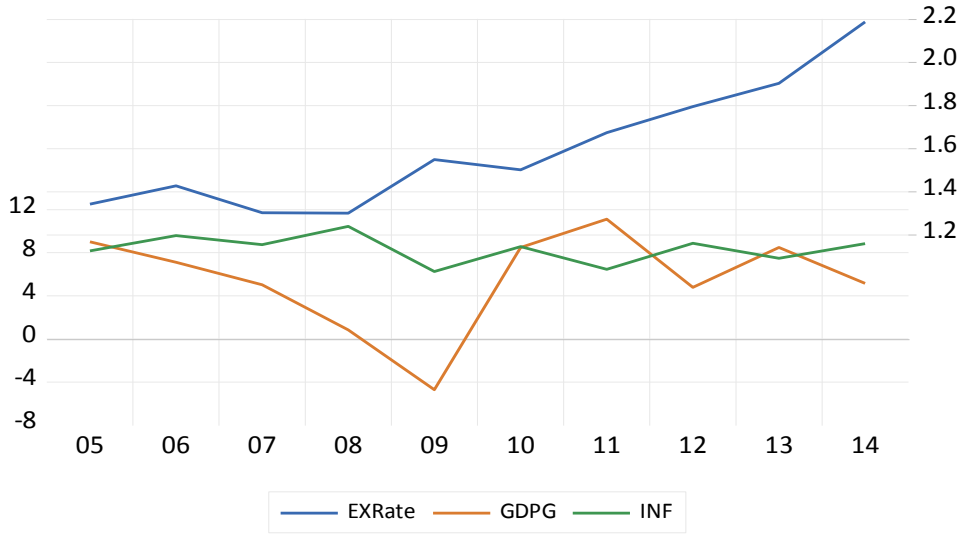


Figure B 1 : Turkish Macroeconomic variables evolution from 2005 to 2014.

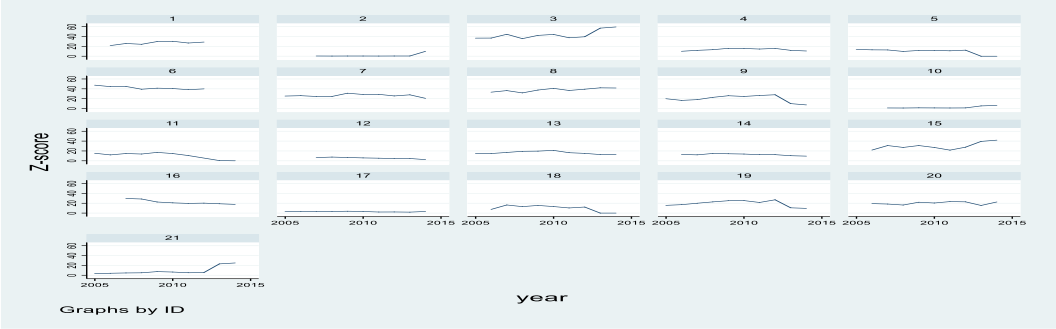


Figure B 2 : Turkish Z-score average evolution from 2005-2014.

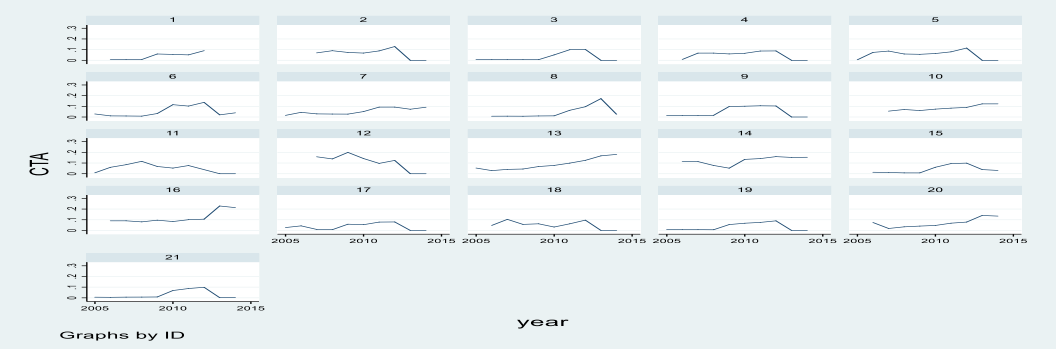


Figure B 3 : Turkish CTA average evolution from 2005-2014.

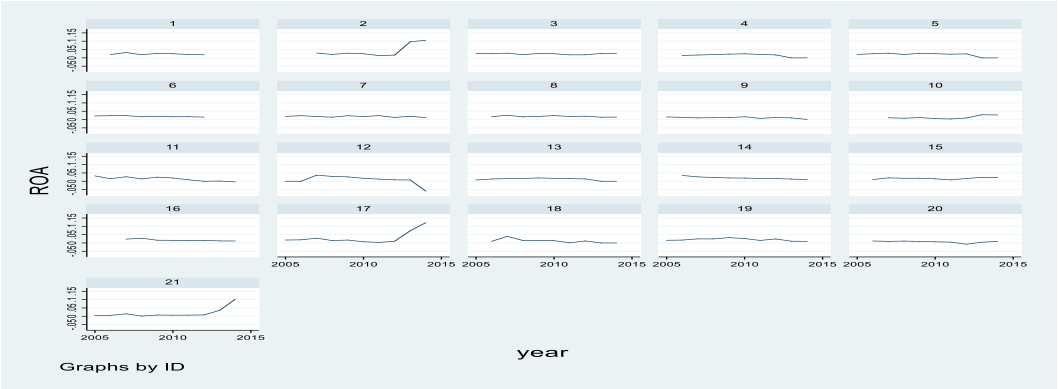


Figure B 4 : Turkish ROA average evolution from 2005-2014.

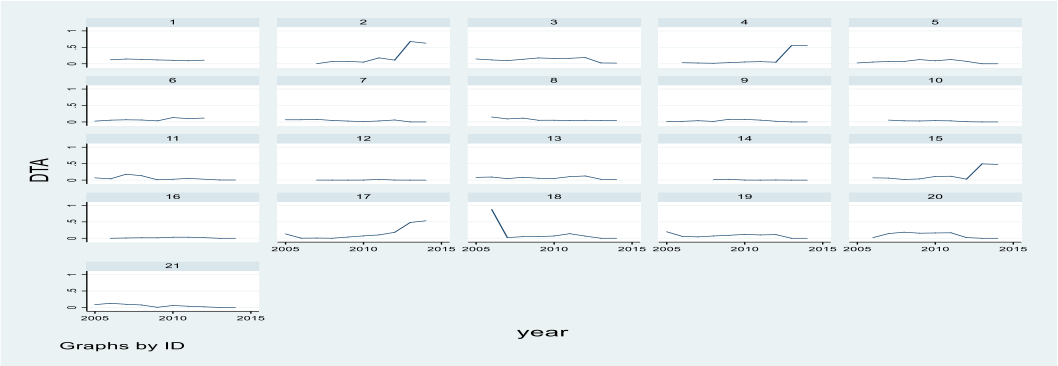


Figure B 5 : Turkish DTA average evolution from 2005-2014.