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New Challenges in Banking and Finance

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Corporate Debt Bias: Reasons and Possible Solutions

Güneş Topçu

Abstract This paper examines the asymmetric taxation of debt and equity and its consequences on the capital structure of companies and the economy as a whole. Policy options, the main ones of which include the restriction or elimination of interest deductibility and the allowance for corporate equity, are proposed as solutions to the corporate debt bias. Country-specific examples of the implementation of policy options to eliminate the tax bias on debt financing are presented. Moreover, information on the availability of tax incentives for the encouragement of equity financing in Turkey is given.

1 Introduction

Although tax discrimination between equity and debt financing seems to favor the latter, due to its tax deductibility, the reliance on debt financing leads to excessively leveraged companies, which increases their default risk and systemic risk as a whole. Furthermore, debt financing erodes the tax base through international debt-shifting. The negative consequences of excessive leverage can be observed in the global financial crisis of 2009, where large financial institutions would have gone bankrupt if they had not been bailed out.

Possible solutions to the corporate tax advantage of debt against equity have been proposed, such as the restriction or elimination of tax deductibility and the allowance for corporate equity.

Although simulation results support the role of allowance for corporate equity in reducing the negative effects of tax bias, when it comes to real life, it has been found

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that there is no clear-cut evidence stemming from the results of the implementation of ACE-type systems in developed countries. The aim of this paper is to analyze the reasons for, effects of and possible solutions to debt bias. The paper covers the implementation of possible solutions to debt bias, not only in developed counties, but also in developing countries.

The paper is composed of 9 sections. Beginning with Sect. 2, information is presented about the capital structure of companies. Section 3 discusses the problems related to the financing models used for debt financing and equity financing. Section 4 looks at the impact of taxation on the capital structure of companies. Section 5 presents the consequences of tax bias on debt financing. Section 6 proposes models to balance the tax bias on debt financing. Section 7 gives country-specific examples of the implementation of certain methods to eliminate the tax bias in debt financing. Section 8 presents the tax incentives that have been applied to encourage equity financing in Turkey, and lastly, Sect. 9 summarizes the paper.

2 Capital Structure of Companies

In the event that capital markets are perfect, that is, when perfect information exists and there is no taxation, no transaction costs, unlimited borrowing and lending opportunities and equal borrowing and lending rates, capital structure does not matter. In real life, however, capital markets are imperfect, and therefore, capital structure affects value. Companies finance themselves by using different sources of funds, such as debt and equity.

According to the literature, there are basically three main theories governing capital structure: the Miller and Modigliani (MM) irrelevance theory, the trade-off theory and the pecking order theory.

Under perfect capital markets, the MM (1958) irrelevance theory asserts that a firm's market value is independent of its capital structure (irrelevance proposition), and that a firm's cost of equity increases with its leverage level. According to this theory, market value depends on the cash generating power and risk of underlying assets. Levered firms cannot command a premium over unlevered firms, since individuals can mimic the borrowing and lending activities of corporations. However, if some of the assumptions of the MM irrelevance proposition are relaxed, different results can be reached on a case by case basis. One of the assumptions of the irrelevance proposition is that there is no tax at the corporate or personal levels of income. When corporate taxes are considered as described by MM (1963), there is an optimum debt equity level that results from the tax shield of interest payments. In due course, when both corporate and personal income taxes are taken into account in the manner stated by Miller (1977), there is no optimal capital structure for individual firms but rather at the aggregate level.

As the assumptions of the irrelevance proposition are relaxed, different results, such as the trade- off theory, emerge. The trade-off theory surfaces when the tax and bankruptcy cost assumptions are excluded. According to the trade-off theory, the

leverage level is determined by the trade-off between the tax benefits of debt and bankruptcy costs. Interest payments are deductible against the corporate income tax, while equity returns are not; therefore, firms issue debt until the increase in expected tax benefit equals the increase in expected bankruptcy costs. In these cases, debt enjoys a tax advantage over equity. On the other hand, high levels of debt increase the possibility of bankruptcy.

The last theory related with capital structure is the pecking order theory. When the assumption of symmetric information is excluded, there exists an order of financing which goes from less risky to more risky security. Firms prefer internal financing to external financing, which means they prefer retained earnings, debt and equity. The reason for this is that insiders know more overall about the company than outsiders do, making it more likely that internal financing will result in the more advantageous determination of share value when the firm issues equity. This is not always the case with external investors, who may believe that the shares are overvalued and therefore give a lower value to the shares.

In the literature, agency costs and signaling effects of debt are given as the non-tax factors that affect the capital structure of companies.

3   Problems Related to the Financing Models Used for Debt Financing and Equity Financing

Companies usually use debt or equity to raise money. According to Odar[1], the main distinction between debt and equity is stated in terms of bonds and stocks, yet the roots of this distinction are based on the cash flow claims of each type of financing. The main distinctions have been specified as: (Block, 2004) Contract differences (seniority) – while debt claims give their holders the rights to contractual cash flows, equity holders are residual claimants; that is, they are entitled to residual cash flows only after all promised claims are covered. (Buettner et al. 2006) Maturity – debt usually has maturity, while equity has an infinite life. (Devereux et al. 2015) Debt holders and Equity holders – Debt holders have neither claims on equity nor control over the management of the firm, or a very limited role, whereas equity-holders do have these. Debt holders, therefore, cannot dilute the owner's ownership right in the company. (De Mooij and Devereux, 2010) Tax differences – this issue is closely related with the topic covered in this paper. Interest expenses are treated differently than equity-based claims, such as dividends or other cash flows. Since interest expenses are tax deductible, while equity is not, this reduces the company's net obligation.

Companies prefer using debt over equity basically because of its tax advantage. The Financial Stability Board (FSB) has reported that when companies search for external financing, they tend to prefer debt over equity because of its low cost and

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[1] Retrieved from http://people.stern.nyu.edu/adamodar/pdfiles/acf3E/book/ch7.pdf.

its inability to change the ownership structure. In contrast, equity financing is preferred when firms are growing rapidly and have high levels of debt. Although debt seems to be less costly when compared with equity, because of the legal characteristics and costs associated with it, favorable changes to the tax rules on interest deductibility do not necessarily always result in a switch to debt in each case (*KPMG*, 2010).

Interest in financing has increased following the global crisis of 2009. In the same KPMG report cited above, it is stated that the reason behind the 2009 crisis was not the tax rules but the availability of cheap debt, which in turn caused the inevitable decrease of returns to equity holders. The U.S. government supplied debt by setting low interest rates, the results of which led to companies borrowing at high levels and earning a higher return on the debt capital. Since debt is fixed, the residual return to shareholders increases as debt becomes more risky. Household debt expanded with the financing of mortgage-backed securities (MBS) and collateralized debt obligations with lower credit quality. The level of subprime lending peaked in 2007. When The Federal Reserve Bank increased the lending rate, borrowers faced difficulties in refinancing their loans. The combination of all these mechanisms in play supports the idea that cheap debt rather than tax deduction was the main reason for the crisis. As further evidence of this, the KMPG report states that although the tax rules governing interest became stricter in 2005, debt levels peaked in 2007. Therefore, the problem was not the use of debt but the excessive level of the use of debt. According to the same report, tax policy had an indirect effect on the crisis, meaning that it contributed to the usage of excessive levels of debt and was not necessarily the main reason behind the crisis. The usage of excessive levels of debt, however, was in part, a response to underlying tax distortions, such as country-specific tax differences and the favorable treatment of capital gains (*IMF*, 2009). Tax distortions play a part in the development of complex financial instruments, including the deriving of benefits from the extensive usage of low-tax jurisdictions. Moreover, securitization can magnify the economic costs of tax distortions (i.e., it reduces the cost of subprime financing).

The IMF report (2009) provides empirical evidence about the higher usage of leverage resulting from tax distortions. According to a survey conducted by Weichenrieder and Klautke (2008), a 10-point increase in the CIT rate increases the debt to asset ratio by 1.4–1.6 points.

4 Impact of Taxation on the Capital Structure of Companies

As mentioned before, corporate interest payments on debt are tax deductible, whereas corporate dividend payments and capital gains[2] are not. Both corporate tax and personal taxes on interest, dividends and capital gains have an effect on capital

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[2]When the shareholders sell their stocks, gain is reported as capital gain instead of ordinary income.

structure. For example, tax advantages on corporate debt may be offset by the taxation of interest income at the personal level, but tax exempt investments, such as pension funds and charitable foundations, prefer debt finance as opposed to equity finance. Capital gain taxes can be deferred, which is an advantage that equity financing has over debt financing. According to the U.S. tax code, capital gains are taxed until they are realized. In other words, it is possible that gains on shares would never be taxed until the shareholder dies. Moreover, despite the tax advantage of debt, corporate shareholders may still prefer equity, since the dividends paid out to them are entitled to a dividends-received deduction under the U.S. tax code (Block, 2004). Still more, for preferential tax rates, equity holders are permitted to convert "what would have been ordinary dividend income into capital gain" (Block, 2004). Therefore, both equity and debt financing enjoy certain advantages, depending on different circumstances, some of which have been mentioned above. Nevertheless, overall there is a perceived bias towards debt due to its tax advantages. In the literature, debt bias is defined as "tax advantage by corporations to finance their investment by debt" (De Mooij, 2011).

5   Consequences of Tax Bias on Debt Financing

According to the results of the 2015 Corporate Debt Bias Conference, corporate debt bias affects international tax planning, insofar as it can erode the tax base through the international debt shifting carried out by multinationals who structure their internal and external debt according to tax incentives. The primary objective here is to minimize taxes. The President's Economic Recovery Advisory Board (PERAB) published a report on tax reform options for the year 2010 that presents the results of the tax bias. The following is an excerpt from that report.

> *Distortions in the corporate tax system have deleterious economic consequences. Because certain assets and investments are tax favored, tax considerations drive over-investment in those assets at the expense of more economically productive investments. Moreover, since interest is deductible, corporations are induced to use more debt, and thus become more highly leveraged and take on more risk than would otherwise be the case* (United States President's Economic Recovery Advisory Board, 2010, p.65).

One of the consequences of allowing interest payments to be deducted against CIT is the increase in the number of leveraged buyouts (LBO). Post-acquisition interest deductions may be large enough to eliminate CIT payments for many years. According to an IMF report (2009), private equity funds, which were responsible for performing the most LBOs, raised USD 230 billion between 2003 and 2006. LBOs increased substantially up to mid-2007, with their share in mergers and acquisitions in the U.S. increasing from 3 to 30 percent.

While high income individuals may prefer equity financing for reasons related to personal taxes, tax-exempt institutions and non-residents prefer debt financing. According to an IMF report (2009), 30 percent of all equities in 2006 were held by pension funds and insurance companies.

Overesch and Voeller (2008) conducted an empirical investigation of the relationship between tax level and financial leverage by using the tax data of 23 European countries from the period of 2000–2005. In this investigation, they found that higher tax benefits positively affected companies' financial leverage. Furthermore, they found that personal income taxes affected debt ratios, that is, the debt to asset ratio increased with the level of dividend taxes, whereas corporate leverage decreased as the level of the taxation of personal interest income increased. The debt ratios of smaller companies have been shown to be more effected than the big companies' debt ratios by the tax benefit of debt. MacKie-Mason (1990) investigated the tax-shield effect on debt usage by analyzing two types of tax shields: tax loss carryforwards and investment tax credits. He found that firms with high tax loss carryforwards tended to use less debt financing, on account of the fact that they were unlikely to use interest deductions. On the other hand, it has been found that investment tax credits do not decrease the probability that debt is issued.

De Mooij (2011) reviewed the literature covering the topic of the CIT rate impact on the debt ratio and derived consensus estimates based on 19 studies. Results show that there was a positive relationship between an increase in the CIT rate and the debt to asset ratio. Specifically, a 10 percent lower CIT rate was found to decrease the debt to asset ratio about 2.8 percent. In the same study, it was reported that debt bias had become more important over time, showing that while data for the year 1992 produced an expected tax impact of 0.19, data for 2011 produced an expected tax impact of 0.30, which is nearly 50 percent larger.

6   Proposed Models to Balance the Tax Bias on Debt Financing

There are several policy options available for mitigating the negative effects of tax bias on debt financing.

De Mooij (2011) has stated that full neutrality can be achieved by applying one or the other of two approaches: (Block, 2004) restricting or eliminating interest deductibility or (Buettner et al. 2006) introducing an allowance for corporate equity (ACE).

6.1   The Restriction or Elimination of Interest Deductibility

The application of thin capitalization rules is one option available (Fatica et al. 2012). Multinational firms in particular often transfer their earnings to places that have low tax rates in order to minimize their tax burden. To prevent these tax avoidance strategies, countries implement thin capitalization rules, which are described as "formal restrictions on the deductibility of interest paid by corporations that have

'excessive' debt compared to their equity or assets" (Fatica et al. 2012). It has been reported that the use of thin capitalization rules has increased since the 1990s. On the negative side, however, they also seem to reduce investment (Buettner et al. 2006).

A second option available is a comprehensive business income tax (CBIT), which denies interest deductibility altogether (with this, there is no difference between debt and equity). In this way, distortions in corporate financial structures are eliminated (De Mooij, 2011). CBIT would increase the tax base, while at the same time, help to decrease the tax rate. This approach does, however, have some disadvantages as well. These include (Block, 2004) an increase to the cost of capital on investment financed by debt, (Buettner et al. 2006) the potential to lead to the under taxation of banks, whose nature it is to use higher amounts of leverage compared to those of companies in other sectors, and (Devereux et al. 2015) increased distortion on marginal investments.

Lastly, another available option is to use "cash flow" forms of CBIT. Under this approach, interest is not deductible, but investments are allowed to be deducted in full (*IMF Report*, 2009). An example would be taxing net distributions issued to shareholders.

6.2   Introduction of Allowance for Corporate Equity (ACE)

With this system, while there is still tax deductibility of interest payments, there is also a deduction for the notional return on equity. Therefore, it is neutral with respect to marginal investment decisions (*IMF Report*, 2009). This results in no tax on projects that give a return which is equal to the cost of capital. In this way, the scale of the investment will not be harmed. ACE is designed in such a way that if too much tax is paid in 1 year, it is compensated for by granting a higher allowance for future years, and thereby real but not nominal income is taxed. Furthermore, ACE counterbalances investment distortions that arise from the differences between economic depreciation and tax-related depreciation. To explain this, De Mooij (2011) said that the book value of an asset in the tax accounts would decrease as the result of an increase in accelerated depreciation for tax purposes. In the years that follow, this would decrease ACE. One advantage of ACE is that because of its symmetric treatment of debt and equity, thin capitalization rules would no longer be needed. One of the disadvantages, however, is that ACE decreases revenue; that is, since it decreases the tax base, it reduces corporate income tax revenue.

De Mooij and Devereux (2010) stated that ACE is preferable to CBIT for four reasons: (Block, 2004) it fosters neutrality for debt and equity (Buettner et al. 2006) it neutralizes the tax effect on marginal investment decisions (Devereux et al. 2015) it lowers firm's cost of capital and finally (De Mooij and Devereux, 2010) it abolishes the distortion on investments that arise from the differences between economic and tax depreciation.

7   Country-Specific Examples of the Implementation of Certain Methods to Eliminate the Tax Bias in Debt Financing

Although simulation models support ACE's role in reducing the negative effects of tax bias, when it comes to real life, there is no clear-cut evidence based on the results of the implementation of ACE-type systems in developed countries, such as Austria, Belgium, Croatia and Italy (De Mooij and Devereux, 2010). In particular, these simulation results show a reduction in the cost of capital and an increase in investment levels when ACE is introduced.

Yet, when looked at in real terms, there are other factors at work that call into question the positive simulated results to be derived from ACE. Firstly, since the simulations involve the implementation of other reforms together with ACE, the specific effect of ACE is not able to be identified, and secondly, the simulated reforms do not include all of the characteristics of the actual ACE system (i.e., an ACE-type system is used).

Devereux et al. (2015) investigated the relationship between companies' capital structures and the corporate income tax system in the UK. The data for the study contained confidential corporation tax return information of a group of UK companies from the period of 2001–2010. In this data, precise information on the tax position of each company is given. Analysis of the data found that a majority of the companies under-reported or over-reported their taxable income, relative to their actual liability, in their financial statements. It was also found that taxation positively affected the companies' leverage ratios and that companies adjusted their leverage ratios in response to changes in the marginal tax rates. While the UK tax system has a bias in favor of how debt is treated, the government's positions show that excessive interest should not be tax deductible, and they take certain precautionary measures to correct debt bias. As stated in the KMPG discussion paper, these precautionary measures are:

- Transfer Pricing provisions aimed at disallowing a deduction for related party payments (including interest), to the extent that the payment exceeds an "arms-length" amount.
- Thin Capitalization provision aimed at disallowing a deduction for related party interest which is beyond an arms-length amount and re-characterizing the excess as a dividend.
- Worldwide Debt Cap rules designed to prevent multinational companies from loading UK subsidiaries with debt and which ensure that the UK tax deductions for interest do not exceed the group's external interest on a worldwide basis.
- Anti –Arbitrage provisions aimed at disallowing an interest deduction where there is no corresponding tax on the interest receipt (the so called "double dip" structures)
- Late Payment rules aimed at disallowing a deduction on an accrual basis, where interest on certain related party loans is not paid within 12 months of the year end (instead the interest is only deductible when paid).

Potal and Laureano (2015) investigated whether or not in Brazil, the only emerging country to experience the implementation of an ACE-type system, the ACE system was able to reduce the tax bias, by looking at all the non-financial firms listed on São Paulo's Stock Exchange from the period of 2000–2009. They found that contrary to expectations, ACE actually worsened the debt bias. This result was attributed to the flawed ACE system; in Brazil, for the tax deductibility to be executed, cash needs to be distributed to the shareholders.

8 Tax Incentives to Encourage Equity Financing in Turkey

When examining the laws related to equity financing in Turkey, it can be seen that a new regulation has recently been introduced to promote equity financing. A policy measure on allowance for corporate equity, legislated on April 7, 2015 and valid as of July 1, 2015, states that in cases of an increase in capital, an amount based on the increase in capital will be deductible against corporate income tax. This allowance is valid only for stock corporations, i.e., for joint stock, limited liability companies and companies with capital divided into shares, and the regulation governs cash capital increases only, where 50 percent of the interest calculated on the cash capital increase is deductible from corporate income tax.

According to the regulation, the discount amount is calculated by first taking the interest rate, which is the weighted average interest rate, announced by the Central Bank of Turkey, on TL- denominated commercial loans that had been issued by banks for the year the discount occurred. Next, the increase in the cash capital amount is multiplied by the interest rate. Half of this interest amount is then taken as discount in the corporate tax declaration. This declaration is only valid under the condition that the company makes profit. If the company incurs loss or is not profitable enough, the amount that could not be discounted will be deferred to subsequent years. This deferral involves no time constraints.

An example of the above process is taken from the April 17, Köprü 2016 edition of the Ekonomist Magazine:

A joint stock company had decided to increase the capital paid in cash by roughly 5 million TL, and this amount was paid on August 5. Five months, including August, remained until the end of the account period. Assuming that the interest rate issued by the Central Bank of Turkey was 14 percent, the annual interest would amount to TL700,000 (5,000,000 * 14%). For a 5-month period, it would amount to TL291,667 (700,000 / 12*5). The amount deductible against corporate income tax would be half of TL291,667, i.e., TL145,833.

Although the regulation currently states that 50 percent of the interest calculated upon cash capital increase is deductible from corporate income tax, a decision by the Ministry Council can change this percentage. Since the regulation is very new, it will take time to see its effects on debt tax bias.

9 Conclusion

Because of imperfect capital markets, the ways in which financing is conducted affect the value of the companies. Companies are usually financed with debt or equity, yet when there is asymmetric taxation of debt and equity, various problems emerge. Tax deductibility of interest expenses against corporate income tax create a bias towards debt. Companies may use excessive leverage to gain benefits from the tax advantage of debt. As a result, overinvestment on assets that are tax favored at the expense of more economically productive investments occurs.

Moreover, the tax base may be eroded due to international debt-shifting by multinationals who structure their internal and external debt according to tax incentives. To remove the negative effects of debt financing, various solutions have been proposed, such as the restriction or elimination of interest deductibility and the introduction of an allowance for corporate equity (ACE). When investigating the countries that have implemented these methods to eliminate tax bias on debt financing, no clear-cut evidence favoring one method over another can be derived from the results. In some incidences, there is even evidence that is contrary to the expectations, as in the case of Brazil. Overall, however, debt bias has been shown to have negative consequences; therefore, different policy options should be applied, on a country-to-country basis, to correct this bias.

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The Effect of Financial Crises on Banking Performance in Developed and Emerging Economies

Necla Tunay, Nesrin Özataç, and K. Batu Tunay

Abstract The aim of the study is to examine the effect of crises on the stability of the bankingsystem in 46 developed and emerging economies for the years 1999–2014. The variables are tested by using the two-step dynamic panel data analysis. The results indicate that the banking crises have an impact on the banking system stability. On the other hand, it is obsereved that the comparative conditions and the volatility on asset prices are the determinants on performance-stability relations. The most important finding is that the credit to GDP gap influence bank performance negatively.

Keywords Commercial banks • Bank crises • Performance • Dynamic panel

1 Introduction

There is a vast amount of research concerning the financial performance of banks relating to bank profitability. Often, the research is country-specific, as well as panel of countries of different countries with different scope and analysis. The results of these studies indicate that there are common characteristics among them, whether the study is bank-specific, banking system and market-based or macroeconomic. Moreover, many studies prove that bank profitability shows persistency.

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Although many studies have been done in this area, there is a paucity of studies analyzing the persistency on banks' profitability. After the global crises, the world witnessed commercial bank bankruptcies that posed a serious threat of systemic risk for banking systems, especially in industrialized countries. In such cases, most banks faced a remarkable amount of loss. Any crisis in the financial or banking system is contagious. However, the dynamics and determinants of the crisis period are not clear. The determinant or determinants of financial instability affecting bank profitability should be made clear. Since banking systems within individual countries have different structures regarding development levels, the period, as well as the effect of the variables, differ from one country to another. However, some variables have a common effect on different-level banking systems in different countries.

The aim of this study is to analyze how the determinants of persistency influence bank performance. The determinants of stability are analyzed through direct and indirect determinants, and two-step dynamic panel data models are used. This study uses data from 26 developed and 20 emerging economies.

2 Literature

There is a wide variety of literature concerning the determinants of bank performance. Primary studies were done by Short (1979) and Bourke (1989). The study done by Molyneux and Thornton (1992) is considered the primary analytical study in this area. Following these, many other studies were performed, such as Berger (1995), Neely and Wheelock (1997), Naceur (2003), Mamatzakis and Remoundos (2003), Naceur and Goaeid (Naceur and Goaied 2001, Naceur and Goaied 2008), Demirgüç-Kunt and Huizinga (1999, 2000), Abreu and Mendes (2002), Staikouras and Wood (2004), Goddard et al. (2004), Athanasoglou et al. (2006), Micco et al. (2007), Pasiouras and Kosmidou (2007), Aburime (2008), Athanasoglou et al. (2008), Dietrich and Wanzenried (2011), Flamini et al. (2009), Hoffmann (2011), Beltratti and Stulz (Beltratti and Stulz 2011), Iatridis and Persakis (Iatridis and Persakis 2012), Roman and Danuletiu (2013), Dietrich and Wanzenried (2014), Diaconu and Oanea (2014), Guillen et al. (Guillen et al. 2014), Naidu and Nair (2014), Yin and Matthews (2014), Albulescu (2015) and Petria et al. (Petria et al. 2015). The aim of the studies was to find out the determinants regarding bank-specific and macro-specific determinants. Many country-specific and comparative studies analyzing hundreds of banks were done. In these studies, linear and dynamic panel data techniques were used.

In bank performance literature, there is a paucity of studies done on the effect of the banking crises on bank performance. Most of the related literature was written after the global crises. Taşkın (2011), Gökalp (2014), Tunay (2014), Albulescu (2015), Bennett et al. (2015), Us (2015), Bhimjee et al. (2016), Capraru and Ihnatov (2014), Kamarudin et al. (2016) and Olson and Zoubi (2016) are some of these. In their studies, Albulescu (2015), Bhimjee et al. (2016), Capraru and Ihnatov (2014)

and Olson and Zoubi (2016) studied many banks within specific countries. Though their data may differ, they all used linear and dynamic panel data methodology. Their studies conclude that crises have negative effects on bank performance. Alternatively, Taşkın (2011), Tunay (2014), Bennett et al. (2015) and Kamarudin et al. (2016) proved crises can also have positive effects on bank performance.[1] Capraru and Ihnatov (2014), Albulescu (2015) and Bhimjee et al. (2016) found that crises have a negative impact on profitability.

Top bank managers were criticized for taking high risks during global crises to increase the premiums they received from the profits because these risks then caused the banks to fail or go bankrupt. In the USA, Bennett et al. (2015) analyzed 371 banks, examining the ratio of internal debt to equity. They found that by controlling leverage ratio, CEOs managed to minimize risk and increase the financial performance of their banks. This finding proves the relationship between internal debt ratio, default risk and financial performance. The stock market returns, ROE, ROA, interest income and non-interest income were analyzed by Bennett et al. (2015). Once again, however, it is possible to observe different results. During the crises, performance measures, internal debt ratio, leverage ratio and nonperforming loans were observed to be negative. It is also noted that between top bank managers' premium payments and bank performance there is a significant negative relation.

Kamarudin et al. (2016) analyzed the financial performance of banks before and after the crises and pointed out the performance of the ownership structure of commercial banks. The study found that bank profitability performance and efficiency depend on different dynamics[2]. Following the crises, both groups had a fall in their efficiencies, but private banks suffered a worse performance when compared to private commercial banks.

During the period of 2004–2011, Capraru and Ihnatov (2014) analyzed the profitability determinants of 143 commercial banks in Romania, Hungary, Poland, Bulgaria and the Czech Republic. After the global crises, debt crises continued in Europe. Average ROE, ROA and NIM were used as profitability measures. However, their results indicated that the negative effect of the crisis can be seen in all measures.

Albulescu's (2015) study on developed and emerging economies proved the negative effect of crises on bank financial performance, pointing out that nonperforming loans were the primary reason for this. According to them, the negative effect of the crises could be seen on the nonperforming loans. Regarding impersistent credit performance, the performance of the banking sector in both developed and emerging countries declined after the global crises. Albulescu (2015) pointed out that in

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[1] In the Turkish Banking system, concerning different periods, both studies prove that crises have a negative effect on ROA and ROA, whereas the effect on NIM is positive.

[2] Kamarudin et al. (2016) concluded that bank size, liquidity, economic growth and sector concentration variables have a negative effect on the profitability of public banks, while private banks see positive effects. Capitalization, credit risk and inflation, however, affect the profit of public banks positively and the efficiency of private banks negatively.

emerging countries bank profit declined due to easy ways of reaching credits, which, in turn, caused nonperforming loans to rise. By aiming to strengthen bank capital, profit declined in the short term.

Bhimjee et al. (2016) investigated the banking systems of 41 developed and emerging economies before and after crises. The banking systems of emerging economies investigated and probable regime differences are tried to be determined.[3] The results indicated that banking performances have two different clusters and each has unique regime dynamics. In the period before crises, the securities in developed countries had a high performance. In the second group, the banks of emerging economies, had a low performance. During the crises, banks in different groups showed similar patterns and regarding this regime synchronization went up and regime dynamics differences disappeared. Such results, like global crises with systemic dimensions and different dynamics, made the synchronization go up and such crises with an international spread and contingency potential can be seen.

After the global crises, conventional banks faced huge debts and generated risks, causing a collapse in the system. As Islamic banks showed a better performance after the crises, there has been an increase in the comparative studies that include Islamic banks and conventional. Studies done by Gökalp (2014) and Olson and Zoubi (2016) are primary examples of these comparative studies.[4]

The wholesale and Islamic bank performance in the Middle Eastern, African and Southeast Asian areas is investigated by Olson and Zoubi (2016) He found out that ROA and ROE performances converged in two different categories. Despite the different operational structures' profit convergence, after the crises profit convergence depends on the post-crises.

When analyzed, the relationship between crises and bank performance cannot be concluded in one way. Regarding these crises had a negative effect. Moreover, crisis performance when determined positively valid in some performance measures. Especially ROA and ROE profitability measures and experimental analysis are used widely and the effect proved to be negative after the crises.

3   Data and Methodology

The literature regarding the analysis of bank performance can be grouped into three main sections. The first group includes credit risk, capital structure, efficiency and concentration; the second group contains competition structure, concentration and ownership structure; and the third group includes macroeconomic variables such as inflation, growth and budget deficit. In most studies where

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[3] Bhimjee et al. (2016) used panel regime-switching modelling in their analysis.

[4] Ramlan and Adnan (2016) did the analysis on Malesia, while Rashid and Jabeen (2016) investigated Pakistan. They found that the crises had a direct effect on performance. Regarding their comparative analysis, they pointed out that Islamic banks showed a better profitability perfomance during the global crisis period.

a wide range of different countries are investigated, macroeconomic variables depend on factors specific to the country involved. In most of the studies where bank performance is analyzed by ROA, ROE and NIM as determinants of bank profitability as profitability ratios.

Although there is a vast number of literature regarding bank performance analysis there is a paucity of studies on the effect of crises on banks. Taşkın (2011), Dietrich and Wanzenried (2014), Gökalp (2014), Tunay (2014), Kamarudin et al. (2016) are some of them. Three of these studies (Taşkın 2011; Gökalp 2014; and Tunay 2014) look at the Turkish banking sector. In the past 40 years, Turkey has experienced three separate financial crises, making it a unique case. In those three studies, the effects of crises on bank performance are usually analyzed by the linear and dynamic panel data models. In those studies, another common thing is the variables that are used in the studies. The variables among bank-specific and macroeconomic variables.

The articles mentioned above are analyzed and the ones that investigated the effect of crises on banking performance are considered however, it should be noted that variables used during crises and performance are taken into consideration. Not only the variables that reflect the systematic and döngüsel boyutlar of the global crises are taken into consideration. In such competition and concentration as sectoral factors but also the variables such as financial health, credit deficit that are important taken as important factors. In our study, we used different variables compared to the ones in the literature, and the dynamic model is used for analysis:

$$P_{it} = \alpha + \sum_{k=1}^{p} \varphi_k P_{it-k} + \beta_1 Crisis_{it} + \beta_2 Gap_{it}^{Crd} + \beta_3 NPL_{it} + \beta_4 Z_{it} + \beta_5 Cap_{it}^{Reg}$$

$$+ \gamma_1 \left(\frac{TA^5}{TA} \right)_{it} + \gamma_2 BI_{it} + \gamma_3 LI_{it} + \delta_1 Vol_{it}^{SM} + \delta_2 Vol_{it}^{Exc} + \varepsilon_{it} \qquad (1)$$

in the equation numbered (1), i is the country, t is the index. According to model P, ROA or ROE performance measurement, Crisis represents the banking crises in related countries, Gap^{Crd} represents the credit-to-GDP gap, NPL is the ratio of non-performing loans to total loans, Z is the z-test score, Cap^{Reg} is the capital requirement ratio (regulatory capital), (TA^5/TA) represents the total asset concentration of the first five banks, BI represents the Boone indicator, LI represents the Lerner index, Vol^{SM} represents volatility in stock prices and Vol^{Exc} represents foreign exchange volatility. ε_{it} is the zero average and rastsal distribution error term. α is the constant term, φ, β, γ, δ are the coefficient vectors.

The (1) numbered equation is analyzed by Arellano and Bover (1995) and Blundell and Bond (1998) using the two-step GMM system on a dynamic panel data model. Arellano and Bond (1991) is preferred, as it provided a one-step alternative ratio. To find out the error term second-order autocorrelation and instruments validity. The Arellano-Bond Hansen tests are applied (Roodman 2006, 2008, 2009).

3.1 Data

For 26 developed and 20 emerging economies, the period of 1999–2014 is observed. The list of the countries is given in Table A.1. There have been 690 observations and in total there are 8280. Data is gathered from IMF, World Bank, OECD and BIS. Foreign Exchange IMF World Development Indicator as of November 2016, interest rates are taken from OECD Economic Outlook as of December 2016, credit-to-GDP deficit is from BIS Statistical Bulletin as of December 2016. The rest of the data is IMF Financial Soundness Indicators as of November 2016. The definitions related to this data are given in Table 1, and the relation of the variables and correlation coefficients in Table 2.

3.2 Results

The banking performance measurement for the equation numbered (1) is analyzed using two-step dynamic panel data. In the case of both the developed and emerging economies, the profit performance is gauged using NIM, ROA ve ROE. The results are given in Tables 3, 4 and 5.

All the results of these diagnostic test results are presented. Wald test models indicate that the significance levels are high. The results of the Sargan tests prove that the independent variables are selected correctly. The models also indicate the residuals of the second level. For this, the Arellano-Bond test is used. The first difference is taken in the model in (AR(1)) and in the second level (AR(2)) prove that the residuals are significant at both levels. All the results are significant with GMM.

In all models, dependent variable lags are significant and bank performances indicate a persistency toward the past. However, persistency levels are different regarding dependent variables. All the equations are tested on NIM, ROA and ROE where persistency is high. In developed economies, persistency is higher than that of emerging economies. NIM as a dependent variable is half to half; however, ROA and ROE indicate lower difference. In emerging economies, ROA and ROE performances especially indicate a persistency to the past. When the whole model is taken into consideration, the dependent variable between 0.11 and 0.38 indicates persistency.

When the whole model is taken into consideration, Therefore, banking crises have a strong effect on bank performance. The crises have a positive effect on NIM and negative on ROA and ROE. During crises, interest rates are observed to have a rise and a fall in the profits.

After the global crises, systemic bank crises are considered to have a credit-to-GDP gap, which primary and secondary models prove are significant and negative. Only in emerging economies is ROA not significant. The increase in systemic risk affects bank performance negatively. This is an expected result.

The relation between nonperforming loans and bank performance has a similar structure with banking crises. In developed economies, ROE is not significant,

Table 1 Descriptive statistics

	NIM	ROA	ROE	Bank Crisis	Credit-to-GDP gap	Z Score	(TA^5/TA)	Security market volatility	Exchange rate volatility	Regul. capital	Non. Per. loans	Boone index	Lerner index
Mean	3.1036	0.8248	9.8224	0.1345	−0.0664	10.4213	71.0256	23.0158	0.0510	13.9261	4.9182	−0.0821	0.1969
Std.Dev.	2.4641	1.2873	18.8698	0.3414	12.6905	6.8879	28.2925	10.7998	0.1186	4.3692	6.0745	0.1434	0.1487
Variance	6.0719	1.6571	356.0701	0.1166	161.0492	47.4432	800.4629	116.6356	0.0141	19.0899	36.9001	0.0206	0.0221
Skewness	2.3179	−1.8397	−8.3627	2.1424	0.1414	0.9933	−1.3624	1.5235	3.3955	0.2558	2.5258	−2.2425	−2.5069
Kurtosis	11.9012	19.6287	125.8185	5.5898	15.2756	4.6253	4.0711	8.9742	15.9980	9.3314	10.1936	11.5379	32.6757

Table 2 Correlation coefficients matrix

	NIM	ROA	ROE	Bank. Crisis	Credit-to-GDP gap	Z Score	(TA⁵/TA)	Security market volatility	Exchange rate volatility	Regul. capital	Non-Per. loans	Boone index	Lerner index
NIM	1.0000												
ROA	0.3996	1.0000											
ROE	0.1624	0.6696	1.0000										
Bank. Crisis	−0.0731	−0.3602	−0.3468	1.0000									
Credit-to-GDP Gap	−0.0434	−0.1269	−0.0940	0.1850	1.0000								
Z Score	−0.1206	0.0957	0.1161	−0.1319	−0.0111	1.0000							
(TA⁵/TA)	−0.1331	−0.0600	−0.0198	0.0501	0.0510	0.1226	1.0000						
Sec.Mar. Volat.	0.2276	−0.2568	−0.1840	0.2715	0.0859	−0.1510	−0.0880	1.0000					
Exc.Rate Volat.	0.3982	0.2870	0.1173	−0.0974	−0.0385	−0.1596	−0.0408	0.1498	1.0000				
Regul. Capital	0.2053	0.2097	0.0674	−0.0016	−0.0917	−0.1030	0.0232	0.0535	0.4000	1.0000			
Nonperf. Loans	0.1761	−0.3039	−0.3726	0.2310	−0.0466	−0.2660	−0.0717	0.1979	0.0587	0.1199	1.0000		
Boone Index	−0.1075	−0.1568	−0.1228	0.0437	0.0175	−0.0803	−0.0725	0.0074	−0.0986	−0.1027	0.0320	1.0000	
Lerner Index	0.1200	0.2302	0.2614	−0.1348	0.0369	0.0346	0.0592	0.0253	0.0546	0.0149	−0.1406	−0.0343	1.0000

Table 3 System dynamic estimations of bank performance determinants for developed economies

	NIM						ROA						ROE					
	Coef.	Z-Test		Coef.	Z-Test		Coef.	Z-Test		Coef.	Z-Test		Coef.	Z-Test		Coef.	Z-Test	
α	−0.15747	−0.440		−0.5009	−2.030	**	0.36210	1.520		0.24553	1.410		27.1534	2.650	**	16.1540	3.980	***
φ_1	0.5550	5.480	***	0.6224	18.180	***	0.15731	3.220	***	0.23723	9.630	***	0.3160	4.030	***	0.3561	15.070	***
β_1	0.1981	1.270					−0.04316	−0.510					−2.9547	−0.910		−6.3249	−10.030	***
β_2	−0.0063	−3.350	***	−0.0074	−6.100	***	−0.00243	−1.200		−0.00472	−2.730	***	−0.0444	−0.980		−0.0692	−2.980	***
β_3	0.0442	2.790	***				−0.08438	−3.180	***	−0.04341	−4.070	***	1.1504	1.150				
β_4	−0.0139	−1.320		−0.0145	−1.990	**	0.05382	3.090	***	0.06619	5.560	***	0.3591	1.320				
β_5	−0.0363	−3.630	***	−0.0216	−4.420	***	0.00261	0.200					−1.2711	−1.850	*	−0.2617	−2.110	**
γ_1	−0.0008	−0.940					−0.00354	−2.060	**	−0.00331	−2.990	***	−0.0598	−1.890	*	−0.0826	−4.780	***
γ_2	−1.2248	−1.420		−0.7898	−3.470	***	0.62562	0.710					−14.6023	−1.050				
γ_3	1.5649	3.160	***	1.2334	7.580	***	0.14624	−0.490					−6.3277	−0.580				
δ_1	0.0188	3.220	***	0.0252	8.990	***	−0.02593	−5.600	***	−0.03206	−14.490	***	−0.1898	−1.470				
δ_2	0.7997	0.350					6.56683	2.990	***	4.35896	3.190	***	−50.4379	−0.960				

Wald Tests:

	Coef.	Z-Test		Coef.	Z-Test		Coef.	Z-Test		Coef.	Z-Test		Coef.	Z-Test		Coef.	Z-Test	
χ^2	1782.76	[0.000]		2552.68	[0.000]		4025.28	[0.000]		9401.81	[0.000]		2213.88	[0.000]		1088.04	[0.000]	

Arellano-Bond Tests:

	Z-Test			Z-Test			Z-Test			Z-Test			Z-Test			Z-Test		
AR(1)	−2.3043	[0.021]		−2.4776	[0.013]		−2.0246	[0.043]		−2.2931	[0.022]		−1.9715	[0.049]		−2.3521	[0.018]	
AR(2)	−1.0844	[0.278]		−0.8382	[0.402]		−1.3546	[0.176]		−1.2719	[0.203]		−0.9057	[0.365]		−0.9214	[0.356]	

Sargan Tests:

	χ^2																	
χ^2	18.9403	[1.000]		17.1946	[1.000]		12.9905	[1.000]		19.6713	[1.000]		15.4812	[1.000]		20.0033	[1.000]	

(***), (**), (*) show significant z-test scores at levels of 1%, 5% and 10%, respectively

Table 4 System dynamic estimations of bank performance determinants for emerging market economies

	NIM				ROA				ROE			
	Coef.	Z-Test	Coef.	Z-Test	Coef.	Z-Test	Coef.	Z-Test	Coef.	Z-Test	Coef.	Z-Test
α	−1.01021	−0.540	−1.58958	−3.780 ***	−1.39741	−2.440 **	−0.87420	−2.740 ***	−8.54063	−0.380	5.72128	2.820 ***
φ_1	0.24269	3.610 ***	0.25973	9.330 ***	0.07469	0.580	0.15998	1.950 *	0.060465	2.990 ***	0.04032	6.680 ***
β_1	0.46619	0.640	1.14788	4.310 ***	−1.47863	−1.640 *	−0.03219	−2.540 **	9.52653	1.130		
β_2	−0.05229	−3.020 ***	−0.05418	−7.170 ***	−0.01997	−1.520			−0.72806	−2.830 ***	−0.92973	−6.300 ***
β_3	0.00786	0.250			−2.49531	−0.660	−5.28057	−1.900 *	−1.23640	−1.690 *	−0.46450	−3.120 ***
β_4	0.04986	0.680	0.07906	2.080 **	0.05128	1.590			0.74332	2.080 **		
β_5	0.10160	1.010	0.16463	6.850 ***	−0.03138	−2.150 **	−0.04784	−2.490 **	1.00979	0.860		
γ_1	0.01231	0.640	0.00764	1.900 *	0.00314	0.880	0.00335	2.530 **	0.16703	2.050 **		
γ_2	−4.00304	−0.400			2.65943	1.940 *	2.66742	3.110 ***	68.81895	1.280		
γ_3	5.88358	1.350	5.10918	5.480 ***	−0.01766	−2.360 **	−0.02341	−2.620 ***	14.47330	1.010	31.53532	6.430 ***
δ_1	0.00483	0.590			−0.25463	−0.110			−0.01213	−0.070		
δ_2	2.94581	0.680			0.09479	3.010 ***	0.10014	3.970 ***	−8.45424	−0.310		
Wald Tests:												
χ^2	1218.80	[0.000]	1072.72	[0.000]	1678.75	[0.000]	492.76	[0.000]	2413.75	[0.000]	585.33	[0.000]
Arellano-Bond Test:												
		Z-Test		Z-Test		Z-Test		Z-Test		Z-Test		Z-Test
AR(1)	−1.8909	[0.058]	−1.9477	[0.051]	−1.9586	[0.050]	−2.2603	[0.024]	−1.7835	[0.074]	−1.7012	[0.089]
AR(2)	1.0942	[0.273]	1.3932	[0.163]	−0.3794	[0.704]	−0.4801	[0.631]	−0.8926	[0.372]	0.0179	[0.985]
Sargan Tests:												
χ^2	12.6347	[1.000]	15.3180	[1.000]	7.0839	[1.000]	14.4444	[1.000]	6.017402	[1.000]	14.5689	[1.000]

(***), (**), (*) show significant z-test scores at levels of 1%, 5% and 10%, respectively.

Table 5 System dynamic estimations of bank performance determinants for whole sample (Developed and emerging market economies)

	NIM Coef.	NIM Z-Test	ROA Coef.	ROA Z-Test	ROA Coef.	ROA Z-Test	ROE Coef.	ROE Z-Test	ROE Coef.	ROE Z-Test
α	−1.14847	−6.990 ***	−0.51413	−4.410 ***	−0.67053	−6.500 ***	8.57950	3.430 ***	6.25213	4.530 ***
φ_1	0.38635	64.500 ***	0.24652	14.580 ***	0.26062	44.280 ***	0.11605	15.230 ***	0.11408	23.760 ***
β_1	0.15567	2.570 **	−0.27329	−5.440 ***	−0.20000	−3.170 ***	−4.09810	−4.380 ***	−4.60421	−9.110 ***
β_2	−0.00752	−7.020 ***	−0.00791	−4.680 ***	−0.00836	−4.990 ***	−0.15162	−4.360 ***	−0.16517	−5.560 ***
β_3	0.04110	8.770 ***	−0.04006	−10.610 ***	−0.03600	−9.530 ***	−0.16149	−1.580	−0.20180	−4.720 ***
β_4	−0.03090	−12.150 ***	0.04236	6.040 ***	0.05289	12.450 ***	0.37377	3.040 ***	0.37135	5.330 ***
β_5	0.10599	8.670 ***	0.04095	8.090 ***	0.03762	6.870 ***	−0.12170	−1.270		
γ_1	0.00649	9.330 ***	0.00505	4.690 ***	0.00596	8.750 ***	0.02037	1.680 *		
γ_2	−1.49043	−6.190 ***	−1.78354	−6.050 ***	−1.92759	−6.200 ***	−21.95234	−2.510 **	−18.16552	−4.430 ***
γ_3	2.83631	11.930 ***	1.06397	3.760 ***	1.18934	6.340 ***	15.97915	5.050 ***	18.38654	7.260 ***
δ_1	0.02310	17.270 ***	−0.02170	−18.190 ***	−0.02138	−19.700 ***	−0.23749	−8.910 ***	−0.21566	−10.160 ***
δ_2	2.36468	6.690 ***	0.70540	2.260 **	0.77207	1.940 **	3.24756	0.370 *		
Wald Tests:		Z-Test		Z-Test		Z-Test		Z-Test		Z-Test
χ^2	31857.67	[0.000]	4726.28	[0.000]	14467.91	[0.000]	8659.34	[0.000]	11082.01	[0.000]
Arellano-Bond Tests:		Z-Test		Z-Test		Z-Test		Z-Test		Z-Test
AR(1)	−1.996	[0.046]	−3.0768	[0.002]	−3.1138	[0.002]	−2.6592	[0.008]	−2.6052	[0.009]
AR(2)	1.0723	[0.284]	−1.2543	[0.209]	−1.2266	[0.220]	−1.1981	[0.231]	−1.1352	[0.256]
Sargan Test:		Z-Test		Z-Test		Z-Test		Z-Test		Z-Test
χ^2	39.9414	[1.000]	37.8763	[1.000]	39.4409	[1.000]	38.9488	[1.000]	37.0541	[1.000]

(***), (**), (*) show significant z-test scores at levels of 1%, 5% and 10%, respectively.

while in emerging economies NIM is not significant. When there is an increase in interest rates, nonperforming credits indicate an increase. In the same way, the increase in nonperforming loans causes a decline in profitability.

The z-test score reflects bank risk-taking and differs from one model to another. When the risk is taken in order to increase profit and the excess risk taken makes it to come up with a conclusion that there is decline in the profit. In all the models, z score has a negative relation with NIM and a positive relation with ROA and ROE. ROE is observed as insignificant and same in emerging economies as well. In emerging economies NIM has a positive relation.

Capital and bank performance, it is observed to be biased results. In developed countries, as expected, NIM and ROE have negative relation in capital, and in emerging economies, NIM and ROE have negative reactions.

Looking at the Boone indicator and Lerner index provides interesting results. When all models are taken into consideration, the Boone indicator is negative, concentration ratio and Lerner index is positive and significant coefficients. Generally, competition structure influences performance and the concentration performance is affected positively.

The volatilities in asset prices and performance relation are used to analyze stock market volatility and foreign exchange volatility where found as significant. When negative coefficient values are taken, the rise in asset price volatility has a negative effect on bank performance.

4 Conclusion

There is a wide variety of literature analyzing bank performance using bank-based, market-based and macroeconomic variables. In general, the effect of bank performance on financial stability and banking system stability. However, after crises in developed economies many banks failed. In this study, the banking systems of 46 developed and emerging economies are investigated and the stability of the banking performance is analyzed. The analysis is done by using systemic dynamic panel data model.

The results analyze the banking crises and the stability of the system regarding bank performance variables. During crises, interest rates increase and NIM is affected positively, whereas the effect on ROA and ROE is negative. In the beginning, there has been a logical explanation in such relations. Credit-to-GDP gap, nonperforming loans, z-test scores and capital are the variables that influence bank performance. In developed and emerging economies, there are structural differences, and from one model to another it is natural to observe different results. After the global crises, credit-to-GDP gap after the systemic bank crises affect the bank performance negatively.

Under both competitive conditions and asset pricing volatility, bank performance is influenced negatively. The competitive structure of the banking system ensures that system stability has an important effect. Consequently, independent variables affect stability performance. The asset price performance effect is the inevitable result. For this reason, it is important to take this into consideration for further studies.

Appendix

Table A.1 Countries in sample

Panel A–Developed countries		Panel B–Emerging countries	
Australia	Italy	Argentina	Romania
Austria	Japan	Brazil	Russian Federation
Belgium	Korea, Rep.	Bulgaria	South Africa
Canada	Netherlands	Chile	Thailand
Denmark	New Zealand	China	Turkey
Estonia	Norway	Czech Republic	Ukraine
Finland	Portugal	Greece	Venezuela, RB
France	Slovak Republic	Hungary	
Germany	Spain	India	
Hong Kong SAR, China	Sweden	Indonesia	
Iceland	Switzerland	Malaysia	
Ireland	United Kingdom	Mexico	
Israel	United States	Poland	

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The Dynamic Effect of Financial Crises and Economic Volatilities on the Insurance Sector

Necla Tunay, Nesrin Özataç, and K. Batu Tunay

Abstract   In this study, the effect of the international financial crises and the volume of the economic performance of the market share of the insurance sector and the premiums accumulated through life and non-life insurance sector are analysed. A dynamic panel data analysis is used to examine 30 developed and emerging economies for the years between 1995 and 2014. The results indicate that the crises and volatilities in economic conditions influence insurance sector negatively.

Keywords   Insurance • Crises • Dynamic Panel Data

1   Introduction

In the period during and after the European Debt crises, insurance companies were faced with serious problems. The crises caused extreme volatilities causing insurance companies irreversible financial losses. Not only banks but also insurance companies, and most of all reinsurance companies based in Europe, faced high risk in the area of financial instabilities.

According to International Monetary Fund (IMF) data, insurance companies have an asset size of $20 trillion, while one-third of wholesale investors have investment portfolios. When companies have huge assets and investments within the sector, it is important to analyze when there is volatility in international economic

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activities and financial crises. The main aim of this study is to analyze the effect of financial crises on the insurance sector for the last 20 years. Crises cause recessions. Even when there are no crises, there is a possibility for ups and downs in the economy. Therefore, it is important to analyze the insurance sector not only during the period of crisis but also during times of economic turmoil.

The reason for the data being limited to 20 years is to be able to observe the current economic structure. If previous years are taken into consideration, then the change in the regime could have an effect on the observations. Therefore, the period could see risks that cause the dynamics to be masked. Due to lack of data, only 30 developed and emerging economies are considered. In the study, the effect of premium generation during the crises on the market share of the insurance companies' life and non-life premiums is analyzed. Two-step system dynamic panel data models are preferred. The paper has two main parts: the first part describes post global crisis periods and the second part presents analysis.

2   Literature Review

A huge number of US insurance companies were influenced by the global financial crises. Regarding this, there has been an increase in the number of studies done on the effect of global crises on the insurance sector. Acharya et al. (2009), Chen et al. (2010), Eling and Schmeiser (2010), Eling and Toplek (2009), and Harrington (2009) investigated sector discipline and regulations. Acharya et al. (2009), Acharya and Richardson (2014), Baluch et al. (2011), Bernoth and Pick (2011), Cummins and Weiss (2010), and Wagner (2010) pointed out the importance of systemic risk in the insurance sector. Cummins and Weiss (2010) and Milidonis and Stathopoulos (2011) investigated the convergence between the insurance sector and capital markets. Meanwhile, Chakraborty (2010) and Chen and Wong (2004) analyzed the effect of the differences of development.

Global financial crises threaten the insurance sector in regards to its payment power. The insurance sector, US mortgage market, and related asset markets found themselves in the middle of the crises. In general, although insurance companies with high risk assets have been influenced by investment portfolios, many companies in the US mortgage market provided security to the commercial banks and transferred the risk to themselves. Technically, investment portfolios not only depend on market risk but also are exposed to credit risk due to the securities they provided, although insurance companies' financial structure ended up being weak to absorb the pure risk. Both in global crises and in European debt crises, insurance companies began to be faced with serious problems. Impavido and Tower (2009), Klein et al. (2009), Kocovic et al. (2011), Liedtke and Schanz (2010), and Schich (2009, 2010) investigated some insurance companies during these crises.

Some of the studies pointed out that insurance companies smoothed the effects of the crises (for example, Schich 2009, 2010), but the researchers all agreed that insurance companies had serious problems during the crises. For this

reason, in order to stabilize the insurance system, precautions were taken against the contagious risks (Kocovic et al. 2011). During the crises, insurance funds in regard to cyclical funding, countercyclical funding, and solvency rules needed to be applied. Moreover, market based valuation rules were also offered. Extreme volatility threatens both insurance companies and also retirement funds (Impavido and Tower 2009; Kocovic et al. 2011). Regulation and supervision should be improved to control insurance and retirement funds (Impavido and Tower, 2009). Such rules and mechanisms are needed to protect investment portfolios against market risk and to prevent insurance companies from providing security that creates credit risk.

Global crises and debt crises in Europe affected insurance companies widely. However, there is a paucity of studies done in that area. Needleman et al. (2012) provided a major study, as did Bijlsma and Vermeulen (2015) and Malafronte et al. (2014), which offer examples for empirical studies.

Bijlsma and Vermeulen (2015) analyzed 63 insurance companies in the Netherlands between 2006 and 2013 using three-month data. A company's behavior and change in portfolio values were investigated. The flight to quality effect was also investigated during the global crises and also after the Europe Debt crises. The results indicate that during the European Debt crises, insurance companies preferred less risky assets. However, there is no indication that such firms had a "flight home effect."

Malafronte et al. (2014), for the period between 2005 and 2010, formed an index in regard to the readability of the yearly reports of insurance companies in Europe and analyzed the risk level of the companies. They reported the financial influence of company specifications and risk disclosure. The results indicate that reports that are open to the public have low readability, however, after the crises, firms started to improve their readability, but there is still no correlation between the number of reports and the quality. Moreover, insurance companies' profitability, reserves, risk level, and the country where the main branch of the company is located are all effective in determining the risk level of the company.

3 Econometric Analysis

3.1 The Structure of the Model and the Method of Analysis

The aim of this study is to discover the change in economic volume after the effects of financial crises. For this reason, despite financial crises, budget deficits and unemployment rates are also taken as variables. Since the economic volume changes, the general price level has a chance to greatly influence the demand for insurance products. This inflationary trend is also considered in the analysis. In many countries, insurance is a function of price level and savings. Increases in both GDP and savings are expected to increase insurance products. The related variables during crises and stagflation are

observed to have a direct and indirect effect on insurance demand. For this reason, GDP and gross savings are used as variables. The model is given as:

$$Ins_{it} = \alpha + \sum_{k=1}^{p} \varphi_k Ins_{it-k} + \beta_1 Crisis_{it} + \beta_2 OGap_{it} + \beta_3 Unem_{it} + \beta_4 Inf_{it}$$
$$+ \beta_5 Sav_{it} + \beta_6 Inc_{it}^{PC} + \varepsilon_{it} \tag{1}$$

In Eq. (1), the market share, life and non-life insurance premiums are the dependent variables vectors. The effect of the international crises is a dummy variable. The years for the crises are indicated as zero. The gap of the reel GDP for a long period of time is diverged. Unem is the unemployment rate. Inf is the inflation rate. Sav is the gross saving logarithm. Inc^{PC} is the income per person. ε_{it} is the zero averaged and irrational distribution averaged zero, and also is the random distribution error term. α is the constant term, where φ, β are coefficient vectors.

Equation (1) is estimated by the GMM estimator based on two-step dynamic panel data models developed by Arellano and Bover (1995) and Blundell and Bond (1998). Not to have biased results, it should be proved that the error terms are second-order autocorrelation and have instruments validity. In order to test the validity of the independent variables, the Hansen test will be applied (Roodman, 2006, 2008, 2009).

3.2 Data Set

In the study, the data set is formed from 30 developed and emerging economies for the period between 1995 and 2014. The countries are listed in Table A.1. There are 600 observations for a total observation number of 5400. The insurance data is taken from the OECD Insurance Activity Indicators. The gap, unemployment rate, gross savings, and GDP per capita income are taken from IMF World Economic Outlook Database. The area that reflects international financial crises is the dummy variable and is taken from Anderson (2013). In regard to this, the Tequila Crisis in 1994, Asia Crisis in 1997, Russia Crisis in 1998, Dotcom Bubble in 2000, and global financial crises between 2007 and 2008 are taken as zero; and the descriptive statistics of the variables are given in Table 1 and correlation coefficients in Table 2.

3.3 Results

Market share, life and non-life premiums, and two-step systemic dynamic panel data models were used, and the results are given in Table 3. In eq. (1), all the variables are tested and the ones that have no significant coefficients

Table 1 Descriptive statistics

	Market share	Life premiums	Non-life premiums	Crisis	OGap	Unem	Inf	Sav	Inc^{PC}
Mean	3.32675	1.98003	3.35830	0.25000	−0.00015	7.45919	3.96211	23.09818	4.91033
Std. Dev.	8.44698	0.69795	2.49168	0.43337	0.01074	4.06592	8.74117	6.16748	0.86492
Variance	71.35145	0.48713	6.20849	0.18781	0.00012	16.53171	76.40799	38.03776	0.74809
Skewness	4.36227	−0.01202	0.93722	1.15470	0.25772	1.75303	7.04990	0.27329	0.95356
Kurtosis	22.18857	4.48358	4.11124	2.33333	5.25807	7.33776	59.46375	3.50318	3.91071

Table 2 Correlation coefficients

	Market share	Life premiums	Non-life premiums	Crisis	OGap	Unem	Inf	Sav	Inc^{PC}
Market share	1.0000								
Life premiums	0.3547	1.0000							
Non-life premiums	0.2096	0.5059	1.0000						
Crisis	0.0002	−0.0362	0.0154	1.0000					
OGap	0.0025	0.0356	0.0356	0.3802	1.0000				
Unem	−0.0963	−0.2383	−0.2136	−0.1096	−0.3339	1.0000			
Inf	−0.0891	−0.3054	−0.2730	0.0705	0.0265	0.0055	1.0000		
Sav	−0.1335	0.2048	0.2157	0.0653	0.0665	−0.3938	−0.1274	1.0000	
Inc^{PC}	0.0009	0.2265	0.1730	−0.0067	0.0183	−0.4231	−0.2306	0.3659	1.0000

Table 3 System dynamic panel data estimations

	Market share (MS)			Life premium (LP)						Non-life premium (NLP)					
	Coef.	z Test		Coef.	z Test		Coef.	z Test		Coef.	z Test		Coef.	z Test	
Constant	3.61453	37.670	***	−0.17445	−0.100		0.21307	2.920	***	0.30515	0.470		0.46631	10.300	***
MS(−1)	0.97459	2430.150	***												
LP(−1)				0.82661	36.670	***	0.78994	61.510	***						
NLP(−1)										0.86719	43.430	***	0.94001	60.130	***
Crisis	−0.01227	−11.660	***	0.12463	7.730	***	0.16053	18.670	***	−0.03912	−5.100	***	−0.05389	−9.580	***
OGap	−3.87001	−10.380	***	−9.00422	−3.630	***	−4.77441	−3.850	***	−4.34130	−6.300	***	−4.52458	−9.780	***
Unem	−0.04384	−14.980	***	−0.03828	−5.210	***	−0.01545	−2.640	***	−0.02761	−7.410	***	−0.02942	−9.660	***
Inf	−0.00429	−7.590	***	−0.00952	−2.050	**				−0.00144	−0.420				
Sav	0.00976	16.240	***	0.04252	11.190	***	0.02630	14.880	***	−0.00813	−4.570	***	−0.00547	−3.360	***
Inc^PC	−0.69531	−56.750	***	0.01096	0.030					0.06974	0.530				
χ^2	97100.01			41849.34			8913.24			13741.59			31707.69		
	[0.000]			[0.000]			[0.000]			[0.000]			[0.000]		
Arellano-Bond Test:															
	z Test			z Test			z Test			z Test			z Test		
AR(1)	−1.7979	[0.0722]		−2.8735	[0.0041]		−2.7156	[0.0066]		−2.1365	[0.0326]		−2.1703	[0.0300]	
AR(2)	−1.4708	[0.1413]		−1.4488	[0.1474]		−1.551	[0.1209]		−1.2855	[0.1986]		−1.3019	[0.1929]	
Sargan Test:															
χ^2	26.3383			24.7275			28.7879			22.8296			24.2183		
	[1.000]			[1.000]			[1.000]			[1.000]			[1.000]		

(***), (**), (*) show significant z tests at levels of 1%, 5% and 10%, respectively

are eliminated. In market share where it is the dependent market share, all the variables are found to be significant. Moreover, life and non-life insurance premiums are taken as dependent variables, and inflation rate and GDP per capita are left, as they do not have any significant results.

All the results are valid in the diagnostic tests. According to the Wald test, the general significance is high. The results of the Sargan test show that all the models prove that all the independent variables are selected correctly. Residuals in the second order autocorrelation are tested by the Arellano-Bond test. Residuals in the second order have no correlation, thus the GMM estimator is proved to be effective. Residuals are not dependent at the second level, so the GMM estimator is found to be effective.

In the dynamic models, only the first level lag of the dependent variable is used due to the limited number of variables. When the results are analyzed, all the models are significant.

International financial crises are reflected by the dummy variables and are found as significant. It can be seen that market share and non-life insurance premiums are influenced negatively. However, life insurance premiums are observed to be influenced negatively. This is an unexpected result. It can be concluded as that there is no limitation for life insurance.

The economic volume change is that all the dependent variables are affected negatively. In the example of global crises, after the economic crises there has been a stagflation period. In such periods, there is a fall in insurance premium production. Consequently, there is a decline in the market share of the insurance companies.

The decline in the unemployment rate is another indicator, and the GDP is also considered as an important variable. Following a financial crisis, there is an increase in the unemployment rate and a limitation in household expenditures. For this reason, both results are expected. In developed countries, the decline in the market share of insurance after a crisis is not an expected result. However, in emerging countries, households are more sensitive towards crisis. The savings are positive and significant in all the analyses. So it is natural to have a positive and significant relation to savings market share and premium production. However, GDP is significant only in the model where market share is used as a dependent variable.

Inflation ratio is also significant in the model where market share is a dependent variable. Likewise, inflation effect on insurance is significant when the market share is a dependent variable. The effect of inflation on market share is negative, and the effect of high inflation on market share is also negative.

Consequently, when the results are evaluated, it can be seen that financial crises have a negative effect on premium production and market share. The budget deficit and the unemployment rate are influenced by crises causing negativity on economic activities. It can be said that financial crises have a direct and indirect effect on the insurance sector.

4   Conclusion

In this study, the effect of international financial crises and the role of the volume of economic activities on the insurance sector were investigated. In regard to this, the market share of the insurance companies and the premium production of life and non-life insurance companies' volume were analyzed using three different dynamic models. The data set was collected on developed and emerging countries. For the analysis, dynamic data models were used.

The results indicate that insurance activities are affected negatively during the crises. However, life insurance premium generation had a positive influence. The reason is not identified, thus in developed economies, life insurance products did not fall even during the crisis period. Non-life premiums and market share, as expected, had fallen during the crisis period. Budget deficit and unemployment rate had a strong negative relationship. Inflation, savings, and GDP per capita income are considered as the items that affect insurance products.

Annex

Table A.1 Countries in sample

Australia	Korea
Austria	Luxembourg
Belgium	Mexico
Canada	Netherlands
Czech Republic	New Zealand
Denmark	Norway
Finland	Poland
France	Portugal
Germany	Slovak Republic
Greece	Spain
Hungary	Sweden
Iceland	Switzerland
Ireland	Turkey
Italy	United Kingdom
Japan	United States

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Multi-objective ATM Location Problem in a Metropolitan City

Mahmoud Golabi, Arman Nedjati, and Gökhan Izbirak

Abstract Location problems are considered as an important branch of the strategic decision-making process. It is incontrovertible that finding the optimal locations of Automatic Teller Machines (ATMs) plays a salient role in retaining and enhancing the market share of the banks. In this study, a multi-objective linear mathematical model is developed to minimize the ATMs' establishment costs, the surcharge costs, the interchange costs, and the number of lost customers simultaneously. In order to demonstrate the applicability of the proposed model, a case study of Tehran metropolis is presented. The General Algebraic Modeling System (GAMS), which is an optimization compiler, is used to solve the problem. The result indicates the establishment location of the new ATM machines by considering the current outsiders' ATMs.

Keywords ATM location • Multi-objective • Surcharge cost • Interchange cost

1 Introduction

Due to the steady growth of urban population and the increasing demand for banking services, choosing the location and determining the required number of Automatic Teller Machines (ATMs) are incumbent decisions in the expansion of banking industry. The facility location problems (FLPs) are considered as rampant methods applied for this purpose.

FLP could be considered as a matter of paramount importance in making fundamental decisions for public and private sector companies. FLP is a well-known branch of operations research which aims to find the best locations for establishing the facilities. A myriad number of researchers have studied FLP by proposing mathematical models with single or multiple objective functions for different purposes (Arabani and Farahani 2012). As one of the pioneers in developing FLP models,

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(Hakimi 1964) introduced the median model in order to find the best locations for deploying p number of facilities. The objective function of the proposed model was to minimize the aggregate weighted distance between demands and established facilities. By considering three different layers of banking service providers, consisting of ATMs, branch bank offices, and main banks, (Min and Melachrinoudis 2001) proposed a hierarchical location-allocation model for deploying the bank facilities. (Miliotis, Dimopoulou, and Giannikos 2002) combined location models with the Geographical Information System (GIS) in order to define the optimal location of bank branches. (Aldajani and Alfares 2009) developed a mathematical model to determine the optimum number and location of ATMs. The objective function of their model was to minimize the total number of ATMs used for covering all demands within a given geographical area. Since location problems are known to be NP-hard (Kariv and Hakimi 1979), they proposed a metaheuristic algorithm to solve the problem. (Karaganis and Mimis 2011) applied Voronoi diagram, GIS, and a directed taboo search algorithm in order to determine the optimum location of ATMs and bank branches in a network. The objective function of their model was to minimize the users' average traveling distance. (Li Xia et al. 2010) developed an enhanced maximal covering location problem to find the best location of bank branches. As the solution method, they developed a hybrid nested partitions algorithm. By partitioning the feasible region, this algorithm focuses on subregions wherein the majority of good solutions are clustered together.

Since the rival banks abound in the majority of high populated cities, most of the demand points are replete with ATMs. It is incontrovertible that selecting any location for establishing the ATMs will change the proximity of the customers of a bank to its ATMs. On the premise that customers prefer closer ATMs, the location of ATMs will change the customers' preference and the pertinent costs. The costs of Automated teller machine (ATM) are a point of controversy within customers and bankers (Byers, Yin, and Zheng 2012). The fee that the banks charge for non-customer ATM users is called "surcharge" fee. The ATM owner or merchant's bank also asks for an "interchange" fee from the consumer's bank (Rysman and Wright 2014). There were lots of discussions about ATM fees between customers' advocates and bankers, nevertheless, according to (Cetera 2016), the ATM surcharges rose to $4.57 in the US. It motivates us to develop a mathematical model that minimizes the surcharge fee of the customers in addition to minimizing the ATM establishment and interchange costs of the bankers.

In this study, the multi-objective ATM location problem (MALP) is developed to help the bankers to locate the minimum number of ATM machines in a way that imposes the minimum cost to the customers and the bank. Four objectives of MALP are minimizing the total ATM establishment cost, our customers' surcharge costs, the interchange costs of the bank, and the total number of lost customers. The model mainly finds the location and the number of ATM machines at the nodes. The customers must be covered within a predefined distance either by our ATM or the other banks' (contracting party) ATM machines. Figure 1 depicts a feasible solution of the problem. While there are nine existing ATMs the six ATM machines of our bank are located at the nodes.
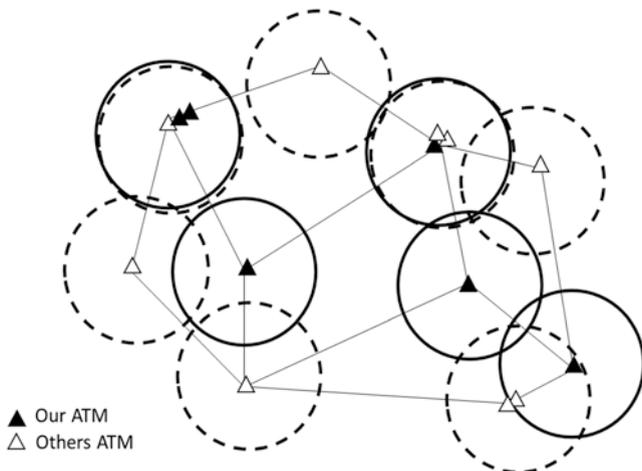
Fig. 1 A feasible solution of MALP problem

2 Model Description

Let $G(N, A)$ be an undirected graph that N is a set of nodes where $N_D \in N$ is a set of candidate ATM locations. L_{ij} is a parameter for all i , $j \in N$ that equals to 1 if the minimum distance of node i to node j is less than or equal to a predefined distance. The service capacity of each ATM in a specified period of time is P and the maximum number of ATM machines can be located is equal to K and the current number of other banks' ATMs at node $i \in S$ is F_i . The cost of establishing an ATM machine, surcharge cost, and interchange cost are represented by C_1, C_2 and C_3 respectively. d_i that is the total demand at node i in a specified period of time is estimated by Poisson distribution based on the available records. M is a big positive value. The decision variables of the model are as follows:

v_i: The number of lost customers at node $i \in N$.
x_j:The number of ATMs must be open at node $j \in N_D$.
e_{ij}: The number of customers at node $i \in N$ allocated to our ATM in node $j \in N_D$.
f_{ij}: The number of customers at node $i \in N$ allocated to other banks' ATMs in node $j \in N_D$.

2.1 *Mathematical Formulation*

The multi objective linear programming model of MALP is formulated as follows:

$$\min \quad \sum_{j \in N_D} C_1 x_j \tag{1}$$

$$\sum_{i \in N} \sum_{j \in N} C_2 f_{ij} \tag{2}$$

$$\sum_{i \in N} \sum_{j \in N} C_3 f_{ij} \tag{3}$$

$$\sum_{i \in N} v_i \tag{4}$$

Subject to:

$$\sum_{j \in N_D} x_j \leq K \tag{5}$$

$$\sum_{i \in N} e_{ij} \leq P.x_j \quad \forall j \in N_D \tag{6}$$

$$\sum_{i \in N} f_{ij} \leq P.F_j \quad \forall j \in N \tag{7}$$

$$e_{ij} + f_{ij} \leq M.L_{ij} \quad \forall i \in N, j \in N \tag{8}$$

$$d_i - \sum_{j \in N} \left(f_{ij} + e_{ij} \right) = v_i \quad \forall i \in N \tag{9}$$

$$x_i \leq h \, \forall i \in N_D \tag{10}$$

$$e_{ij}, f_{ij}, x_i \geq 0 \, and \, integer \quad \forall i \in N, j \in N \tag{11}$$

The first objective function minimizes the establishment cost of the ATMs, objective function (2) minimizes the surcharge costs, objective (3) minimizes the interchange cost, and objective function (4) minimizes the total number of lost customers. Constraint (5) indicates that the total number of ATMs must not exceed the constant K. Constraint (6) and (7) ensure that the ATM's capacity restriction is not violated. Constraint (8) guarantees that the covered customers exist within a predefined distance by ATMs. Constraint (9) defines the number of lost customers at node i and constraint (10) limits the number of ATMs to h at each node. Finally, constraints (11) are known as integrality constraints.

3 Weighted Sum Method for Multi-objective Optimization

The weighted sum or scalarization approach is one of the famous methods used to solve the multi-objective optimization problems. This method combines the multiple objectives into one single-objective scalar function (Branke et al. 2008). In this

approach, the single-objective function minimizes the weighted sum of developed objective functions. It should be mentioned that it is up to the decision-maker to choose appropriate weights, noting that weighting coefficients do not necessarily correspond directly to the relative importance of the objective functions (Caramia and Dell'Olmo 2008).

4 Case of Tehran

As the capital of Iran in an area of 686.3 km^2, Tehran has an estimated population of 9 million inhabitants in 2016 (Statistical Center of Iran 2014). There are 29 active banks with more than 3560 bank branches in Tehran (Bartarinha news portal 2014). The number of deployed ATMs of Tehran is estimated to be more than 10,500 machines (Samt newspaper 2015). In order to implement the discussed problem to the case of Tehran, according to the map of Tehran, 287 network nodes representing the demand points of the city have been considered. By using the ArcGIS software, 918 network edges representing the main streets connecting the demand points have been extracted. Since the demand generation follows a Poisson distribution, the demand occurrence rate of each network node is assumed to be proportional to the population of its corresponding location, the proximity to the business centers, and the related average wealth level of the inhabitants. The number of existed ATMs at each network node is elicited from the comprehensive information system of Iran's banking network location (Gisbanks 2014). Figure 2 shows the network nodes
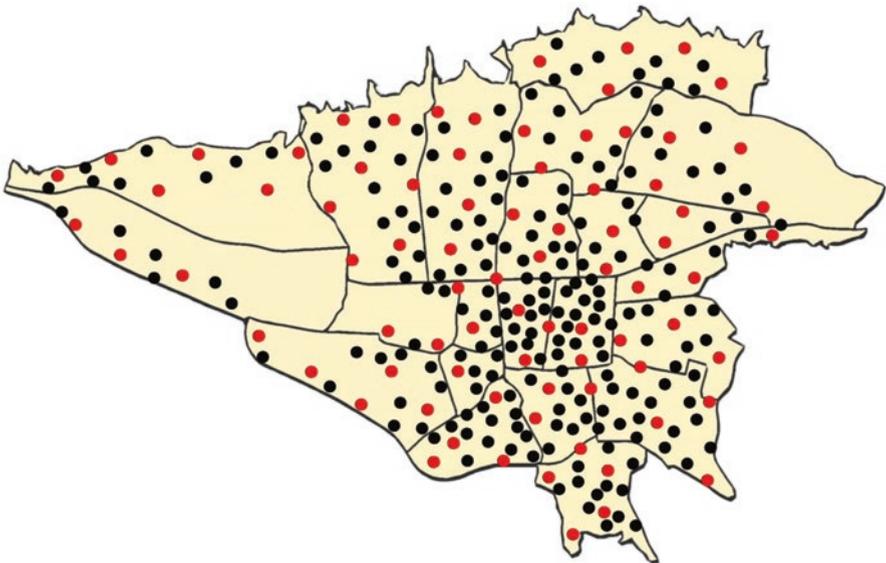

Fig. 2 Nodes representing the demand points of Tehran

considered for the case of Tehran in black color. The candidate locations for establishing the ATMs have been shown in red color nodes. It is assumed that totally 150 ATMs should be distributed to 80 candidate locations.

5 Results

The proposed mathematical model for locating ATMs at candidate locations of Tehran metropolitan is solved by using general algebraic modeling system (GAMS) and run on a laptop having the configuration of Intel Core i7-2620 M CPU 2.70GHz, with 8.00 GB RAM, and windows 10 operating system. GAMS could be considered as an eminent optimization compiler to solve both linear and non-linear mathematical models. The results obtained from GAMS indicate that among 80 candidate locations, totally 38 locations should be selected for establishing the ATMs. Also, the required number of ATMs at each selected location is determined. Figure 3 depicts the selected locations and the predefined covered area pertinent to them by large green circles. The covered area is defined based on the maximum walking distance to reach the ATMs. In this study, a maximum walking distance of 2.5 km is considered for the case of Tehran. As it is shown, since the density of population is high in the central parts of Tehran, the optimal locations for establishing the ATMs are selected from these areas. The customers that are not located within the walking distance of our ATM machines are either allocated to other's ATMs or lost.
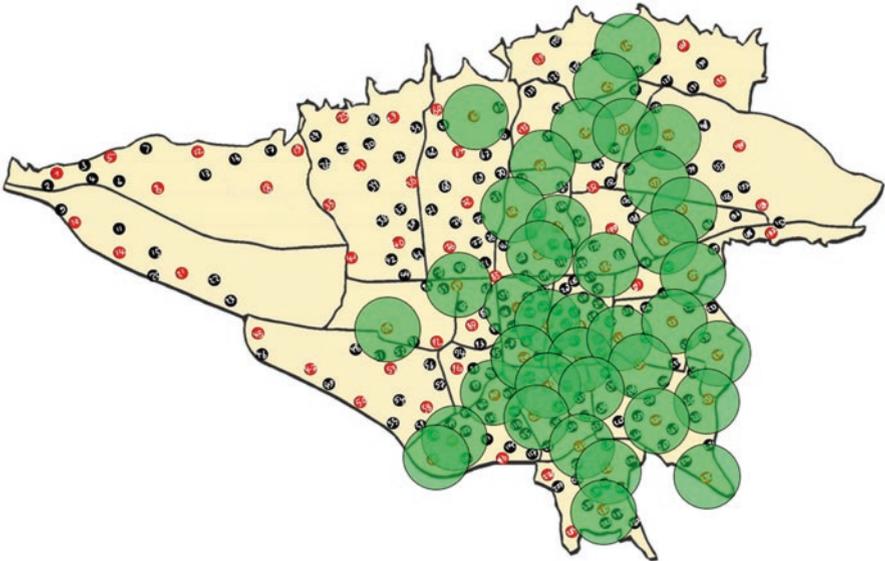

Fig. 3 Optimal ATM locations based on 80 numbers of potential locations

6 Conclusion

Facility location problem is one of the most important branches of optimization and operations research. Finding the optimal locations of Automatic Teller Machines (ATMs) plays a salient role in retaining and enhancing the market share of the banks. Thus in this paper, a facility location problem to find the optimal locations for establishing a pre-defined number of ATMs in Tehran metropolitan is considered. The proposed mathematical model consists of four objective functions. The first objective function minimizes the establishment cost of the ATMs. The second objective function aims to minimize the surcharge costs. Minimizing the interchange costs is the aim of third objective function. Finally, the fourth objective minimizes the total number of lost customers. By restricting the maximum walking distance to reach the ATMs and the number of assigned ATMs to each selected location, the proposed mathematical model is solved by GAMS optimization compiler. The results indicate that the center of the city which has a high density of population must be covered by our own ATM machines prior to eastern part of the proposed metropolitan city.

For future studies one can consider the traveling distance minimization of the customers rather than cost minimization objective functions. In addition, the problem can be extended by considering queuing system for ATM machines in order to minimize the waiting time of customers.

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Frontline Employees at the Ghanaian Local Banks and the Stress of Long Hours of Work

Selira Kotoua, Mustafa Ilkan, and Hasan Kilic

Abstract A research model was designed to evaluate the ideal working time for front frontline employees at the Ghanaian local banks to reduce emotional exhaustion among the employees. Twenty local banks were involved in the research. Customer service and job involvement including organizational commitment and job satisfaction were the variables. Banks have traditionally paid much attention to customer behavior because it has several effects on revenue generation from customers. The present competition among banks has generated a new climate of approach to manage local banks through customer relationships that include job commitment, Job contribution, job satisfaction and turnover intentions among employees. It is resulted that majority of Local banks employees in Accra work long hours and get less paid. The results therefore show how most employees are emotionally exhausted and have turnover intentions, but difficult to find new jobs to replace the present stressful employment.

Keywords Ghana • Emotions • Jobs • Satisfaction • Exhaustion • Banks

1 Introduction

The purpose of this research is to use a research model to investigate the local banks in Accra and the frontline employees. The local banking sector in Accra is an intensive working organization with their frontline employees' working extra hours to accumulate benefits for the banks. Customers play an important role in the factors that affect the banks sustainability (Nasri and Charfeddine 2012). The local banks depend on customers for benefits and functioning. Based on these reasons, the

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growth of the Banks relies on the efficiency and the effective work of the employees to function and maximize profits. Long hours of hard work will enable the sector to remain feasible in the rapid changing competition among other Ghanaian banks (Berger et al. 2015). Several Banks in Ghana have noted that hard work pays and it creates good relationships between employees and customers. Banking institutions, therefore make their employees work long hours without providing rewards to compensate the time spent in the workplace (Rai et al. 2012; Adkins and Premeaux 2012; Hamermesh and Stancanelli 2015). Most of the local banks focused on managing cost and maintaining quality of service thereby encouraging more employees' performance as a strategy to gain the competition and competitive advantage over other banks (Berger et al. 2016a, b; Al-Alak 2014). Several academic scholars have examined workplace problems in the banking sector around the globe and drawn the conclusion that rewards are likely to influence employees' behavior to perform well in their jobs. One of the most important problems discovered was the unspoken accepting of the turnover intentions among employees and the deep implications or cost the behavior of turnover intention will impact in the banking organizations in Accra if nothing is done to avoid the abuse (Gelard and Karimi 2016). This study, therefore intends to investigate how to use job satisfaction as a mediator to reduce turn over intention in the Ghanaian local banks in Accra. The studies of Wallace et al. (2013) reveal that when frontline employees in the local banks are embedded in their responsibilities, it makes them committed to their jobs. The research further indicates that when an employee is thoroughly involved in his job he is committed to the institution in which he works. When employees put all their effort to obtain the goals of the organization they work for, they are not likely to think about intending to quit (Kashif et al. 2016). The studies of Allen and Meyer (1993) indicate that there are three methods by which employees can be committed to the banking sector. He name the three methods as (a) the psychological state of the employee relations with the local bank (b) the implication with the decision to want to continue to work for the bank (c) implication with the decision not to work for the local bank any more. The research further explained that each of the above mentioned constituents is influenced by distinct experiences that have different implications that impacts employee relationship with the local bank. However the studies of Dhar (2015) reveal that affectivity is a commitment by which frontline employees recognize as a specific banking organization tool that can influence employees to conserve the membership and remain in the local bank as a perceived economic value.

2 Literature Review

The majority of researchers and academic scholars attempted to answer the questions of what makes employees want to quit their jobs by examining the antecedents of employees' intending to turnover (Trivellas et al. 2013; Muralidharan et al. 2013). Till present time researchers are still investigating this problem of intention to quit

(Benjamin 2012; Purk and Lindsay 2006). Some findings demonstrate that lack of consistency has always been the main reasons (Kundu and Gahlawat 2015). There are several reasons why employees quit one job and join another (Coetzee and Stoltz 2015). The experience of emotional exhaustion and stress in a job is one factor (Ching et al. 2016; Oktug 2017). Job dissatisfaction is the major influence on employees to turnover their jobs (Weng & McElroy 2012). The research of Zopiatis et al. (2014) suggests that workers turnover jobs because of economic factors. An economic model was utilized to indicate that employees quit their jobs due to low salaries and benefits (Krug 2008; Acikgoz et al. 2016). In a similar manner role ambiguity can lead to turn over intention (Zhang et al. 2017). Role ambiguity is a situation where the employees do not know how to do their jobs or the distinction between what management expects of the employees and what the employees feel should be done (Lenka 2016; Bashir and Ramay 2010). Issues of this nature, cause uncertainty about what should be the role of the employees and what should be the role of the employers. This can result to disagreement of what is expected and what is not (Widmer 1993).

The constructs of job involvement were introduced by Korschun et al. (2014). Various empirical relevant literatures related to employees and different work environments have been studied. Based on organizational perspective, job involvement is being observed as a motivational factor for employees (Diefendorff and Chandler 2011; Leischnig and Kasper-Brauer 2015). It is also considered as a rudimentary basis for initiating competitive advantage among business marketing institutions (Vorhies and Morgan 2005; Cornaggia et al. 2015; Saeidi et al. 2015). Job involvement has also been noted as a focal point for individual employees' development, growth, and satisfaction in workplace goal oriented behavior (Belias et al. 2015; Çetin et al. 2012). Job involvement plays an important role in job enhancement in the organizational effectiveness and engages employees in production behavior (Aiello and Bonanno 2017). It is has been generally psychologically agreed that the features of job involvement and supervisor behavior characterized organizational delineation and employees' effectiveness in work results for individual people (Aiello and Bonanno 2017; Alnaa 2016).

In the present books of psychology related to commitment and employee organizational variables (Eisenberger et al. (2010) and Zeinabadi (2010) revealed that organizational commitment is a procedure of identification of the goals of the organizations. Voluminous review of empirical studies indicates organizational commitment include employees, customers, the public or unions (Nkegbe and Ustarz 2015). Organizational commitment has been involved negatively with turnover intentions and withdrawal behavior such as the increment of performance and maximized absenteeism and tiredness of employees. Considerable number of researchers examined the antecedents of organizational commitment literature and came to the inference that the variables differ from one investigation to another (Kumasey et al. 2017). This makes research literature inconsistent where commitment has been expressed and operationalized in different approaches.

2.1 Contribution to Knowledge

Turnover intentions among consumers have many reasons. Dissatisfaction, better market alternatives or reaction to an increment in the cost of goods and service in the organization are among the various reasons that can lead to intentions to quit (Trivellas et al. 2013). Consumer loss causes a direct effect on the organization and leads to decline in profitability. Turnover intentions from customers can also cause losses to positive word of mouth, decrease in the organizational income and should not be encouraged in any organization. Researchers accepted that customers' citizenship behavior involves voluntary support and action that may not produce direct benefits for the customer, but a value to the organization (Bove et al. 2009; Yi & Gong 2006; Yi et al. 2011). When customers experience intention to quit doing business in an institution, the idea of organizational citizenship behavior dies naturally. Similarly, intention to quit among employees affects job satisfaction, leads to job stress and discourage job performance as whole that can affect the organization interest.

2.2 Conceptual Research Model

As indicated in Fig. 1 the research model has several relationships. Job satisfaction has an impact on turnover intention, job satisfaction impact on job involvement and institutional commitment. Job satisfaction has partial or full mediation with job involvement and institutional involvement. Age, gender, marital status, education and organization tenure are considered control variables.
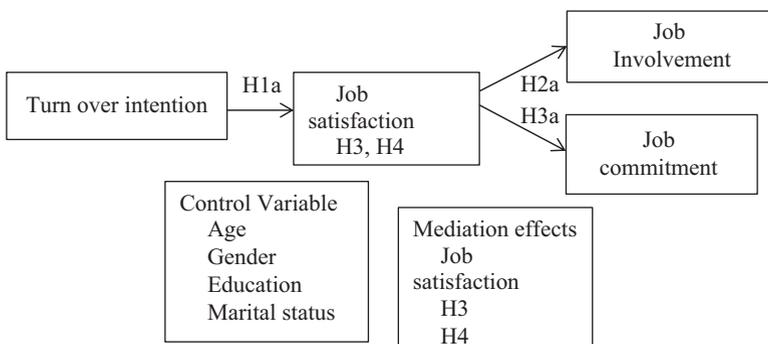

Fig. 1 Conceptual research model

2.3 Mediation Effects

Job satisfaction as a mediating influence on job involvement and institutional commitment in various organizational relevant literature indication that employees who are satisfied with their jobs experience internal satisfaction. Job satisfaction is categorized as the extent to which employees feel positive or negative about their work (Oetomo 2011; Barnes et al. 2015). Negative connection with absenteeism leads to intention to quit among employees (Valente et al. 2015).The problems and impacts of stress in jobs such as role ambiguity and role conflict have impact in job involvement and institutional commitment. The issues of continuance, affective and normative in organization relate to job satisfaction. Continuance is regarded as the positive emotional behavior of employees that has component of strong needs in institutional commitment (Bhuian and Islam 1996). Affective commitment on the other hand is the feelings and the attachment employees have on their organizations, the amount of involvement and their contributions towards progressive development of the organizations' membership. Normative commitment in organizations relates to job satisfaction. Various researchers generally accepted that continuance, affectivity and normative commitments are the perceptions of the workers and their obligations to their institution. Role conflict is a situation where one is expected to fulfil the duties of two contradictory positions. Example of role conflict could be a manager in an organization who is expected to fire someone who is also a friend (Berger et al. 2016a, b). Role ambiguity on the other hand is presented as a situation where an individual employee has not clear directions about an expected role of his job in an institution.

2.4 Turnover Intention

Naturally, customers like good services and may intend to move their business to another bank elsewhere if they perceive negative behavior about the services they get from the local bank. It has been proposed that consumers' behavior towards quality of services can be a reason for turnover intentions (Tajuddin Ali and Kamaruddin 2015). It is important for employees to treat customers well and to avoid a negative behavior that can influence a business moving from one local bank to another. The model of turnover intention by Cotton and Tuttle (1986) demonstrates that the relations between quality of service behavior and turnover intentions can appear stronger in customers than in employees based on perceive quality. It is also posited that employees who work long hours and receive less reward may have intention to turnover a job (Cahuc et al. 2016). Based on these theory the hypothesis were formulated.

Burnout leads to turnover intentions. This refers to a phenomenon that was used by employees in the frontline local banks to deal directly with customers' day to day emotions. Burnout studies were first conducted by Maslach et al. (1986). Burnout

has three definition components namely (i) emotional exhaustion which is a situation where employees are over extended in their jobs and feel physically and emotionally tired (ii) Depersonalization refers to a period of feelings among various desk front employees that experience disconnected thoughts due to hard work of long hours. This type of feeling does not make employees to lose contacts of reality in their in their jobs, but make them wishing to turnover from their daily jobs (iii) The reduction of personal accomplishment in jobs make employees feel incompetent, unproductive and no achievement in their jobs. Theoretical frameworks link with burnout reveal that it is the major mediating relationship between work stress and behavior results Peng et al. (2016). It is further explained that among these behavior results bring about turnover intentions, which have been researching many academicians around the world.

H1a Turnover intention has a positive relationship with job satisfaction

2.5 Job Satisfaction

Job satisfaction is regarded as one of the main factors of intentions to stay in a job (Zopiatis et al. 2014). Job satisfaction is a complex experience with several affecting components. It is a significant predictor of employees' intent to stay that leads to decreasing in turnover intentions. Many authors inferred that a reduction in turnover intention is experienced when employees are satisfied with their jobs. The study of Çetin et al. (2012) posited that job satisfaction has strong relations with affectivity and normativism than it has with job continuous commitment. Based on the foundation of the theory originated from the early research and the examination of the relationships between job involving and affectivity the following hypothesis was developed.

H2a Job satisfaction has a positive relationship with job contribution

2.6 Job Involvement

Job involvement is a psychological identity of a job by an employee in an organization such as the bank (Trivellas et al. 2013; Deepak 2016; Bayraktar et al. 2017). The research of McKelvey and Sekaran (1977) and Frone et al. (1995) demonstrated that employees form attachment with their jobs when they have job involvement behavior. Similarly, the studies of Paullay and Stone-Romero (1994) and (Johari and Yahya 2016; Huang et al. 2016) reveal that job involvement is a state of mind where individual employees can be pre-occupied and engaged with his job concerns. Another research from Zopiatis et al. (2014) defined job involvement as an individual with a high interest in his job. An employee with low job involvement pivots his interest in other things than his job. Job involvement is a measurement for

job employees' work life quality. The research of Jensen et al. (2013) states that employees with high level of job involvement are likely to be independent in doing their work that is in line with the job responsibilities than people who are less involved in their jobs. It is further explained that people who are involved in their jobs reduce turnover intentions.

2.7 *Organizational Commitment*

Institutional commitment is the relative strength of individual identity with one's involvement in a particular institution (Peng et al. 2016; Carmeli et al. 2017; Chen and Chiu 2009). Institutional commitment can be defined into three groups. (i) Belief in an institution and the accepting of the objectives of the institution (ii) The wiliness of an individual employee to put considerable effort in the objectives and value of an institution (iii). The wish of individual employees is to maintain a relationship and membership of an institution. Institutional commitment therefore demands something more than loyalty to an institution. It requires a strong relationship that the individual employees are willing to sacrifice their time and energy to contribute to the institutions' welfare and security. It is sensible to recognize that though individual employees can be committed to their families, political parties, but the action of commitment to the institution should be paramount and the employee will be liable to display the three kinds of behaviors recognized in the above definition.

H3a Job satisfaction has a positive relationship with institutional commitment

3 Methodology

A judgmental sample was used to interview full time frontline employees in twenty local banks in Accra. An email was sent to the management of the banks to request for permission to conduct the research. The management accepted for the study to be conducted and questionnaire of 350 were distributed to the employees through a supervisor. The researchers were not allowed to directly distribute the questionnaires to the respondents. A supervisor was selected in each bank to distribute the questions which took 2 weeks to complete. The respondents were informed the survey was voluntary and they were assured of their anonymity. The respondents rated questionnaire related to work satisfaction, job involvement, organizational commitment and intention to quit. Apart from the demographic variables, 5 point response scale was used to measure the study ranging from 1 (strongly disagree) to I (strongly agree). All the measurements were originally written in English and because Ghana is a majority English speaking country there was no need for back translation. The questionnaire was used to test 15 employees working in different

banks in Accra and there were found to be understandable and there was no need for any changes. Out of the 350 questionnaires that were distributed, 275 were obtained representing 79% as response rate. About 59% of the respondents were male and the rest were female. The ages between 18 and 29 were 34% while the ages between 28 and 49 were 52%. The rest were above 49 years of age. Sixty-six percent of the respondents had B.Sc. degrees and the rest had secondary school education. The employees were all frontline employees in the local banks. The participants reported average job tenure of 5.3 years with the local banks as their present employment.

3.1 Measurement

Turnover intentions among employees in the frontline local bank were measured by using 4 items from the four scale items of intention to quit (Di Pietro et al. 2014). I intend to leave this job in a few weeks, I have been thinking about leaving this job, I am looking for another job in another bank, I am tired of working in this job without proper rewards. These items were subjected to rating based on a 5 point Likert scale from I strongly disagree to 5 I strongly agree and the cronbach's was 0.90. Burnout was similarly measured by using the theory of (Hakanen and Schaufeli 2012; Peng et al. 2016). Burnout is meaured by the components of frequent employees' burnout syndrome that include the perceiption of emotional exhaustion, depersonalizations and employees personal accomplishments (Rožman et al, 2017).

Job satisfaction was measured using 5 item scale variables adopted from the studies of Kim et al. (2005) and Donavan et al. (2004).The items include (i) I consider my work very pleasant (ii) I feel satisfied with my present work (iii) I like my work (iv) My work is very interesting (v) I enjoy doing my work. The item variables were measured based on five -point Likert scale ranging from 1 (I strongly disagree) to 5 (I strongly agree). The Cronbach's alpha value was measured as 0.92 indicating strong internal validity consistence. The frontline employees are the most important part of the banking system. The success and failure of a bank will therefore depend on the involvement of the frontline employees in their jobs. The frontline employees in the bank are always the first to contact the customers' emotions. Job involvement is a cognitive state of employees' psychological mind that impact job identification that differs from one employee to another. It is important to note that when employees are satisfied with their job they experience job involvement. Job involvement therefore impacts the organization and the psychological attachment of the individuals working in it. Job involvement is regarded as the most important influence of employees' motivations has received a huge considerable research among academic scholars over the past years (Trivellas et al. 2013; Berger et al. 2016a, b). The research of Kanungo (1982) suggested 10 item measurements for job involvement that was regarded as the most represented psychological identity of job involvement. Based on these theories, this study measured job involvement by using 4 items scale. The Cronbach alpha variable for this measure was 0.91 showing that the internal validity was consistent.

Job commitment was evaluated using 5 scale items adopted from (Porter et al. 1974).The measurement of job commitment explained as (i) Do you stay late in the office to complete your work,(ii) Do you skip work before the ideal time is up, (iii) Do you give your own duties to other workers under you to do for you because you don't feel like doing it (iv) What kind of job commitment does your work require. This refers to the commitment individual employees plan to commit to their jobs in the local banks as an affectivity. All the items were measured based on a 5 Likert scale ranging from 1 (I strongly disagree) to 5 (I strongly agree). The Cronbach alpha variable for this measure was 0.90 showing that the internal validity was strong and consistent.

3.2 Main Results

Few items were dropped because of lower standardized loadings and the errors from the correlation measurement in the confirmatory factor analysis. One item from turnover intention measurement, one item from job satisfaction and one item from job involvement and one item from job commitment were taken off. The result indicated that the five item factor measurement model fit the data accurately ($X^2 = 288.70$, df = 199; $X^2/df = 1.45$; CFI = 0.90; RMSEA = 0.08; SRMR = 0.09; NNFI = 0.91 and the GFI = 0.91). All the loadings were observed to be significant and the sizes are grouped from 0.90 to 0.92. The qualities of the loadings were measured greater than the accepted cutoff level of 0.70. The total percentage variances withdrawn from the turnover intentions; Job satisfaction; Job involvement and Job commitment were 0.64, 0.69, 0.65 and 0.70 respectively. The results revealed did not indicate evidence of convergent validity problems (Price et al. 2012). The study of Schatz and Sandel (2013) measure was utilized as a base to examine discriminant validity and the results were report in Table 1 as the AVE values. The turnover intention AVE = 0.72; Job satisfaction AVE = 0.68; Job involvement AVE =0.71 and Job commitment AVE = 0.73. The average variance obtained from the analyses by each latent variable was noted to be greater than the variance shared in the constructs. All the measures were shown to be reliable and each construct was more than 0.60. The composite reliability scores for turnover intention, Job satisfaction, Job involvement and Job commitment was 0.72, 0.68, 0.71 and 0.68 respectively.

Table 2 is the correlation table that measures means, standard deviation and the correlations of the variables. This also allows the data to be compared based on their relationships. As indicated in the correlations Table 2, it is noticed that the majority of the employees in the local banks in Accra are not satisfied with their jobs because of the stress of long hours of cheap labor. Note. The composite variable scores for each construct is calculated based on their average of the total scores of the items. The scores for turnover intention, job involvement and job commitment ranged from 1 to 5 but the scores for job satisfaction which is the mediator is arrayed from

Table 1 Scale items and confirmatory factor analysis results

İtems scale	Standardized loading	Percentage variance	Eigen values	Alpha values	AVE values
Turnover intention		0.64	1.51	0.90	0.72
I will probably be looking for another job soon	0.74				
I often think about quitting	0.69				
I will quit this job sometime in the next year	0.78				
I will quit this job sometime in the next year	–				
Job satisfaction		0.69	1.36	0.92	0.68
My job is very pleasant	0.75				
I am very satisfied with my job	0.84				
I am very enthusiastic about my job and related responsibilities	–				
I definitely dislike my job	0.77				
My job is very rewarding	0.68				
Job Involvement		0.65	1.34	0.91	0.71
How often do you go on break	0.66				
Do you receive phone calls at work not related to your work	0.75				
How long do last at break or lunch	0.81				
How often do you get coffee while at work	0.89				
Do you give your full attention to your work	–				
Job commitment		0.76	1.45	0.90	0.73
Do you stay late in office to complete your work	0.90				
Do you skip work before the ideal time is up	0.76				
Do you give your own duties to other workers under you to do for you because you don't feel like doing it	0.89				
What kind of job commitment does your work require	0.79				

1 to 6. Gender was coded as binary variable (0 = Male and 1 = female). * correlation is significant at 0.05 and ** Correlation are significant at 0.01 level.

The extraction method Principal component analysis, rotation method: varimax with Kaiser Normalization, Kaiser Meyer Olkin (KMO) Measurement of Sampling Adequacy: 0.916. Bartlett's Test of Sphericity p value 0.00 (chi-square: 288.70 df: 199). The Reliabilities were measured using Cronbach's alpha weights.

Table 2 Descriptive statistics of study variables

	Variables	1	2	3	4	5	6	7	
1	Age	–							
2	Gender	0.05	–						
3	Education	0.03	0.04	–					
4	Marital Status	0.06	0.09	0.06	–				
5	Turnover intention	0.02	0.11	0.11	0.09	–			
6	Job satisfaction	0.08	0.13	0.08	0.13	0.22*	–		
7	Job Involvement	0.10	0.15	0.16	0.19	0.27**	0.29**	–	
8	Job commitment	0.09	0.14	0.09	0.01	0.28**	0.23*	0.32**	–
9	Mean	2.10	3.11	2.21	2.03	4.01	3.06	2.08	3.04
10	Standard deviation	1.32	0.92	1.73	1.42	4.06	3.08	2.71	2.09

Table 3 Multiple regression analysis

Dependent and independent variables of standardized regression weigh						
	Job involvement			Job commitment		
	Step1	Step2	Step3	Step 1	Step2	Step3
Independent Variables	β	β	β	β	β	β
(1) Control variables						
Age	0.11	0.09	0.01	0.02	0.07	0.05
Gender	0.14	0.04	0.12	0.06	0.08	0.08
Education	0.13	0.06	0.10	0.16	0.05	0.04
Organization tenure	0.09	0.07	0.08	0.05	0.06	0.03
(2) Turnover intention turnover intention	–	0.28**	0.14	–	0.23*	0.21*
(3) Job satisfaction　job satisfaction	–	0.46**	–	–	0.25*	–
F　　　statistics	6.51*	9.33**	12.35**	16.51**	8.22**	8.41**
R2 at every step	0.19	0.25	0.34	0.22	0.36	0.47
ΔR	–	0.06	0.09	–	0.14	0.11

Note: Gender was coded as binary variable (0 = male and 1 = female). The results did not show any problem of multicollinearity from the variance inflation factors. *$P < 0.05$ and **$P < 0.01$

As indicated in Table 3 turnover intention has a significant and positive relationship with job involvement ($\beta = 0.28$, $P < 0.01$), turnover intention has positive relations with job commitment (0.23, $P < 0.05$) and (0.21, $P < 0.05$). Based on these results the hypothesis H1a, H2a and H3a are all supported. The results for the mediating effects are also shown in Table 3. Turnover intention has significant positive relations with job involvement (0.46, $P < 0.01$). The results indicates that by including job satisfaction as a mediator in the model reduces the size of the effects on the job satisfaction and job commitment (0.25, $P < 0.05$) were not significant any more. The result in Table 3 also shows a significant increase in the R^2 of the model ($\Delta R^2 = 0.09$, $P < 0.01$) and ($\Delta R^2 = 0.11$, $P < 0.01$). Table 3 also indicates that none of the control variables were significant.

4   Discussion

This study makes a helpful contribution to the management literature in three methods. The first method is the test of the full mediation effect of job satisfaction in the various relationships. (i) between turnover intention and job involvement (ii) turnover intention and job commitment. The second contribution relates to the limited empirical studies that estimated the above stated mediation effects in Europes but this study was conducted in Ghana which is a developing country in West Africa. The third contribution data were collected from frontline employees from the Accra local banks and their managers. Helpful findings were observed from the empirical examination.

The findings related to the impact of turnover intention on job satisfaction were inline with the studies of Schwepker (2001). Social exchange theory was used to determine the behavior of the frontline employees in the local banks. The findings related to job satisfaction on job involvement and job commitment are consistent with the current studies of Zopiatis et al. (2014) and Peng et al. (2016). The results also propose that the effects of job satisfaction on job involvement are much more than job satisfaction and job commitment. This could be the reason why the employees are not happy with their work in the local banks.

It is very significant to note that employees in any career such as sales managers, engineers, lawyers, teachers and technical supporters are all susceptible to burnout and not just employees in the local banks in Ghana (Zeng et al. 2010; Naceur and Zriba 2015). Despite the fact that burnout is common among employees, some managers are not aware of why employees experience burnout or how burnout can be put to a stop. Managers who comprehend the effects of burnout and its' causes also learn to prevent it from taking place among employees and maintain a positive work balance among a team of workers (Salami and Ajitoni 2015). Employees' burnout is the individual response to persistent emotional and interpersonal stress within a place where people work (Lin 2012). Employees that feels overwhelmed with job demand experience burnout. A team member with a huge stack of papers on his table and to do a list that stretches to three pages may reveal a panic on his face. Lack of sufficient information to do the job properly may lead to burnout (Allam 2007). Managers should therefore organize training for employees and reduce long hours of work to enable them perform effectively in their jobs.

5   Practical Implications for Managers

There are a number of useful implications for managers rising up from this study. First the outcome of the study reveals that bank managers should foster a suitable working environment with less stress for their employees. Long hours of work cause stress on employees and leads to turnover intentions. The bank managers can use intention to quit as a source of encouragement on social exchange behaviour

among the frontline employees. It is very important for the frontline employees in the bank to have social exchange relations with their customers and the banks they work for. The reason being that employees who relate friendly with customers, encourage them to transact monetary business with the local banks thereby expecting the banks to reward their effort. It is therefore important for managers to recognize the effort employees put into their jobs by providing them with financial and non-financial rewards. Secondly, training programs should also be organized to encourage employees to avoid job ambiguity as job ambiguity can lead to turnover intentions. If employees are properly informed and have proper training to perform their responsibilities, they can be aware about the priorities of the banking institutions. Training can also help frontline employees to solve customer complaints very easily without going to see the managers. Lastly, It is important to hire frontline employees who whose personalities match the job requirement. Employees suitable for a job can be done through case studies or conducting a basic test. Through this strategy, the right types of employees suitable for the local bank in Accra can be identified and recruited.

6   Limitations and Future Research

This study has some few limitations and many directions for future studies. Firstly, this study used a period of 2 weeks to collect data and conduct the research. In the near future more time can be allocated to collect data for the research. It was also noted that the managers of the local banks in Accra did not allow the research to directly contact the respondents. The researchers therefore relied on the managers to distribute and collect the data. However confidentiality of the respondents was guaranteed. Data collected in this manner can cause selection bias. In the future, researchers should be allowed to directly distribute and collect data from respondents to avoid potential problems of common bias and data selection bias. The repetition of this study can be conducted with a larger sample size in other parts of African countries or other regions in Ghana to broaden knowledge and database for future use. It is also observed that working long hours can cause insufficient sleep that may lead to risk of illness and high emotions (Karatepe and Aleshinloye 2009; Zhang and Seo 2016). The research of Van der Kooy et al. (2007) and Park and Choi (2013) suggest that employees who work long hours experience psychological stress, emotional exhaustion and emotional dissonance that may trigger worries that can lead to the risk of cardiovascular problems and other form of illness. Management of the local banking sector in Ghana in the Accra region should therefore consider to reduce long hours among Bank employees. Recent studies also revealed that reducing in long hours of working may rather increase productivity in the banks (Pencavel 2016). It is further explained that when employees are refreshed they work harder to increase productivity and working long hour should be eliminated from banking in Ghana. The interest in long hours of work has been a subject of debate between the government of Ghana, the local and foreign industries plus other

business organizations such as the local banks (Strazdins et al. 2017; Krug et al. 2017). The impact of long hours of working with a particular respect to institutional performance and the expansion of productivity has been a topic of discussion (Conway et al. 2016; Gareis and Barnett 2002). This was commissioned against the background of constant increase in the demand for a better work life balance. The government of Ghana on the other hand is intending to introduce a new rule to cut down long hours of working among employees.

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Examining the Relationship between the Stock Returns and Earnings Measures – Evidence from Borsa Istanbul

Asil Azimli and Pınar Evrim Mandaci

Abstract This paper investigates the relationship between stock returns and different types of earnings measures (such as net income, gross profits, operating profitability, cash-based operating profitability and accruals) for the firms traded on Borsa Istanbul. We construct portfolios by sorting firms according to the implied earning measures from low to high and analyze whether there are differences among them. Our sample period is from June 2007 to December 2015 covering 172 firms in average. Our results consistent with the previous studies indicating the profitability of equally and in some cases value weighted extreme portfolio investment strategies based on earnings measures.

Keywords Stock returns • Borsa Istanbul • Portfolio

1 Introduction

The relationship between the earnings and stock returns was firstly uncovered by Ball and Brown (1968). They argue that the earnings that is measured by net income can predict the cross section of average stock returns. Beaver et al. (1980) and Eastern and Harris (1991) investigate the relationship between stock returns and earnings per share by using current returns as a predictor of future earnings consistent with the Gordon Growth Model of stock valuation (see, Gordon and Shapiro 1956). Following their study, Fama and French (1996, 2008) argue that explanatory power of earnings is low when compared with the size and value measures. Among the more recent studies, Novy-Marx (2013) examine an another earning measure, namely gross profit deflated by the book value of total assets and find that this measure predicts the cross section of expected returns better than the net income and as good as the book-to-market (BE/ME) ratio. They argue that the "gross profitability" is cleaner measure of the economic profitability.

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Ball et al. (2015) follow the study of Novy-Marx (2013) to point out whether the predictive power of gross profit is greater than that of the net income and they find that the differences in deflators cause a difference between the explanatory power of gross profit and net income. They argue that Novy-Marx (2013) deflate gross profit by total book assets and net income by book equity, ending with the higher predictability of gross profits. Additionally, Ball et al. (2015) examine another measure of earnings, namely operating profit and show that operating profit is better than both the gross profit and net income in explaining cross section of stock returns.

According to Kothari (2001), accruals and cash flows are the components of earnings. Operating accruals represent accountants' attempt to transform operating cash flows into earnings that are more informative about firm performance. However, self- interested managers manipulate accruals, which would distort earnings as a measure of firm performance. Therefore, many argue that high returns can be explained better by the cash flow component of earnings (see, for instance, Ball et al. 2016). Analogously, Sloan (1996) reveal a negative relationship between the accruals and stock returns. In their most recent study, Ball et al. (2016) argue that cash-based operating profitability (CBOP) excluding accruals is better in explaining the cross-section of expected returns than the measures of profitability including accruals such as gross profit (GP), operating profit (OP) and net income (NI). The reason for this is that high accruals will impact the cross section of returns negatively because high accruals indicate low cash based profitability. They show that an investor may earn higher return solely by adding *CBOP* measures in their portfolio than by adding both accruals and *OP*. A cash based profitability measure may have the potential to be more informative about future stock returns than accrual based profitability measures.

The aim of this study is to investigate the relationship between stock returns and different types of earning measures, both cash based and accrual based, including net income, gross profitability, operating profitability, cash-based operating profitability and accruals for the firms traded on Borsa Istanbul (BIST). Additionally, we try to measure the relationship between the stock returns and other variables such as size and value measures which are commonly used. In this context, we follow the studies of Novy-Marx (2013) and Ball et al. (2015, 2016) in constructing our study. In order to test the relationship between these variables and stock returns, we form equally and value weighted portfolios by sorting the firms from low to high levels of different types of earnings variables, and size and value measures. Our sample consists of 172 firms in average ranging from 147 in 2007 to 213 in 2015.

Our study is different from the previous studies in three ways. Firstly, it is the most comprehensive study in terms of variables, sample period and sample size. Our study consists of many types of earnings and its time period is longer than the others. Secondly, as far as we know, it is the first study examining the relationship between *CBOP* measure and stock returns for the firms traded on BIST. In their study, Ozkan and Kayali (2015) examine the relationship between the cash flow from operations and stock returns for the BIST. They get cash flow data directly from the statement of cash flows. However, in this study we follow the study of Ball

et al. (2016) in determining the *CBOP* measure that excludes accruals which is more appropriate. Thirdly, we noticed that the majority part of the previous studies concentrated on developed markets. Demirtas and Zirek (2011) examines the forecast power of earnings yield to stock prices for 20 emerging markets. This study will contribute the existing literature by considering Borsa Istanbul as an emerging market with more earnings variables.

Our findings indicate that trading on extreme decile portfolios, particularly financing equally weighted portfolio of profitable stocks with equally weighted portfolio of unprofitable stocks, sorted according to the net income, gross profits, operating profits, cash-based operating profits, and accruals provides positive premiums in the BIST, at least during 2007–2015. However, when we construct value weighted portfolios premiums on extreme deciles investment strategy on net income, operating profitability and cash-based operating profitability disappeared. In addition, standard deviation of returns on hedge portfolios is larger in value weighted sorts for all the cases. This result indicates that there is a huge variability in extreme portfolios, notably in firm size. On the other hand, results related with the market equity and book equity to market equity sorts are consistent with most of the literature and holds both in equally weighted and value weighted portfolio sorts. Our results indicate that on an economical basis extreme portfolio investment strategies on earnings measures are profitable, however not statistically significant; therefore, we cannot reject that the market is not efficient at semi-strong form of efficiency. One reason for insignificant mean returns is high standard deviation of decile portfolios that is a common problem among developing markets.

The organization of this paper is as follows. Following the Introduction, Sect. 2 gives the sample and variable, Sect. 3 depicts the empirical results and the lastly Sect. 4 concludes the paper.

2 Sample and Variables

2.1 Sample

We follow the studies of Fama and French (1993, 2015) and Ball et al. (2015, 2016) in constructing data. We start our sample with entire firms traded on BIST and eliminate financial companies and firms with missing data of market value of equity (ME), book value of equity (BE), book value of total assets, gross profit, and current month return. Additionally, firms with negative book value of equity and firms with a fiscal year end of any month other than December are also eliminated to match the sample. We assume that financial tables of the fiscal year end of December year t − 1 will be available publicly at the end June year t. Therefore, we lag annual accounting information by 6 months and match with returns at the beginning of each July. We start our sample in July 2007 with 147 firms and end it in December

2015 with 213 firms with an average of 172 firms in the whole sample period. We collect monthly stock returns from the data store of the BIST (*datastore.borsaistanbul.com*), financial statements from both the official web page of the BIST (*borsaistanbul.com*) and Public Disclosure Platform of Turkey (*kap.org*), respectively. Risk free rate is obtained from web page of Statistical Institute of Turkey (*tuik.gov.tr*) and represent 1 month weighted average deposit rate of commercial banks in Turkey.[1]

2.2   Variables

We use five different measures of earnings; namely net income, gross profits, operating profits, cash based operating profits and accruals. Additionally, we use ME as a size measure and BE/ME as a value measure. Earnings variables scaled by the total book assets of December t − 1.[2]

Net income (NI); is the ratio of net income in December t − 1 to total book assets. According to the Ball and Brown (1968) there is a positive relationship between net income and expected stock returns.

Gross profits (GP); is obtained by reducing revenues with cost of goods sold in December t − 1 following to Novy-Marx (2013). Author revealed a positive relationship between gross profits and expected stock returns.

Operating profitability (OP); is obtained by reducing gross profitability with general and administrative expenses net of research and development expenditures[3] in December t − 1 following Ball et al. (2015, 2016). According to them there is a positive relationship between OP and expected stock returns.

Cash-based operating profitability (CBOP); is an accruals free profitability measure. Variable obtained following Ball et al. (2016) as follows; Operating profitability reduced by (change in accounts receivable from t − 2 to t − 1 minus change in inventory from t − 2 to t − 1 minus change in prepaid expenses from t − 2 to t − 1 plus change in deferred revenue from t − 2 to t − 1 plus change in trade accounts payable from t − 2 to t − 1 plus change in accrued expenses from t − 2 to t − 1). According to authors CBOP is a stronger measure of profitability with a positive impact on expected returns.

Accruals (ACCR); is December t − 1 accruals. Variable represents non-cash portion of profitability. Empirical evidence points out a negative relationship between accounting accruals and expected stock returns (see, for instance, Sloan 1996; Ball et al. 2016). Variable is obtained following Sloan (1996) as follows; (change in cur-

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[1] Risk free rate is in U.S. dollars in order to eliminate the impact of inflation of Turkish Lira.

[2] In scaling earnings measures we used total book assets of December t − 1 for all the variables. Use of consistent deflator among different variables that is to be examined in explaining expected returns is important (see, Ball et al. 2015).

[3] According to Ball et al. (2015) reducing operating profitability with research and development expenditures is not appropriate, since such items reported as they are incurred. However, firms bear research and development costs in order to generate future revenues.

rent assets from t − 2 to t − 1 minus change in current liability from t − 2 to t − 1) minus (change in current liabilities from t − 2 to t − 1 minus change in debt included in current liabilities from t − 2 to t − 1 minus change in income taxes payable from t − 2 to t − 1) reduced by Depreciation and amortization of t − 1.

Market value of equity (ME); market value of equity (market price times number of shares outstanding) represents the market size of a firm at end of June year t. Substantial evidence document a negative relationship between ME and expected stock returns (see, for instance, Banz 1981; Fama and French 1992; Heston et al. 1999; Rouwenhorst, 1999).

Book value of equity to market value of equity (BE/ME); indicates how much book assets can be purchased for a given market price of firm. Higher the ratio implies high book assets for market price, hence, such stock referred to as value stocks. Rosenberg et al. (1985); Fama and French (1992); Fama and French (1998) and Rouwenhorst (1999) document a positive relationship between value stocks and expected returns. The BE/ME ratio is ratio in December t − 1.

3 Empirical Results

3.1 Descriptive Statistics and Correlations

Descriptive Statistics and both Spearman and Pearson correlations results are presented in Table 1. Panel A reports means, standard deviations and 10th, 50th and 90th percentiles of profitability and market variables. Panel B presents Spearman (bottom panel) and Pearson (top panel) correlation coefficients.

Table 1 Panel A indicate that gross profitability has the highest mean and standard deviation. This is not a surprise since GP is not adjusted for expenses other than cost of goods sold. On the other hand, negative mean value of accruals is attributable to the adjustment for depreciation. Parallel to the findings of Ozkan and Kayali (2015) and Ball et al. (2016), we find a positive mean value of earnings measures other than accruals. Patterns presented in the Table I are consistent with the previous studies indicating that the higher earnings can be attributed to the cash based component of earnings and lower earnings can be attributed to the accrual component of earnings.

Panel B presents correlation coefficients between variables. As expected there is a negative correlation between accruals and *CBOP*. Correlation coefficients between other profitability measures are all positive. It seems apparently that there is a positive relation between *ME* and profitability measures indicating that the large firms have positive profits, in average. And there is a negative relationship between *BE/ME* and profitability indicating that value stocks tend to be less profitable. This finding contradicts Novy-Marx (2013). Author revealed that profitable firms tend to be value firms.

Table 1 Descriptive statistics and correlations

Panel A: descriptive statistics

Variables	Mean	Standard deviation	Percentile		
			10th	50th	90th
Profitability measures deflated by total assets					
Net income	0.037	0.101	−0.067	0.036	0.144
Gross profits	0.187	0.140	0.038	0.166	0.353
Operating profitability	0.059	0.089	−0.037	0.053	0.161
Cash-based operating profitability	0.046	0.109	−0.070	0.041	0.171
Accruals	−0.014	0.105	−0.127	−0.014	0.104
Other measures					
Market value of equity	1,106,519	3,175,964	26,947	170,348	2,072,181
Book equity to market equity	0.942	0.767	0.270	0.756	1.817

Panel B: spearman (bottom panel) and Pearson (top panel) correlations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) Net income	1	0.369	0.660	0.373	0.187	0.163	−0.186
(2) Gross profits	0.455	1	0.583	0.366	0.056	0.147	−0.242
(3) Operating profitability	0.752	0.649	1	0.614	0.127	0.212	−0.192
(4) Cash-based operating profitability	0.441	0.391	0.627	1	−0.418	0.177	−0.116
(5) Accruals	0.198	0.086	0.163	−0.368	1	−0.065	−0.011
(6) Market value of equity	0.437	0.222	0.422	0.321	−0.030	1	−0.188
(7) Book equity to market equity	−0.206	−0.296	−0.239	−0.196	0.053	−0.344	1

3.2   Excess Returns on Portfolio Sorts

We start portfolio formation in each July t using accounting data from fiscal year ending December t − 1 and calculate returns for 12 months till June t + 1. In this study, starting from July 2007 all of the stocks are assigned into investment portfolios based on implied variables. For instance, in order to construct portfolios based on *OP*, all the stocks ranked based on their *OP* of December 2006 at the end of June 2007, from lowest to highest, and divided into ten deciles based on the *OP* breakpoints of the portfolio. Then stocks in each decile allocated into ten investment portfolios and monthly equally weighted and value weighted returns calculated from July 2007 to June 2008. Our sample starts in July 2007 and ends in December 2015.

Table 2 reports average excess value and equally weighted returns, standard deviations and alpha and market sensitivity coefficient of CAPM. Value weighted returns calculated using *ME* of June t.

According to the Table 2, expected returns increases from low profitability deciles to high profitability deciles monotonically on equally weighted portfolios constructed based on gross profits, operating profitability and cash based operating profitability. On the other hand, the relationship between accruals and stock returns for value weighed portfolios is negative and parallel to our expectations.

Returns on hedge positions indicate that investment strategies organized as financing equally weighted portfolios of profitable firms with equally weighted portfolios of unprofitable firms, both on the basis of cash based and accrual based profitability measures, provide average monthly premiums ranging from 0.40% to 0.55%. During 2007–2015 investors exploit highest returns and allocation line slope by investing in extreme accruals portfolios (0.55% per month). Premiums on the same strategies for *OP* and *CBOP* are almost equivalent (0.54%). However, returns on strategies have higher standard deviations (SD), yielding to a poorer reward-to-volatility ratio compared to that accruals strategy. Our results in the Table 2 indicate that premiums are economically large but not significant.

When we construct value weighted portfolios hedge positions become too risky. Even worse, premiums on *NI*, *OP* and *CBOP* disappeared. On the other hand, the relationship between *NI* and expected returns is reverse for value weighted sorts. These patterns indicate that there is a great variability within portfolio characteristics, in particular in firm size. High SD on portfolio returns explains part of the statistical insignificance of the means. This is one of the common problems in the portfolio tests (see, for instance, Fama and French 1993, 2008).

Capital Asset Pricing Model (CAPM) failed on the basis of coefficients of codetermination (R^2) in explaining returns on hedge portfolios. However, alpha values provided by the model still not enough standard errors away from the mean. Results of *f*-statistics related with the pricing model provided below in Table 4 and discussed below.

Table 3 reports monthly equally weighted and value weighted average excess returns and standard deviation of returns for portfolios sorted by market variables including *ME* and *ME/BE*.

Table 3 indicates a negative relationship between the *ME* and average excess return and a positive relationship between *BE/ME* and average excess return. Our results are also similar to the results of related studies. We expect a negative relationship between the firm size and stock return indicating the size (small firm) effect and we expect a positive relationship between BE/ME indicating the value effect.

Table 3 also indicate that both equally and value weighted *ME* and *BE/ME* sorted extreme deciles investing provide positive premiums. Albeit, *ME* sorts favors value weighting while *BE/ME* sorts favors equal weighting. Returns on equally weighted *BE/ME* sorted hedge portfolio is statistically significant and value premium in the BIST is economically larger than value premiums observed in developed markets.[4]

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[4] See, for instance, Fama and French, (2008), Novy-Marx (2013) and Rouwenhorst (1999).

Table 2 Excess returns on portfolios sorted by profitability variables

Sorts on profitability variables										
	Equally weighted returns					Value weighted returns				
			CAPM					CAPM		
Portfolio	Avg. SD	Mean	α_{CAPM}	β_{CAPM}	Adj. R^2	Avg. SD	Mean	α_{CAPM}	β_{CAPM}	Adj. R^2
Panel A: sorts by net income to total book assets										
1 (Low)	11.6	−0.24 −(0.21)	−0.18 (−0.25)	1.11 (13.0)	62.32	19.9	2.67 (1.36)	2.74 (1.57)	1.12 (5.28)	21.03
5	10.6	−0.18 −(0.17)	−0.12 (−0.20)	1.08 (15.7)	70.78	7.18	2.25 (3.16)	2.23 (3.30)	−0.28 (−3.45)	9.76
10 (High)	9.65	0.26 (0.27)	0 .31 (0.55)	0.94 (13.6)	64.55	9.35	0.96 (1.04)	1.00 (1.29)	0.63 (6.67)	30.19
Hedge, 10–1	6.89	0.50 (0.73)	0.49 (0.73)	−0.17 (−2.13)	3.39	17.6	−1.71 (−0.98)	−1.74 (−1.02)	−0.49 (−2.39)	4.44
Panel B: sorts by gross profits to total book assets										
1 (Low)	11.6	0.11 (0.10)	0.18 (0.26)	1.13 (13.7)	64.94	11.1	−0.10 (−0.09)	−0.04 (−0.06)	1.07 (13.2)	63.12
5	10.7	0.22 (0.21)	0.28 (0.48)	1.08 (15.2)	69.39	11.6	−0.11 (−0.10)	−0.04 (−0.07)	1.20 (16.8)	73.61
10 (High)	10.4	0.51 (0.50)	0.57 (1.10)	1.08 (17.2)	74.39	8.30	0.12 (0.14)	0.16 (0.33)	0.80 (13.3)	63.40
Hedge, 10–1	6.21	0.40 (0.65)	0.39 (0.64)	−0.05 (−0.72)	0.01	6.87	0.22 (0.32)	0.20 (0.31)	−0.27 (−3.46)	9.77
Panel C: sorts by operating profitability to total book assets										
1 (Low)	11.4	−0.15 −(0.13)	−0.08 (−0.12)	1.10 (13.3)	63.42	15.5	0.28 (0.18)	0.34 (0.28)	1.14 (7.73)	36.77
5	11.1	0.16 (0.15)	0.23 (0.37)	1.11 (15.2)	69.41	11.9	−0.51 (−0.43)	−0.44 (−0.73)	1.23 (17.1)	74.29
10 (High)	9.74	0.40 (0.41)	0.45 (0.81)	0.96 (14.2)	66.47	9.16	−0.25 (−0.28)	−0.20 (−0.36)	0.88 (0.07)	62.88
Hedge, 10–1	6.43	0.54 (0.85)	0.54 (0.85)	−0.14 (−1.86)	2.38	12.2	−0.52 (−0.43)	−0.54 (−0.45)	−0.26 (−1.83)	0.02
Panel D: sorts by cash-based operating profitability to total book assets										
1 (Low)	10.9	0.02 (0.02)	0.08 (0.14)	1.08 (14.5)	67.42	10.4	0.14 (0.13)	0.20 (0.74)	1.02 (14.1)	66.25
5	10.8	0.03 (0.02)	0.09 (0.15)	1.09 (15.3)	69.64	12.3	−0.07 (−0.06)	0.00 (0.00)	1.10 (13.9)	65.64
10 (High)	10.3	0.57 (0.55)	0.62 (1.06)	1.02 (14.3)	66.68	9.24	−0.09 (−0.93)	−0.03 (−0.06)	0.93 (15.3)	69.78
Hedge, 10–1	5.03	0.54 (1.09)	0.54 (1.08)	−0.06 (−1.00)	0.00	6.42	−0.22 (−0.35)	−0.23 (−0.36)	−0.09 (−1.16)	3.50
Panel E: sorts by accruals to total book assets										
1 (Low)	10.1	0.29 (0.29)	0.35 (0.57)	0.98 (13.4)	63.92	10.1	0.38 (0.38)	0.44 (0.72)	0.98 (13.3)	63.60

Table 2   (continued)

	Equally weighted returns					Value weighted returns				
	Avg.		CAPM			Avg.		CAPM		
					Adj.					Adj.
Portfolio	SD	Mean	α_{CAPM}	B_{CAPM}	R^2	SD	Mean	α_{CAPM}	B_{CAPM}	R^2
Sorts on profitability variables										
5	10.7	0.31	0.38	1.07	67.45	11.8	−0.07	0.00	1.14	63.63
		(0.29)	(0.61)	(14.5)			(−0.55)	(0.00)	(13.3)	
10	10.7	−0.25	−0.19	1.07	68.72	11.1	−0.41	−0.35	1.05	60.58
(High)		(−0.24)	(−0.32)	(14.9)			(−0.37)	(−0.51)	(12.5)	
Hedge,	4.12	0.55	0.53	−0.09	2.13	7.32	0.79	0.79	−0.07	0.03
1–10		(1.32)	(1.32)	(−1.79)			(1.09)	(1.09)	(−0.79)	

Numbers in parenthesis represents t-statistics

Table 3   Excess returns on portfolios sorted by market variables

| Portfolio | Equally weighted returns | | | | | Value weighted returns | | | | |
| | Avg. | | CAPM | | | Avg. | | CAPM | | |
	SD	Mean	α_{CAPM}	B_{CAPM}	Adj. R^2	SD	Mean	α_{CAPM}	B_{CAPM}	Adj. R^2
Sorts on market variables										
Panel A: sorts by market value of equity										
1 (Low)	11.8	0.98	1.04	1.05	54.63	11.4	1.02	1.08	1.04	57.03
		(0.84)	(1.33)	(11.1)			(0.91)	(1.46)	(11.6)	
5	12.57	0.61	0.67	0.99	42.18	12.9	0.69	0.75	1.00	40.58
		(0.49)	(0.70)	(8.64)			(0.54)	(0.76)	(8.36)	
10	10.25	0.27	0.33	1.10	78.75	9.51	−0.24	−0.18	1.03	80.45
(High)		(0.26)	(0.71)	(19.4)			(0.80)	−(0.43)	(20.4)	
Hedge,	7.53	0.71	0.71	−0.45	0.01	7.06	1.26	1.26	0.01	0.01
10–1		(0.96)	(0.95)	(−0.5)			(1.80)	(1.80)	(0.12)	
Panel B: sorts by book equity to market equity										
1 (Low)	10.5	−0.49	−0.44	0.97	58.15	9.44	−0.23	−0.18	0.90	61.96
		(−0.47)	(−0.65)	(11.9)			(−0.24)	(−0.31)	(12.9)	
5	11.4	0.34	0.41	1.17	72.71	11.7	−0.90	−0.83	1.17	67.60
		(0.30)	(0.69)	(16.4)			(−0.77)	(−1.26)	(14.6)	
10	12.23	1.12	1.19	1.16	61.57	12.3	0.73	0.82	1.19	64.48
(High)		(0.93)	(1.58)	(12.8)			(0.62)	(1.13)	(13.6)	
Hedge,	6.80	1.62	1.63	0.19	4.44	7.89	0.98	1.00	0.29	8.62
10–1		(2.40)	(2.47)	(2.38)			(1.25)	(1.33)	(3.25)	

Numbers in parenthesis represents *t*-statistics

Moreover, value strategy provides the highest reward-to-volatility ratio among entire strategies investigated.

Our results indicate that CAPM fails to explain returns on hedge portfolios on ME and ME/BE sorts on the bases of R^2 coefficients. Details related with the performance of the model on hedge portfolios provided below in Table 4.

Table 4 CAPM *f*-statistics

	Equally weighed	Value weighted
Panel A: hedge portfolios on profitability measures		
Net income	4.54 (0.03)	5.70 (0.02)
Gross Profits	0.52 (0.47)	11.94 (0.00)
Operating profitability	3.46 (0.07)	3.34 (0.07)
Cash-based operating profitability	0.99 (0.32)	1.35 (0.25)
Accruals	3.20 (0.08)	0.62 (0.43)
Panel B: hedge portfolios on market variables		
Market value of equity	0.25 (0.62)	0.02 (0.90)
Book equity to market equity	5.69 (0.02)	10.5 (0.00)

Numbers in parenthesis represents probabilities

Table 4 presents *f*-statistics and probabilities obtained by regressing monthly returns, both equally and value weighted, on hedge portfolios against BIST-100 index adjusted for the riskless rate. According to the results CAPM can explain returns on *NI* sorted hedge returns. Interestingly, model also performs well in capturing variations on value strategy returns. While returns on *CBOP*, *GP* (equally weighted), accruals and *ME* cannot be captured by the variations in the market portfolio. According to the results we can argue that concentration for the future research should be on these variables.

4 Conclusion

Our aim is to measure the relationship between the different types of earnings namely, net income, gross profits, operating profits, cash-based operating profits and accruals and stock returns for the firms traded on BIST. Our period is from July 2007 to December 2015 covering 172 firms in average. Our findings related with portfolio sorts are consistent with the existing literature. We find that constructing and taking a year of position in equally weighted extreme portfolios sorted based on implied characteristics and financing those positions with opposite side extreme decile portfolios provide positive premiums. Particularly, among earnings measures accrual sorted extreme decile investment provides the highest reward-to-volatility ratio during the sampling period. However, equally weighted value investment strategy is far more appealing compared to the accruals strategy. When we construct value weighted portfolios only gross profits, accruals, market equity and book equity to market equity sorts rewards diverging from the market portfolio. Our findings also point out that stock returns are negatively related with accruals and positively related with cash based components of earnings. And consistent results

obtained with the existing literature related with the size and value effects. However, our results are not statistically significant, partly due to the high volatility of portfolio returns, and we cannot argue that the market is inefficient in semi-strong form on the statistical basis at least for the period 2007–2015.

There is still wide range of open questions to be addressed related to this issue. Future studies should investigate profitability within size and value sorts by constructing double sorts since there is a negative and positive relation between profitability measures and size and value, respectively. Implementing such a strategy will also enhance diversification and reduce the SD of portfolios. This will aid how much standard errors away are average portfolio returns from the mean. Moreover, economic reasons underlying discussed patterns should also be investigated in the future research.

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Performance Ranking of Development and Investment Banks: ANP Application

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Abstract Traditionally, Analytic Hierarchy Process (AHP) and Analytic Network Process (ANP) methods used for Multi-criteria decision making problems. Hierarchical definitions are not enough when relations between the components of multi-criteria decision-making problems are not one-sided rather mutual, Both AHP and ANP based on mutual comparison. ANP is the general form of AHP and considers the interactions and feedbacks between the components which are not directly related rather than creating a network that makes it possible to able to eliminating the levels which are in the hierarchical structure. In this study, ANP model based on the main criteria which are capital adequacy, asset quality, liquidity, profitability and income - expenditure and related 13 criteria which is known sub-criteria of development and investment banks. The framework investigates financial performances of 6 privately-owned development and investment banks by using Analytic Network Process based on experts' opinions and related literature for the period 2011–2015 in Turkey.

Keywords ANP • Decision-making • Development and investment banks • Performance ranking

1 Introduction

Actually, performance measurement can be defined as quantization of efficiency and effectiveness of an action and performance measurements can be defined as quantitive activity period as well (Amaratunga and Baldry 2002). Thus, performance

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measurement is a defining period for businesses or individuals to task assignments or to determine strategies (Evangelidizs 1992).

Determination of factors and measurement of their performances is a necessity for success due to the global and fierce competition. Traditionally, different sectors measure their performances with financial criterias such as: income, sales, etc. and its performance in the contex of financial precautions is an absolute criteria for a business. The changes in the industry, new technologies and increasing competition made especially the localized performance measurement methods inadequate for performance measurement of the business (Kaplan and Norton 2000).

The Analytic Network Process, is generilazed form Analytic Hierarchy Process which solves the finite alternatived decision problems using a hierarchical system. The problems may not always be represented in a hierarchical manner.

ANP is a methodology which provides the every connections and feedback between the criterias and sub-criterias that affect the deciding period systematically. With ANP method, firstly a model is built and the problem is formulized. By constructing pairwise comparison matrixes between the criterias that optimize the problem, the decider is expected to compare according to Saaty point scale. The compared criterias are then turned into matrixes. After the weights are acquired by dividing every element of the matrix by the column sum, the super matrix is constructed.

For this purpose, within the boundaries of this study ANP is chosen to be the optimal method for development banks' multi criteria decision making methods.

Purpose of this study is to build a system which will -by taking into consideration of the Development Bankings efficiency, at levels(tasks, resources), at market levels (competion, demand) – be able to determine the performance and the effects of the parameters to the mentioned performance.

1.1 Literature Survey

Traditionally performance evaluations depends on ratio analysis. In addition to this, when dealing with evaluation of banking operations, for full dependability, some non-financial criterias are needed to be used. For bank operations to be evaluated effectively non-financial performance criterias should be considered as well (Secme et al. 2009; Toloie-Eshlaghy et al. 2011; Islam et al. 2013).

In their study (Akkoç and Vatansever 2013) got similar results from using AHP and TOPSIS methods when measuring the performances of 12 banks in Turkey between 2003 and 2013.

The limit matrix not only points the proper alternative; it shows the importance and contribution of each and every criteria upon deciding process (Anık 2007). In his 2006 work, Partovi by using AHP and ANP methods observed that AHP method gives more precise results for choosing a site of establishment.

The creation of super matrix is what makes ANP different from AHP at the problem solving step. The interactions between criterias and alternatives are considered in this step and with the help of the super matrix the best alternative is chosen (Susuz 2005). At 2007 work of the alternatives that are used for the methods for choosing a site of establishment using the ANP approach are compared.

(Meade ve Sarkis 1999) used ANP method for their project selection. (Karsak et al. 2002) ve (Partovive ve Corredoira 2002) used AAP method for quality and function deployment process. (Bayazıt 2002) for designating optimal management system for a business, Tallur, and Sarkis 2002).for strategical supplier selection, (Yurdakul 2003) in the model he developed for long term performance evaluation for production businesses, (Niemira ve Saaty 2004) for financial crisis forecast used ANP method.

On the other hand, at recent years the banking system regulators and inspectors use quantitive measurement techniques depending on finantial ratios of the banks for providing financial security of banks as an important tool.

1.2 Data and Methodology

In the study, the data which are the financial ratios, considered between 2011 and 2015, provided pubished at the website Turkish Banks Association (www.tbb.org.tr).

ANP is a method that allows for more complex and reciprocal relations to be created between decision levels and its components. As in AHP case ANP too is based on pairwise comparison. For creating this pairwise comparison matrices or super matrices and determining the relative importance weights the 1–9 scale developed by (Saaty 1990) is used (Table 1).

Criterias and alternatives in these type of problems may be interacting with each other. In this case, to find the weights of the components (relative importance vectors), analysis of a more complex process is needed. Analytic Network Process is a method suitable for these cases.

Table 1 The importance scaled used in pairwise comparison

Rating	Definition	Explanation
1	Equally important	Two criterias are equally important
3	A little important	Experiences and judgments makes one criteria a little more important than the other one
5	Very important	Experiences and judgments makes one criteria a lot more important than the other one
7	Very much important	The criteria is far superior than the other
9	Immensely important	The data and experience in hand indicates one criteria is far more superior than the other
2,4,6,8	Between levels	The levels at the between can be used as well

Source: Saaty (1990: 15)

Taking into consideration the relationships between decision criterias and sticking to one direction and by doing so eliminating the obligation to modeling; ANP, is a general form of analytic hierarchy process used in multi criteria decision analysis developed by Thomas L. Saaty.

The steps of ANP are summarized below;

Step 1. Defining the Problem and Construction of the Model At the first step, the decision problem is defined. The goal is to state the main criterias, sub-criterias and alternatives clearly.

Step 2. Defining the Interaction Between the Criteries The inward and outward connection and if existing the feedback between the criterias are associated.

Step 3. The Pairwise Comparison Between Basic Decision Makers In this step under the basic decision makers in every dimension the main and sub criterias' pairwise comparisons are made and the relative importance ratings are calculated.

Step 4. Examination of the Consistency of the Acquired Matrix The points received from the experts are entegrated to form a comparison matrix. After the normalization of the columns of this matrix, the acquired average row values show the weight of the each component. However, the consistency of the comparison matrix is needed for the these values to be valid.

The pairwise comparisons are made in the form of a matrix and by doing so the priority values of the criterias are acquired. The expert aided pairwise comparisons' consistency is measured for every matrix separately by calculating matrix consistency rate (CR). For the executed comparison to be consistent the CR must be equal or less than 0.10. If that is not the case the comparisons should be reviewed.

Step 5. Creation of Super Matrix and Its Analysis Super Matrix is sectional matrix and the every matrix section there shows the relationship between two criterias. To determine the long term relative effect of the criterias on each other the super matrix is exponentiated. To equate the importance weights at some point $(2n + 1)$th power of the super matrix is taken and n here is an arbitrary very large number and the newly acquired matrix is called the limit super matrix.

Step 6. Selection of the Best Alternative By exponentiating the super matrix, the limit super matrix is obtained. The priority values of the criterias in the limit super matrix are acquired and the most primary alternatives are determined.

In ANP, the analysis is made by using three types of matrixes called unweighted, weighted and limit matrix. The unweighted super matrix gives out the relative importance vector resulted by pairwise comparison of every component. The weighted super matrix, is the matrix that is acquired by multiplying these values by the weight of the set the components in. The limit matrix is obtained by taking the limit of the weighted matrix where the components converge to their relative importance values because of the existance of feedback in the problem. The resulting values of the Decision Problem is obtained from this matrix.

Implementation of the form of the super matrix the importance weights relative to the alternatives are found. Additional calculations are needed to find the general

priority of the alternatives if the super matrix consist of only the factor groups related to each other. For the calculations that will be made the factor priorities are used resulting from the super matrix. The best alternative is chosen as the one with the highest importance weight value.

Also credibility of the ANP evaluations are increased since the assessments are made by the relative experts, consistency test is made and especially the inclusion of every component affecting the problem.

1.3 Implementation and Results

The fundamental data (criterie and sub-criterie) that constitute working with ANP model consist of 5 of 7 main criteria and 13 of the 37 subcriterias (nodes) that are included within the perspective of the related experts also known as banks' criteria (ratio groups); Capital Adequacy, Active Quality, Liquidity, Profitability and sub-criteria.

Following the entry of binary comparisons into the Super Decision program within the framework of expert opinions, the model is set up in Fig. 1. The cluster
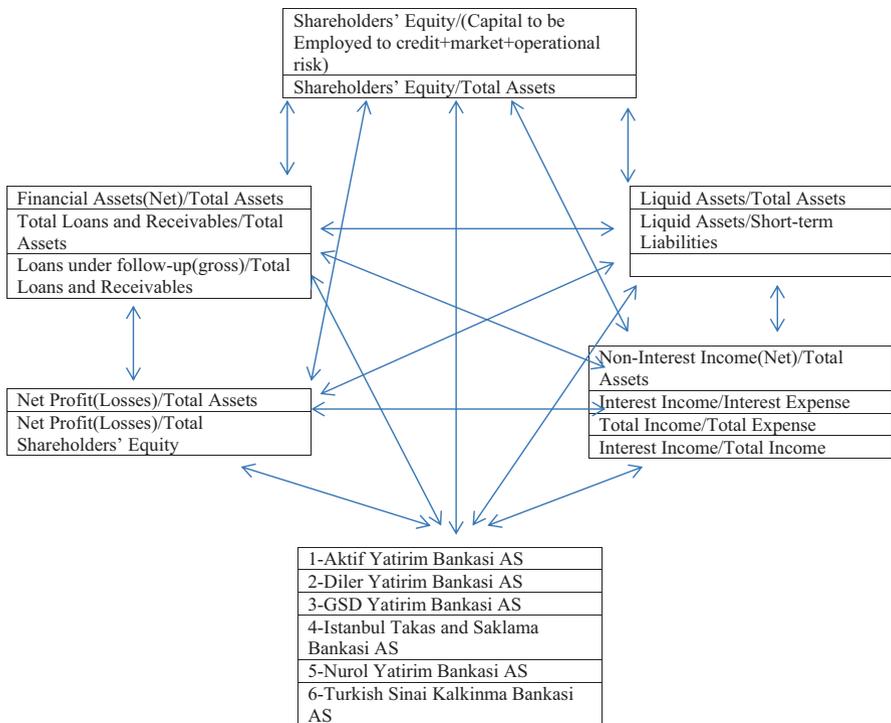

Fig. 1 Analytical network process model

matrix and also the weights of the criterias obtained after the ANP model is established in Super Decision program (Ver. 2.8.0) software are given in Table 2.

When Table 2 is examined, according to the goal of performance ranking, the rank of importance of the criteria from the criterion matrix "Profitability" was the most important criterion with 35.66%. After the first criterion, "Income-Expense Structure" with 29.71%, "Liquidity" with 21.15%, "Capital Adequacy" with 9.28% and "Active Quality" with 4.19%.

According to 2011 results of the Super Decisions Program of ANP model applied to the ones included in the scope of the study, Privately-owned Development and Investment Banks operating in Turkiye Sınai Kalkınma Bankası AŞ is in the first place with a share of 26% considering the ranking of the banks. Nurol Kakınma Bankası AŞ with a share of 20% (Fig. 2).

The matrix of priorities for the ratios weights obtained with the model is given in Table 3 below. Priority table shows importance scores in terms of performance evaluation of sub-criteria. The values in the Limiting column indicate how much the sub-criteria affect the end result. For example, the most important sub-criterion is

Table 2 The cluster matrix

	1 Capıtal adequacy	2 Assets qualıty	3 Lıquıdıty	4 Profıtabılıty	5 Income expendıture structure	6 Alternatıves
1 Capıtal adequacy	0.0928	0.1666	0.1666	0.1666	0.0774	0.0928
2 Assets qualıty	0.0419	0.1666	0.1666	0.1666	0.0559	0.0419
3 Lıquıdıty	0.2115	0.1666	0.1666	0.1666	0.3232	0.2115
4 Profıtabılıty	0.3666	0.1666	0.1666	0.1666	0.2081	0.3666
5 Income expendıture structure	0.2970	0.1666	0.1666	0.1666	0.1146	0.2970
6 Alternatıves	0.0000	0.1666	0.1666	0.1666	0.2206	0.0000

The Overall Synthesized Priorities for the Alternatives	
1-Aktif Yatirim Bankasi AS	0.1301
2-Diler Yatirim Bankasi AS	0.1608
3-GSD Yatirim Bankasi AS	0.0772
4-Istanbul Takas and Saklama Bankasi AS	0.1641
5-Nurol Yatirim Bankasi AS	0.2030
6-Turkish Sinai Kalkinma Bankasi AS	0.2645

Fig. 2 ANP results, 2001

Table 3 Matrix of priorities

Name	Normalized by cluster	Limiting
Shareholders' equity/((Capital to be employed to credit + market + operational risk)	0.6811	0.0886
Shareholders' equity/Total assets	0.3188	0.0415
Financial assets(Net)/Total assets	0.1156	0.0130
Total loans and receivables/Total assets	0.2591	0.0291
Loans under follow-up(gross)/Total loans and receivables	0.6252	0.0704
Liquid assets/Total assets	0.3182	0.0663
Liquid assets/Short-term liabilities	0.6817	0.1420
Net profit(Losses)/Total assets	0.3537	0.0794
Net profit(Losses)/Total shareholders' equity	0.6462	0.1451
Non-interest income(Net)/Total assets	0.2343	0.0447
Interest income/Interest expense	0.4011	0.0766
Total income/Total expense	0.0754	0.0144
Interest income/Total income	0.2890	0.0552
1-Aktif Yatirim Bankasi AS	0.1301	0.01732
2-Diler Yatirim Bankasi AS	0.1609	0.0214
3-GSD Yatirim Bankasi AS	0.0772	0.0102
4-Istanbul Takas and Saklama Bankasi AS	0.1641	0.0218
5-Nurol Yatirim Bankasi AS	0.2030	0.0270
6-Turkish Sinai Kalkinma Bankasi AS	0.2645	0.0352

Net Profit (Losses)/Total Shareholders' Equity (14.51%) and Financial Assets (Net)/Total Assets Ratio with 1.30%. In other words, Net Profit (Losses)/Total Shareholders' Equity affects the solution of our multi-criteria decision making problem 14.51% and the Net Assets (net)/Total Assets Ratio sub-criterion affects 1.30%.

The above priorities obtained from modeling include weights belonging to matrix sub-criteria.

The performance ranking of selected banks are given for the period 2011–2015 is given following Table 4.

The results especially show that state banks which are Türkiye Sınai Kalkınma Bankası AŞ and İstanbul Takas Ve Saklama Bankası AŞ are first two orders in the begining 3 years, Aktif Yatırım Bankası AŞ and GSD Yatırım Bankası AŞ which are private banks are last two orders for all years

2   Conclusion

Performance measurement and determining the factors affecting the performance in financial sector shine out from the recent studies. Analytic Network Process is method in which the qualitative and quantitive values can be used. Analytic Network

Table 4 Privately-owned investment and development banks performance ranking 2010–2015

2011	Total	Normal	Ideal	Ranking
1-Aktif Yatirim Bankasi AŞ	0.0173	0.1302	0.4922	5
2- Diler Yatirim Bankasi AŞ	0.0214	0.1609	0.6083	4
3-GSD Yatirim Bankasi AŞ	0.0103	0.0772	0.2920	6
4- Istanbul Takas Ve Saklama Bankasi AŞ	0.0218	0.1641	0.6204	3
5-Nurol Yatirim Bankasi AŞ	0.0270	0.2030	0.7675	2
6-Türkiye Sinai Kalkinma Bankasi AŞ	0.0352	0.2645	1.0000	1
2012	Total	Normal	Ideal	Ranking
1-Aktif Yatirim Bankasi AŞ	0.0219	0.1646	0.6966	3
2- Diler Yatirim Bankasi AŞ	0.0208	0.1566	0.6627	4
3-GSD Yatirim Bankasi AŞ	0.0152	0.1142	0.4832	6
4- Istanbul Takas Ve Saklama Bankasi AŞ	0.0280	0.2105	0.8908	2
5-Nurol Yatirim Bankasi AŞ	0.0157	0.1178	0.4986	5
6-Türkiye Sinai Kalkinma Bankasi AŞ	0.0315	0.2363	1.0000	1
2013	Total	Normal	Ideal	Ranking
1-Aktif Yatirim Bankasi AŞ	0.0148	0.1113	0.4403	6
2- Diler Yatirim Bankasi AŞ	0.0249	0.1870	0.7392	3
3-GSD Yatirim Bankasi AŞ	0.0169	0.1267	0.5008	4
4- Istanbul Takas Ve Saklama Bankasi AŞ	0.0277	0.2080	0.8225	2
5-Nurol Yatirim Bankasi AŞ	0.0152	0.1141	0.4511	5
6-Türkiye Sinai Kalkinma Bankasi AŞ	0.0337	0.2529	1.0000	1
2014	Total	Normal	Ideal	Ranking
1-Aktif Yatirim Bankasi AŞ	0.0120	0.0901	0.3800	6
2- Diler Yatirim Bankasi AŞ	0.0316	0.2372	1.0000	1
3-GSD Yatirim Bankasi AŞ	0.0173	0.1298	0.5474	5
4- Istanbul Takas Ve Saklama Bankasi AŞ	0.0260	0.1951	0.8226	3
5-Nurol Yatirim Bankasi AŞ	0.0201	0.1510	0.6368	4
6-Türkiye Sinai Kalkinma Bankasi AŞ	0.0262	0.1967	0.8292	2
2015	Total	Normal	Ideal	Ranking
1-Aktif Yatirim Bankasi AŞ	0.0145	0.1086	0.4283	5
2- Diler Yatirim Bankasi AŞ	0.0337	0.2535	1.0000	1
3-GSD Yatirim Bankasi AŞ	0.0082	0.0613	0.2419	6
4- Istanbul Takas Ve Saklama Bankasi AŞ	0.0311	0.2340	0.9231	2
5-Nurol Yatirim Bankasi AŞ	0.0233	0.1750	0.6906	3
6-Türkiye Sinai Kalkinma Bankasi AŞ	0.0223	0.1677	0.6615	4

Process is one of the most adequate methods for decision makers to decide in the presence of many variables of complex structure. In this study the goal is to find the financial parameters affecting the performance of a bank and determining the performance ranking of the banks.

In this study the performance analysis of the six Privately-Owned Development and Investment Banks operating in Turkey for the 2011–2015 period is made using

Analytic Network Process (ANP) and the findings are commented. State banks ranks generally first order because of big capital adequacy, the private banks rank changing by year.

ANP is a much more capable method than AHP and it is used in complex decision making problems. ANP is the first methodology to systematically show the every connection and feedback between the criterias and sub-criterias that affect the decision making process. ANP also is a good analyzer for the situations in which the numerical factors cannot be stated.

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Longevity Risk in Life Insurance

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Abstract In last years, longevity risk became as an important issue. One of the sectors that deal with longevity risk in their evaluations is insurance sector uses human life information as an input. If longevity risk is neglected, this case will cause to put false financial equivalence and also will bring the institutions face to face with serious losses during their capital adequacy calculations. The aim of this work is showing that capital liability is decreasing when we use longevity swap that is one of hedging approaches. Longevity swap is selected as an instrument for hedging. Lee-Carter model is applied to swap and mortality ratio equation. Estimation is done to swap and mortality ratio equation by using Monte Carlo simulation. Two conditions which are hedged and non-hedged cases were compared and has shown that under definig correct swap cost hedging provides to its user remarkable saving.

Keywords Longevity risk • Longevity swap • Mortality ratios • Lee-Carter model • Monte Carlo simulation

1 Introduction

Humankind has always worked on uncertain situations.They tried to minimize the adverse effects of unknowns on people's lives.The death times of creatures was always wondered by people and it was always at the beginning of the list of curiosities. Since we don't know the exact time of deaths, the information of how much capital should be saved for our financial calculations will always include risks. The reason of this risk is uncertainty and it can be reduced when the actuarial calculations contain future estimations and financial analyzes.This improvement will give us the chance to getting closer to the right conclusions.

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Unexpected cases can cause serious problem especially for companies that have lifelong payments to their customers (i.e. insured). Because of this reason the evaluations should be done with prudence and the risky situations should be managed properly. Hedging longevity risk is necessary and important especially for insurance companies which have pension plans. Life insurance companies should take into account longevity risk in their payment systems. Comparing the economic results of hedged and non-hedged cases is significant to understand the necessity and the importance of hedging longevity risk.

In general, there are two main ways to deal with longevity risk. One of them is revising mortality tables with the mortality and expected life developments. The other one is using derivative products to reduce the impact of unexpected life (SOA 2014, p.13). To avoid longevity risk I prefer the second method in this study, that is using swaps (longevity swaps) which are one of the most used derivative instruments in financial markets.

In first section for better understanding there are several longevity risk definitons, literature review and reference applications as background information. Additionally, mortality ratios and its relation with longevity risk is explained. To get through to this subject, there are also informations about time and age distributions of world's population structure.

In second section hedging longevity risk approach and Lee-Carter Model, that is used in hedging process, is indicated. Also, swap and its usage is clarifed. After that, Monte Carlo simulation is defined with its used place. For hedging longevity risk, there is also a corridor hedge defined and revealed clearly what this exactly is. According to this corridor hedging, the pricing is described. Afterward, longevity swap is defined with some real applications.

Third section is the application part that is already described in previous section. Longevity risk is taken in consideration. So that, hedged and non-hedged cases of liabilies for a pension scheme are compared. This application gave us the opportunity to make important analyzes and obtain serious conclusions. Consequently, results have shown that under definig correct swap cost, hedging provides to its user remarkable saving.

1.1 Longevity Risk and Literature Review

<u>Longevity risk</u> occurs when people live longer than it's expected and since this unexpected part, life insurance companies that have pension plans can come face to face with extra costs (Jones 2013, p.11). In other words this risk can be defined as opposite of mortality risk. There are many researches on longevity risk. In 1988, Marocco and Pitacco had analyzed mortality trends and had pointed out on the assumption that estimated mortalite tables should be in calculations used. Thus, longevity risk could be reduced. In 1999, Olivieri and Pitacco had defined Rectangularization (density of deaths around the mode of the curve of deaths.

i.e.increases longevity risk) and Expansion (mode of curve of deaths. i.e.insurers can decrease longevity risk with taking this points into account) (Coppola et al. 2000, p.50–52).

In twenty-first century, academic studies about longevity risk are increased. On the other hand, working on longevity risk is still not enough (Bank for International Settlements 2013, p.1). Especially in the releated financial markets, longevity risk and its negative impacts became even more important than before (Blake et al. 2009, p.491). In 2000, Riemer-Omel and Trauth had worked on longevity risk with a risk management mentality. In same year, Olivieri and Pitacco had worked on longevity risk in life insurance portfolio and its capital requirement (Pitacco 2002, p.13). Also Coppola, Di Lorenzo and Sibillo made a suggestion about composite financial and mortality risks. Another one is Ferri and Olivieri's study. They analyzed long term cares (Olivieri and Ferri 2002, p.1). The issue that they have analyzed is the movements of random mortality and also dependant elderly people that effect this movements.

In 2001, Olivieri and Pitacco studied on developed retirement and emphasised on correct capital reserve (Pitacco 2002, p.13). Moshe Arye Milevsky has several studies. One of them is mortality swaps and tax arbitrage in the Canadian insurance market (Milevsky and Charupat 2001, p.124–147). Another one is mortality derivatives and the option to annuitize (Milevsky and Promislow 2001, p.299–318).

In 2002, Olivieri and Pitacco had worked on mortality developments with Bayes. Also, Biffis and Oliver, worked on pension systems. They tried to find solutions to minimize this risk (Pitacco 2002, p.13). Another longevity study belongs to Peter Laslett. He defined third age (i.e. a new age level between middle age and old age) (Laslett 1991, p.85). Robert Butler's worked on human life. Jungian Allan Chinen worked on second half of life (University of Massachusetts 2002).

In 2005 Lin and Cox, Cowley and Cummins worked on life insurance and hedging operations. These works had contiued in 2006 by Dahl and Moller. In the same year, Blake had studied on pricing longevity bonds and Down had worked on pricing longevity derivatives, the survivor swaps (Blake, Waegenaere, Mcminn, Nijman 2009, p.3). Eric's study included hedging longevity risk with longevity bonds and showed that longevity risk is preventable by this way (Stallard 2006, p.575).

During 2006–2008 years Bauer, Russ, Biffis and Hari developed moddelling mortality term structure and pricinig forwards. In 2006–2009 Cairns, Dowd and Blake studied on mortality modelling (Blake, Waegenaere, Mcminn, Nijman 2009, p.4). In 2009, David PLOMP studied on longevity pricing with Lee-Carter model for Netherland population (Plomp 2009).

In 2012, Dauphine University had analyzed longevity risk's effect on mortality to emphasis on longevity risk. In this research, movement of mortality ratios were modelled with Extreme Value Theory for Portugal, Spanish and French populations (Bravo, Real, Freitas 2012, p.34). Same year, there was another research in New Zealand that worked on the impact of longevity risk in their pension systems. In 2013, Clark used mortality swaps as risk management to hedge longevity risk and mortality risk (Clark 2013, p.19).

According to some researchers, decrement in mortality rates will continue in the future. However, there is also counter view that the decreasing of mortality rates will be held up by social effects such as obesity, stress and lifestyle (Aro 2013, p.30).

In 27 April 2016, Prospera Financial Services reported that longevity risk is more serious than inflation risk nowadays. In this research, they defined expected life after retirement age as 10 years for previous generation. This life expectancy rose to 25–30 years for current generation. They pointed out that even there is no inflation risk during this process, pension plans will made loss because of rising expected lifes of people, which means longevity risk.

Also, one of the most important longevity conference is Internaitonal Longevity Risk and Capital Market Solutions Conference (Blake, Waegenaere, Mcminn, Nijman 2009, p.1). This is the platform that longevity risk is talked worldwide.

According to OECD, the old aged people's ratio in the whole population is rising in USA. This is an important example for all countries and gives us a serious clue about populations structures (Graphic 1 and Table 1).
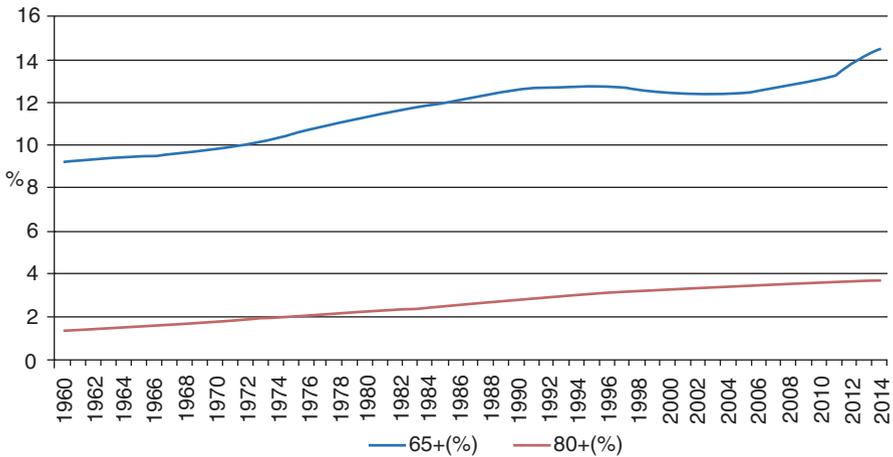
Graphic 1 Percentages of 65+ and 80+ aged people in USA (Source: OECD.Stat.Health Status 2016)

Table 1 Movement of 65 aged people in USA	USA	65+ Age (m)	Percentage in total population
	1960	16,7	9,2
	2002	35,6	12,4
	2014	46,2	14,5

OECD (2016)

In summary, goverments and life insurance companies didn't notice the potential financial risk of longevity till twentieth century. But all the researches that have done in last 15 years created a significant awareness on this issue and the developments on this risk type prompted people to hedging longevity risk.

Nowadays, longevity risk is at the forefront in developed countries. It should not be forgotten that if longevity risk is not taken into account in financial calculations by companies that deal with human life, the possibility of unexpected costs will rise and companies can come face to face with extra payments which they haven't predicted. Also, this means serious financial trouble for the related markets. The same scenario is expected for developing countries with delay.

Longevity risk and Solvency II are closely related to each other. Solvency is the affordability of liabilities for financial institutions. For being solvent means that there is enough or more assests for liabilities (Ferrouhi and Mohammed 2014, p.233). Otherwise, companies can have difficulty in affording their obligations. According to Internaitonal Association of Insurance Supervisors (IAIS), a company is solvent if it is able to afford its liabilities under most circumstances at any time (IAIS 2000, p.6). Solvency II has important impacts on pricing, reserve funds, capital and insurance operations for annual payments (O'Sullivan 2010, p.15). Solvency Capital Requirement (SCR) can be calculated in two ways. Companies can evaluate their risk profile using an internal model or can use standard modules which are prepared for this calculations.

In this research, capital requirement and pricing longevity risk are calculated under Solvency II conditions. Basically, total risk should be divided into risk types and all risk types should be multiplied with their own risk factors. According to Solvency II, life insurance companies should also calculate risk margin (RM) as well as SCR (Meyricke and Sherries 2013, p.7). Also, European Insurance and Occupational Pensions Authority (EIOPA) had advised to use cost of capital as %6 in RM calculations (EIOPA 2012, p.85).

Using financial derivative instruments is a useful way in hedging longevity risk and I chose swap as a financial derivative instruments. Swap is widely used for risk management for long years. When people live more than it had expected, insurance companies will come face to face with floating mortality rates. This instability will bring to the life insurance companies financial surcharge. The researches on longevity risk has shown that this type of instruments should be improved for hedging. Also, goverment support is essential for economic balance in this market (OECD 2014, p.12).

Longevity risk is well known especially for last 15 years and guarding against this risk is also getting important. So that, there are many financial transactions per year and this transactions bring profit to its user. For example, in 2015 there was a swap agreement between Axa insurance in England and Reinsurance Group of America (RGA) and is priced at €2.8bn. This company is the 50th company in England that made longevity swap transaction. Hymans Robertson indicated that this longevity swap trend will continue in financial markets. Another example ise the swap transaction operation between Pirelli and Zurich and is priced at €600bn. Table 2 shows some transactions informations (SOA 2014, p.14)

Table 2 Longevity swap and longevity risk transactions in 2013–2014

Fund	Providers	Solution	Size (€)
2014			
BT Pension Scheme	Prudential Insurance Company of America	Pension customized longevity swap	16 bn
Total UK Pension Plan	Pension Insurance Corporation/ Hannover Re	Buy-in and longevity reinsurance	1.6 bn
Royal London	RGA International Reinsurance Co	Longevity reinsurance	1.6 bn
AkzoNobel	Legal & General/Prudential	Buy-in and longevity reinsurance	3.6 bn
Aviva	Swiss Re/Münich Re/SCOR	Pension customized longevity swap	5 bn
2013			
BAE Systems	Legan & General	Pension customized longevity swap	1.7 bn
Astra Zeneca	Deutsche Bank/Abbey Life	Pension customized longevity swap	2.5 bn
Carilion	Deutsche Bank/Abbey Life	Pension customized longevity swap	1 bn
AEGON	Societe Generale CIB/SCOR	Longevity swap to capital market investors	1.4 bn
Pension Insurance Corp.	Reinsurers	Longevity reinsurance	1.4 bn
Philips Pension Fund	Rothesay Life	Pension insurance	0.484 bn
EMI Group Pension Fund	Pension Insurance Corporation	Buy-out of all liabilities	1.5 bn
Bentley	Deutsche Bank/Abbey Life	Pension customized longevity swap	0.4 bn
Abbey Life/ Rothesay Life	Hannover RE	Longevity reinsurance	1 bn
BAE Systems	Legan & General/Hannover Re	Pension customized longevity swap	3.2 bn

In April 2012, International Monetary Fund (IMF) has reported that companies have to take action against longevity risk to eliminate the impact of this risk (IMF 2012, p.2). There are 3 basic suggestions:

- For short and long term financial sustainability, goverments should recognize longevity risk and should also improve methods to measure this risk with updating relevant calculations.

- Goverment, pension companies and people should share longevity risk.
- It is difficult to overcome longevity risk when the whole risk is only in one market. Therefore, longevity risk should be divided among other markets, it should be transfered to more than one market.

1.2 Method

Lee-Carter, worked on central death rate for forcasting the mortalities. This ratio is defined as

$$m\left(x,t\right) = \frac{D\left(x,t\right)}{E\left(x,t\right)} \tag{1}$$

$m_{(x,t)}$: Central death rate for age x in year t
$D_{(x,t)}$: Number of deaths aged x in year t
$E_{(x,t)}$:Number of lives aged x in the middle of year t

Monte Carlo simulation is a common used approach type to empirical and statistic problems. This simulation method is based on the probability theory and relies on repeated random sampling to have numerical result (Hançerlioğullari 2006, p.546).

In this research pay off function is used for pricing longevity swap. Pensions (i.e. payments) are regular payments that are made under defined conditions (Plomp 2009, p.58). Pricing swap with pay off function is essential for hedging longevity risk. Also, pricing longevity risk is done under *equivalent utility pricing principle* and *risk neutral valuation principle* (Rooijen 2013, p.5). Pay off function is defined as

$$
\begin{aligned}
V\left[m\left(x,\text{fixed}\right),t\right] &= \text{notional} \times \left(E\left[m\left(x,t\right)\right] - m\left(x,\text{fixed}\right)\right)_{+} \\
&= \text{notional} \times \left(\hat{m}\left(x,t\right) - BE\right)_{+} \\
&= \text{notional} \times \left(\text{floating rate} - \text{fixed rate}\right)_{+}
\end{aligned} \tag{2}
$$

$E[m_{(x,t)}]$: Expected value
$m_{(x,\text{fixed})}$: Fixed mortality rate

1.2.1 Corridor Hedge

In 2012, AEGON insurance company and Deutsche Bank completed an important longevity risk management transaction. €12bn risk had transferred in this longevity risk contract (Deutsche Bank 2012, p.21). This swap transaction is one of the largest swap contracts. In this agreement, there was a corridor hedge between Aegon and
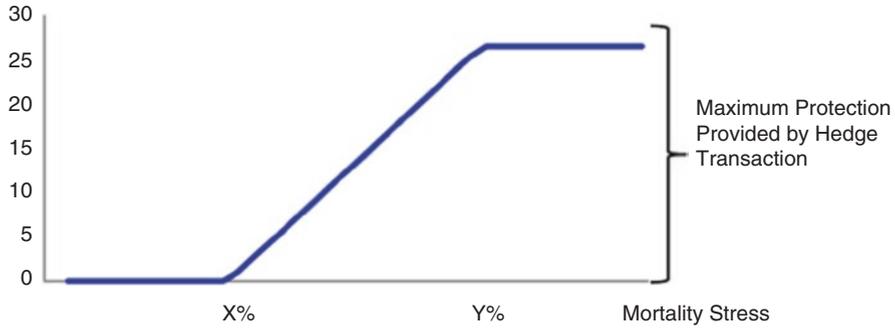
Graphic 2 Hedge payoff profile (Source: Deutsche Bank 2012, p.22)

Deutsche Bank. The structure of this corridor consisted of a predetermined interval and was limited by floor and ceiling. They agreed on floor and ceiling as 10% and %20 which are the decreasing rates of mortality ratios. So that, Deutsche Bank had to pay to Aegon when mortality rates decreased more then 10% (up to %20). If this downwardness took place more than %20 Deutsche Bank had to pay only %20 of this mortality decrease. Thus, payments were limited with these determined rates. Graphic 2 is an example of such limited payments.

In this study, *net present value of liabilities* were discounted and accumulated as below

$$\mathrm{NPV}(x) = \sum_{t=1}^{\infty} \left[\mathrm{CF} \cdot \prod_{i=1}^{t} \left(1 - m(x+i-1,i) \right) \cdot \mathrm{DF}(t) \right] \tag{3}$$

$\mathrm{NPV}_{(x)}$: Net present value for a fixed age x.
CF: Cash flow at time t
$m_{(x,t)}$: Expected mortality rate for a fixed age x at time t
$\mathrm{DF}_{t(x)}$: Discount factor at time t

For Risk Margin, EIOPA's suggestion is accepted and 6% is taken as cost of capital in this calculation (EIOPA 2012, p.85). According to this acceptance, this fixed ratio is applied to capital requirement that is based on the net present value of liability.

$$\mathrm{RM} = \sum_{t=0}^{\infty} \mathrm{CoC.SCR}_t.\mathrm{DF}_t \tag{4}$$

Net present value of liabilities with hedging longevity risk is as below updated

$$\text{NPV}_{\text{swap}}\left(x\right) = \sum_{t=1}^{\infty}\left[\text{MV}_{\text{swap}}\left(x,t\right) + \text{CF}.\prod_{i=1}^{t}(1 - m(x+i-1,i)).\text{DF}\left(t\right)\right] \qquad (5)$$

$\text{NPV}_{(x)}$: Net present value for a fixed age x.
CF: Cash flow at time t
$m_{(x,t)}$: Expected mortality rate for a fixed age x at time t
$\text{DF}_{t(x)}$: Discount factor at time t
$\text{MV}_{\text{swap}(x,t)}$: Market value of swap for a fixed age x at time t

$$\textbf{Hedging Cost}\left(\textbf{x}\right) = \sum_{t=T+1}^{\infty} c_x \cdot DF_t \qquad (6)$$

c_x: Cost of hedging longevity risk for a fixed age x, price of swap
$\text{DF}_{t(x)}$: Discount factor at time t

1.3   Application

As I said before, longevity risk plays a vital role all over the world. Improvement in life standards and extension of human life have critical impact of financial calculations. If longevity risk is neglected, this case will cause to put false financial equivalence and also will bring the institutions face to face with serious losses during their capital adequacy calculations.

The aim of this work is showing that capital liability is decreasing when we use longevity swap that is one of hedging approaches. Swap is selected as an instrument for hedging. For this purpose, longevity swap is used as a financial instrument and the contract with its conditions which is made between AEGON and Deutsche Bank in 2012 is taken as an example (Deutsche Bank 2012, p.16). Lee-Carter model is applied to swap and mortality ratio equation. Estimation is done to swap and mortality ratio equation by using Monte Carlo simulation. Two conditions which are hedged and non-hedged cases were compared and has shown that under definig correct swap cost hedging provides to its user remarkable saving. Hence, this hedging method is quite important and is a suggestible approach for financial markets due to high possibility of making profit.

1.3.1   Used Data in this Research

There are two applications for Turkey and Germany.

- For first application, original data of Germany is used that includes population and death information for 1970–2007 years. Also, 2015 German mortality table is starting point for estimation of mortality ratios .

- In second application, original data of Turkey is used that includes population and death information for 1935–2015 years. Also, TRSH 2010 Turkey mortality table is starting point for estimation of mortality ratios.

For each country, Lee-Carter model is applied and Monte Carlo simulation is used for mortality ratio forecasting. The basic data is obtained by simulating the historical data 1000 times. After this, taking the average of this simulations gave us the estimated mortality ratios. In this study, cash flows are taken as 1 unit. Also, interest rate is taken as %5 for discounting the liabilities. By calculating risk margin, the application of EIOPA is accepted and applied. If we take %6 of net present value of liabilities we will get risk margin. In this study calculations have done for 40, 50, 60, 70 and 80 age groups for each application. At the end of both applications, hedged and non-hedged cases were compared and has shown that under definig correct swap cost hedging provides to its user remarkable saving.

The reason why there is two different application is that there wasn't regular historical data for Turkey for last 30 years. Although, the same process has done, structure of this data didn't give us rational results. Therefore, a shock approach is used for central mortality ratio estimation. The rest of application process was same with first application.

The longevity swap agreement between AEGON-Deutsche Bank in 2012 is taken as an example and is adjusted as below

- Counterparty has no payment if the decrement of mortality ratio is less than 10%
- Counterparty has to pay all this unexpected part if the decrement of mortality ratio is between 10% and 30%
- Counterparty has to pay only the %30 of unexpected part if the decrement of mortality ratio is more than 30%

1.4   Results and Interpretation

Calculation 1
For non-hedged case, the liability of 40 age insured people is as below calculated. In this calculation CF (Cash Flow) is accepted as 1 unit. Also, mortality ratios in German mortality tables is used in these equations for all 40, 50, 60, 70 and 80 years. The average of female and male mortalite ratios is taken into account. In this calculation discount rate is used to find the net present value of liabilities and is assumed as %5 interest. By calculating risk margin, the application standards of EIOPA is accepted and applied to these equations. Also, these steps are done for all the selected age groups (Table 3).

Table 3 Central expected mortality ratios of Germany

Central expected mortality ratios of Germany

Year	1	2	3	4	5	6	7	8	9	10
40 age	0,00148	0,00163	0,001935	0,002066	0,002287	0,002599	0,002866	0,003308	0,003491	0,003716
50 age	0,004793	0,005201	0,005602	0,005997	0,006512	0,006784	0,006861	0,007719	0,008042	0,00901
60 age	0,010481	0,011996	0,012834	0,013209	0,014433	0,014806	0,016044	0,016684	0,017736	0,019338
70 age	0,026015	0,029442	0,030459	0,033664	0,037467	0,040001	0,043371	0,048274	0,050601	0,055927
80 age	0,06658	–	–	–	–	–	–	–	–	–

Year	11	12	13	14	15	16	17	18	19	20
40 age	0,004042	0,004438	0,00476	0,00509	0,005523	0,005689	0,005749	0,006482	0,006754	0,007503
50 age	0,008638	0,009865	0,010498	0,010693	0,011666	0,011906	0,012889	0,013403	0,014109	0,015366
60 age	0,020883	0,023565	0,024342	0,027088	0,030247	0,032447	0,03528	0,039439	0,041361	0,046029

Year	21	22	23	24	25	26	27	28	29	30
40 age	0,007176	0,008193	0,008643	0,008769	0,00954	0,009681	0,01047	0,010882	0,011458	0,012459
50 age	0,016617	0,01872	0,019268	0,02151	0,024023	0,025881	0,02825	0,03164	0,033244	0,03738

Year	31	32	33	34	35	36	37	38	39	40
40 age	0,013577	0,015309	0,015731	0,017737	0,019898	0,021464	0,023468	0,026459	0,027842	0,031419

Table 4 Capital requirement and risk margin table of hedged and non-hedged cases for Germany

	Non-hedged case			Hedged case			
	SCR	RM	Total	SCR	RM	SC	Total
40	26,44	1,18	**27,61**	22,79	1,00	0,37	**24,15**
50	18,22	0,76	**18,98**	16,26	0,67	0,22	**17,15**
60	11,22	0,44	**11,66**	11,09	0,44	0,08	**11,60**
70	5,56	0,21	**5,77**	5,54	0,21	0,01	**5,76**
80	1,39	0,07	**1,46**	1,39	0,07	0,00	**1,46**

$$\begin{aligned}
NPV(40) \quad &= \sum_{t=1}^{\infty}\left[CF.\prod_{i=1}^{t}(1-m(40+i-1,i)).DF(t)\right]\\
&= \sum_{t=1}^{\infty}\left[\begin{array}{l}1.\{(1-m(40,1)).DF(1)\\ +\big((1-m(40,1)).(1-m(41,2))\big).DF(2)+\ldots\}\end{array}\right]\\
&= 26,44\\
RM \quad &= \sum_{t=0}^{\infty}(\%6).SCR_t.DF_t\\
&= 1,18
\end{aligned}$$

$$NVP(40)+RM = 27,61$$

For hedged case, different than non-hedged situation is that simulated mortality rates are used in calculations. Furthermore, marked value of swap and swap cost are added to this calculations. Discount rate is used to find the net present value of liabilities and is assumed as %5 interest. By calculating risk margin, the application standards of EIOPA is accepted and applied to these equations. If we take %6 of the net present value of liabilities we will get risk margin amount. Pay off function which is based on floating mortality rates is used in cost calculation. Coupon values are calculated for each year and are discounted with %5 for finding present value. That gave us swap market value.

$$\begin{aligned}
NPV_{swap}\left(40\right) &= \sum_{t=1}^{\infty}\left[MV_{swap}\left(40,t\right)+CF.\prod_{i=1}^{t}(1-m(40+i-1,i)).DF\left(t\right)\right]\\
&= \sum_{t=1}^{\infty}\left[\begin{array}{l}MV_{swap}\left(40,t\right)+1.\{(1-m(40,1)).DF\left(1\right)\\ +\big((1-m\left(40,1\right)).(1-m(41,2))\big).DF\left(2\right)+\ldots\}\end{array}\right]\\
&= \sum_{t=1}^{\infty}\left[\begin{array}{l}\sum_{t=1}^{T=1}\left(p_{40,t}-c_{40}\right).DF_t +1.\{(1-m(40,1)).DF\left(1\right)\\ +\big((1-m\left(40,1\right)).(1-m(41,2))\big).DF\left(2\right)+\ldots\}\end{array}\right]\\
&= 22,79
\end{aligned}$$

$$RM = \sum_{t=0}^{\infty} (\%6).SCR_t.DF_t$$
$$= 1,0$$

$$SwapCost = \sum_{t=T+1}^{\infty} c_{40}.DF_{(t)} = 0,37$$
$$NVP_{swap}(40) + RM + SC = 24,15$$

All these calculations have done for all selected age groups. The results of this evaluations are in Table 4. The results of these applications had shown that despite swap cost in hedged case, total liability of hedged case is less then non – hedged case.

Calculation 2

For non-hedged case, the liability of 40 age insured people is as below calculated. In this calculation CF (Cash Flow) is accepted as 1 unit. Also, mortality ratios in TRSH 2010 mortality tables is used in these equations for all 40, 50, 60, 70 and 80 years. The average of female and male mortalite ratios is taken into account. In this calculation discount rate is used to find the net present value of liabilities and is assumed as %5 interest. By calculating risk margin, the application standards of EIOPA is accepted and applied to these equations (Table 5).

$$NPV(40) = \sum_{t=1}^{\infty} \left[CF.\prod_{i=1}^{t} (1 - m(40 + i - 1, i)).DF(t) \right]$$
$$= \sum_{t=1}^{\infty} \left[1.\left\{ \begin{array}{l} (1 - m(40,1)).DF(1) \\ +((1 - m(40,1)).(1 - m(41,2))).DF(2) + ... \end{array} \right\} \right]$$
$$= 26,32$$

$$RM = \sum_{t=0}^{\infty} (\%6).SCR_t.DF_t$$
$$= 1,17$$
$$NVP(40) + RM = 27,49$$

For hedged case, simulated mortality rates are used. Furthermore, marked value of swap and swap cost are added to this calculations. Discount rate is used to find the net present value of liabilities and is assumed as %5 interest. By calculating risk margin, the application standards of EIOPA is accepted and applied to these equations. If we take %6 of the net present value of liabilities we will get risk margin amount. Pay off function which is based on floating mortality rates is used in cost calculation. Coupon values are calculated for each year and are discounted with %5 for finding present value. That gave us swap market value.

Table 5 Central expected mortality ratios of Turkey

Central expected mortality ratios of Turkey

Year	1	2	3	4	5	6	7	8	9	10
40 age	0,000909	0,001015	0,001138	0,001275	0,001431	0,001591	0,001757	0,001934	0,002128	0,00237
50 age	0,002639	0,002942	0,003276	0,003646	0,004047	0,004502	0,005012	0,005588	0,006216	0,006918
60 age	0,007598	0,008382	0,009252	0,010189	0,011187	0,012266	0,013491	0,014866	0,016392	0,018083
70 age	0,01997	0,022146	0,02456	0,027247	0,030149	0,033381	0,036954	0,040998	0,045415	0,050378
80 age	0,05596									
Year	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
40 age	0,002639	0,002942	0,003276	0,003646	0,004047	0,004502	0,005012	0,005588	0,006216	0,006918
50 age	0,007598	0,008382	0,009252	0,010189	0,011187	0,012266	0,013491	0,014866	0,016392	0,018083
60 age	0,01997	0,022146	0,02456	0,027247	0,030149	0,033381	0,036954	0,040998	0,045415	0,050378
Year	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
40 age	0,007598	0,008382	0,009252	0,010189	0,011187	0,012266	0,013491	0,014866	0,016392	0,018083
50 age	0,01997	0,022146	0,02456	0,027247	0,030149	0,033381	0,036954	0,040998	0,045415	0,050378
Year	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**
40 age	0,01997	0,022146	0,02456	0,027247	0,030149	0,033381	0,036954	0,040998	0,045415	0,05038

Table 6 Capital requirement and risk margin table of hedged and non-hedged cases for Turkey

	Non-hedged case			Hedged case			
	SCR	RM	Total	SCR	RM	SC	Total
40	26,32	1,17	**27,49**	25,85	1,14	0,30	**27,29**
50	18,18	0,75	**18,93**	17,75	0,73	0,21	**18,69**
60	11,47	0,45	**11,93**	11,17	0,44	0,14	**11,74**
70	5,75	0,22	**5,97**	5,61	0,22	0,07	**5,90**
80	1,41	0,07	**1,48**	1,40	0,07	0,02	**1,48**

$$NPV_{swap}(40) = \sum_{t=1}^{\infty}\left[MV_{swap}(40,t) + CF.\prod_{i=1}^{t}(1-m(40+i-1,i)).DF(t)\right]$$

$$= \sum_{t=1}^{\infty}\left[\begin{array}{l} MV_{swap}(40,t) + 1.\{(1-m(40,1)).DF(1) \\ +\big((1-m(40,1)).(1-m(41,2))\big).DF(2)+...\} \end{array}\right]$$

$$= \sum_{t=1}^{\infty}\left[\begin{array}{l} \sum_{t=1}^{T=1}(p_{40,t}-c_{40}).DF_t + 1.\{(1-m(40,1)).DF(1) \\ +\big((1-m(40,1)).(1-m(41,2))\big).DF(2)+...\} \end{array}\right]$$

$$= 25,85$$

$$RM = \sum_{t=0}^{\infty}(\%6).SCR_t.DF_t$$

$$= 1,14$$

$$Swap\,Cost = \sum_{t=T+1}^{\infty} c_{40}.DF_{(t)} = 0,3$$

$$NVP_{swap}(40) + RM + SC = 27,29$$

The results of these calculations demonstrated that hedging longevity risk reduced the aggregate liabilities.Another important result of this applications is that this hedging method is more profitable when the ages are younger. As we can see from Table 4, for 80 age there is nearly no difference of total liabilities (Table 6).

1.5 Conclusions and Suggestions

In last years, longevity risk became an important issue. One of the sectors that deal with longevity risk in their evaluations is insurance sector uses human life information as an input. The fact that is populations are getting older. United Nations draw the attention on this aging process with world populating ageing reports.

In this context, longevity swap is a hedging method different from reinsurance and companies can use this method in their risk management process. The first longevity hedging operation in capital market is taken place between JP Morgan and Lucida (an pension fund in UK) via q-forward in 2008. In the same year, the first longevity hedging operation with longevity swap is occured between UK life insurer Equitable Life and Canada life insurance company €500bn. In 2004, European Investment Bank announced the first longevity bond. The duration was 25 years and hedging amount was €540bn. Even this operation was also for hedging longevity risk it couldn't be applied because of unsuitable duration, price and population structure. In 25–26 September 2008, longevity swaps were discussed in the conference which was hosted by Netspar and pension institute. Also, CreditSuisse was one of the pioneers at using longevity risk. In 2009, survivor swaps were offered by German boursa. In 2010, the world bank announced a $50bn longevity bond with 8 years maturity. In 2011, JP Morgan had bought Pall UK pensions investments risk which was £70bn. All these operations are hedging longevity. Most of the risk transactions occured in UK. In 2012, 3 important transfers has done that are taken place in Netherland and USA. General Motor and Prudential insurance made a buy out risk transfer transaction $26bn. The other risk transfer is taken place between AEGON-Deutsche Bank with longevity swap €12bn.

All these examples show that dealing with longevity risk is an important part of risk management. In this study, there are two applications.

For the first application (that is calculated with data of Germany) we can see that for 40 age people, total liability is decreased after hedging longevity risk 3,46 unit from 27,61 to 24,15. However when we analyze this for 70 age people this decrement will be only 0,01 unit from 5,77 to 5,76. For the second application (that is calculated with data of Turkey) the total liability for 40 age people is decreased 0,2 unit after hedging longevity risk from 27,49 to 27,29. For 70 age people, the total liability is decreased 0,08 unit.

This study revealed that this hedging strategy has different impact of different age groups. Companies can made more profit when they hedge young aged insured groups. This hedging method is more profitable when the ages are younger. Also, hedging longevity won't be so much effective when the hedged group is old aged. In this study, we can see that for 80 aged people even hedging longevity is done total liability is not changed. In other word, there is neither profit nor loss for this age group.

As a consequence, the interest ratio, corridor hedge and the fluctuation of mortality ratio can change and all these calculations can be adjusted under different swap costs. Furthermore, using longevity swap is an alternative way to reduce companies liabilities and is a suggestible approach for financial markets due to high possibility of making profit. It should not be forgotten that using national mortality tables and updating them periodically is essential for actuerial calculations.

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Estimating the Effect of Common Currency on Trade in West African Monetary Zones: A Dynamic Panel-GMM Analysis

Cagay Coskuner and Godwin Oluseye Olasehinde-Williams

Abstract   The purpose of this study is to evaluate the effect of common currency on economic performance of ECOWAS member nations in terms of international trade patterns. To achieve this objective, we applied the Generalized Method of Moments (GMM) estimation technique to a dynamic panel gravity model of bilateral trade between ECOWAS countries. A dummy variable of common currency was introduced to determine if the ECOWAS member states that have already adopted a common currency (WAEMU) fare better than those that are yet to adopt a common currency (WAMZ). Results show that adoption of common currency by WAEMU states has led to better trade performance in comparison to WAMZ states. We conclude that there is a strong case for monetary integration in the ECOWAS sub-region.

Keywords   Monetary integration • International trade • Gravity model • Dynamics • GMM

1   Introduction

According to Tsangarides and Qureshi (2008), since the adoption of the Euro by the European Union as its common currency, interest in monetary integration has surged globally. The West African community is not left out of this global trend. Like several other regions, the ECOWAS region also plans to launch a common currency to be called ECO by the year 2020. This is a major economic decision that is likely to have far-reaching consequences for the individual economies of the countries in the group and as well as for the entire regional bloc at large. Such a major economic decision needs to be critically examined before it is put into operation. This is quite important because just like so many previous studies have claimed that monetary

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integration impacts economic performance positively, usually through increased trade and economic growth (Stankovic 2013), several other studies have also claimed that the adoption of a single currency can in fact be limiting and counter-productive (Feldstein 2012; Krugman 2011).

The main argument against monetary integration is that member countries are forced to abandon their domestic currency and harmonize their nominal exchange rates. The countries surrender their monetary policy initiative to a common central bank thereby losing the ability to deal with asymmetric shocks (Houssa and Leuven 2004). In fact, in recent times the world has witnessed occurrences like Brexit — ideas that call into question the relevance of economic models that render domestic autonomy inferior to the authority of international agreements.

This study therefore aims to empirically examine whether the adoption of a common currency will result in better economic performance, especially in the aspect of trade within the region. A key objective is to compare the performance of the 2 sub-groups within the ECOWAS region in order to determine if the group belonging to a monetary union has fared better than the other group.

2   Background

The economic community of West African states (ECOWAS) which is made up of 15 West African countries was formed on the 25th of May, 1975. The specific objective behind its creation is the promotion of regional integration and economic cooperation resulting in the emergence of a large, single trading bloc. The founders of the group believed that such regional integration was the most effective means of achieving sustainable development.

Interestingly, within the ECOWAS group are 2 sub-groups; the West African Economic and Monetary Union (WAEMU) which is made up of 8 countries (Benin, Burkina Faso, Cote d'Ivoire, Guinea Bissau, Mali, Niger, Senegal, and Togo), created to drive economic integration in the West-African countries that have already adopted the CFA Franc as a common currency, and the West African Monetary Zone (WAMZ) which is a group of 6 countries (Gambia, Ghana, Guinea, Liberia, Nigeria and Sierra Leone) with the intention of introducing their own common currency. Cape-Verde is the only ECOWAS nation that does not belong to either of both groups. A monetary unification of these two groups which is expected to result in a single currency to be called ECO by the year 2020 is a major objective of the ECOWAS region.

3   Literature Review

According to Debrun, Masson and Pattillo (2010), there are three main empirical approaches used in evaluating the suitability of monetary unions.

The first approach has its foundation in the Optimum Currency Area (OCA) theory. This theory, also called Optimum Currency Region (OCR), is perhaps the most popular in the analysis of monetary integration. It was introduced by Mundell (1961) and McKinnon (1963), with further improvements by Kenen (1969) and Krugman (1990). The theory is often used as a basis for determining whether or not a group of countries should go ahead to form a currency union. The OCA theory is a cost-benefit analysis. It is a common method of evaluating the costs and benefits attached to joining a monetary union. According to Tsangarides and Qureshi (2008), under OCA theory, the costs and benefits are dependent on the types of shocks the monetary union members are exposed to, as well as their speed of adjustment to such shocks. For example, if the shocks are symmetric, the costs will be lower, but if they are asymmetric, the costs will be higher.

Selected Empirical works following OCR approach
Fielding and Shields (2001) develop a model to estimate output shocks and exchange rate in the CFA Franc zone of Africa (WAEMU). Their findings show that there is no evidence in support of the fact that the use of common currency results in greater integration. Similarly, Houssa and Leuven (2004) with the aid of a dynamic factor model evaluate monetary union cost within West Africa on the basis of asymmetric aggregate demand and supply shocks. The findings support the presence of economic costs within the region as supply shocks are asymmetric between the countries of the region. Bangaké et al. (2008) creates an index of OCA for CFA zone countries with a regression of bilateral nominal exchange rate of volatility on traditional OCA variables. His conclusion is that structural convergence exists between WAEMU countries. Sugimoto (2008) examines whether or not the West African region forms an optimum currency area through the use of a GNPP-Generalized Purchasing Power Parity model. Based on his findings, he concludes that both WAEMU and WAMZ zones separately meet the required conditions for establishment of a common currency area. Zhao and Kim (2009), with a Vector Autoregressive Regression analysis examine the nature of shocks that CFA member nations are exposed to, and they find that while country-specific shocks play very vital role in domestic output of CFA Franc countries, regional shocks are not so important. The conclusion of the authors is that CFA zone nations are susceptible to asymmetric shocks since they differ structurally from each other. Chuku (2012) examines whether West Africa forms an optimal currency area. A multivariate structural VAR procedure was applied and according to the findings, the patterns of supply, demand and monetary shocks are very asymmetric in nature—an indication that the ECOWAS region will face major difficulties in operating a common currency.

The second approach focuses on the evaluation of the levels of convergence of specific macroeconomic indicators among potential member nations of the monetary union. According to Debrun *et al*. (2010), this approach is not based on any particular theory; rather, it focuses on the monitoring of specific indicators agreed upon as entry requirement by the potential member nations.

Selected empirical works focusing on convergence levels

Masson and Dore (2002), on the basis of convergence criteria set up by WAEMU countries, review fiscal adjustments within the zone. Findings indicate that WAEMU countries post-1994 have experienced divergence rather than convergence. Cham (2009) examines the feasibility of monetary union in the West Africa Monetary Zone on the basis of OCA and convergence criteria. The results reveal that the zone failed to meet both the convergence and OCA criteria. Alagidede, Coleman and Cuestas (2012) examine inflation dynamics and common trends in GDP of countries intending to form the West African Monetary Zone. Using fractional integration and cointegration methods, the authors discover heterogeneous behaviour among the said countries. Okafor (2013) carries out a cost-benefit analysis of a single currency within the WAMZ zone. Vector Auto-regression and panel estimation were used to estimate behavioral models for cost and benefit elements. The study concludes that fiscal policy distortions remain a major challenge to a common currency in the WAMZ zone. Asongu (2014) investigates the existence of real, monetary and fiscal policy convergence within African monetary unions (mainly in the EAM and WAMZ zones), with the aid of a dynamic panel GMM estimation, the author concludes that there is lack of convergence within the region.

Also, the study by Saka, Onafowokan and Adebayo (2015) assesses monetary union in West Africa through a panel estimation of Beta convergence for the period 2000–2008. The result of the study suggests that there is income convergence among the involved countries and therefore that integration via monetary union will likely lead to steady growth and better equilibrium state.

The third approach involves the comparison of economic performance of existing currency unions with the economic performances of non-members of a monetary union. Under this approach, focus is usually on economic growth, regional trade and business cycles.

Selected empirical works based on comparison of economic performances

Guillaume and Stasavage (2000) studied African monetary policy, with special emphasis on the countries involved in regional monetary agreements such as the Rand monetary area, CFA and East African currency board. The findings suggest that monetary unions have the ability to serve as a means of providing credible commitment to macroeconomic policies within the included countries. Glick and Rose (2002), with a panel data set of 217 countries for the period between 1948 and 1997, examine if opting out of a monetary union has any impact on international trade. The findings claim that countries that opted out of monetary unions witnessed significant reduction in international trade while countries that opted to join monetary unions experienced significant increases in international trade. Also, Anyanwu (2003), using both descriptive and empirical methods analyzed how trade and output is affected by monetary union within WAEMU and other ECOWAS nations. The author concludes on the basis of empirical evidence that both international trade and economic growth are positively affected by monetary union. The result suggests that ECOWAS nations with single currency trade twice as much with each other than with other countries of ECOWAS. The result also suggests that the ECOWAS

countries with single currency experience very substantial increase in their output. Masson and Patillo (2004) claim that due to strong commitment to a fixed exchange rate regime and stable currency convertibility, CFA member states have enjoyed greater stability in their economic and financial space.

4   Data and Methodology

The empirical analysis of monetary union suitability for this study will be based on the economic performance comparison approach. This approach is the most appropriate because the study is centered on 2 groups which are to be compared—the WAEMU group having already adopted a common currency (CFA Francs), and the WAMZ group currently in the process of adopting a common currency.

4.1   Data

Data covering the period between 1999 and 2013 on the variables in Eq. 3 was collected for 10 out of the 14 WAEMU and WAMZ countries based on the availability of data. These 4 countries—Guinea, Liberia, Sierra Leone, and Guinea Bissau— were dropped because of lack of sufficient data. Data was sourced mainly from the UN comtrade database, containing annual trade statics of countries and the World Development Indicators published by the World Bank.

4.2   Gravity Model of Bilateral Trade

Jan Tinbergen's (1962) seminal work has firmly established that the gravity equation law can be used to measure the volume of trade between any 2 nations. The gravity model establishes that trade volume between countries is negatively related to the distance between them and positively related to their economic size. Overtime, the traditional gravity model has been augmented with several other variables.

   The general multiplicative form of the gravity model is given as:

$$X_{ij} = GS_i M_j \phi_{ij} \tag{1}$$

   Where: X_{ij} represents the value of exports from i to j in monetary terms. G represents the level of world liberalization. S represents export specific factors (for example, GDP of exporting country). M represents importer specific factors (for example, GDP of importing country). Φ represents the ease of access of i to the market of j (inverse of bilateral trade costs). I and j represent the pair of countries involved in bilateral trade.

The standard means of estimating the gravity model because of its multiplicative form is through taking natural logarithms of the variables included in the model. This gives an estimation equation:

$$\ln X_{ij} = lnG + \ln S_i + \ln M_j + \ln \phi_{ij} \tag{2}$$

In this study we further augment the gravity model with the inclusion of a Franc-dummy, amongst other commonly used regressors in gravity model estimations to test the impact of currency union on international trade. Also, while most trade researchers apply static panel estimations, strong arguments have been made for introduction of dynamism into gravity model of trade estimations, mainly because lagged values of trade volume have significant effect on actual bilateral trade between countries (Bun and Klaassen 2002; Pllaha 2012). Moreover, static panel regressions, by not accounting for the underlying dynamics in the model, cause dynamic panel bias which results in model misspecification (Baltagi 2008; Baum 2006; Bond 2002; Greene 2008).

We therefore estimate the dynamic panel model:

$$lnT_{ij} = \beta_0 + \beta_1 lnT_{ij-1} + \beta_2 \ln\left(Y_{i*}Y_j\right) + \beta_3 \ln\left[Ypc_i - Ypc_j\right] + \beta_4 \ln Distance_{ij}$$
$$+ \beta_5 BORDERDUMMY + + \beta_6 FRANCDUMMY + \varepsilon_{ij} \tag{3}$$

Where: T_{ij} represents the trade volume between countries i and j in monetary terms. Y_i and Y_{pci} are the GDP and GDP per capita of exporting country respectively. Y_j and Y_{pcj} are the GDP and GDP per capita of importing country respectively. lnT_{ij-1} represents the lagged values of trade volume, Y_i*Y_j is the product of GDP for country-pairs and $[Ypc_i - Ypc_j]$ represents the absolute value of the difference between per capita incomes of country pairs. Distance refers to the distance between country-pairs. Border-dummy is a dummy variable in which countries with common border take the value of 1 while those without common border take the value of 0. Distance and dummy for common border are used to proxy trade costs. It is assumed that trade costs are lower for neighboring countries and increases with distance. Finally, Franc-dummy is a dummy variable in which WAEMU countries take the value of 1 and WAMZ countries take the value of 0.

4.3   Generalized Method of Moments

A basic problem with the specified dynamic panel model is that because T_{ij} is a function of the error term, it follows that T_{ij-1} is also correlated with the error term, and this violates the zero conditional mean assumption and introduces endogeneity bias (Baltagi 2008). This problem is easily dealt with through the use of Generalized Method of Moments (GMM) estimation. According to Baum (2006) and Roodman

(2006), the Generalized Method of Moments (GMM) technique is the most suitable means of estimating dynamic panel models since it always produces consistent estimates.

There are 2 commonly adopted types of GMM regressions, the difference-GMM (Arellano and Bond 1991) and the system-GMM (Arellano and Bover 1995; Blundell and Bond 1998). They are both dynamic panel estimators that are particularly useful under the following circumstances; when one of the regressors is a lagged value of the independent variable, when there is a possibility that regressors are correlated with past and current realizations of the disturbance term (non-strictly exogenous regressors), in the presence of serial correlation and heteroscedasticity within entities (Roodman 2006).

For this study, we apply the system-GMM estimation for the following reasons; first, our model includes distance as a regressor and since it is time invariant, differencing it will cause it to disappear. Second, differencing unbalanced panels magnify the gaps in the data series. There are gaps in data used for this study, thus the difference-GMM is not suitable. Third, according to Baltagi (2008), the system-GMM generally produces more efficient estimates.

5   Results and Analysis

We estimate Eq. 3 with a Generalized Method of Moments (GMM) technique to address this problem. Our instrumental variables include (-1 and -2) time lags for trade volume, product of GDP pairs and the absolute value of the difference between per capita incomes. The result is presented in Table 1.

Most of the variables are significant and carry the expected signs as dictated by gravity literature. The coefficient of lagged trade volume show that past trade volume positively influences the current trade volume, 1% increase in lagged trade volume results in 0.3% increase in current trade volume. This supports the findings of Harris, Mátyás, and Tombazos (2008) and Pllaha (2012). The coefficient of the

Table 1 Dynamic panel GMM result

$\ln T_{ij-1}$	0.311317[b]
$\ln(Y_i^a Y_j)$	0.611876[a]
$\ln(Y_{pci} - Y_{pcj})$	0.256424[b]
$\ln Distance_{ij}$	−3.085686[a]
Border-dummy	−1.541693
Franc-dummy	5.33131[a]
Sargan(p-value)	0.229353

[a]Significant at 1% level
[b]Significant at 5% level
[c]Significant at 10% level

product of GDP of country-pairs show that economic size of countries has a positive and significant impact on trade volume, unit increase in this variable causes a 0.61% increase in trade volume. This is in accordance with the gravity theory of trade. The coefficient of the absolute value of the difference between per capita incomes is positive and significant. 1% increase in this variable result in 0.26% rise in trade volume. There are 2 opposing theories about the relationship between these 2 variables; the Heckscher-Ohlin theory claims that the absolute value of difference between per capita incomes will have a positive impact on trade volume, while the Linder theory claims that the effect is negative. Our result provides evidence in support of Heckscher-Ohlin theory. In line with the gravity theory of trade, 1% increase in distance between country-pairs results in a 3.1% decline in trade between country-pairs, an indication that trade costs increases with distance. The impact of shared borders on trade is indeterminate in this study since the result is statistically insignificant.

Finally and most importantly, the Franc-dummy coefficient when converted to natural numbers show that trade volume is 5 times bigger between countries that belong to WAEMU than in countries that belong to WAMZ. The value is greater than that of Anyanwu (2003) who found it to be 2 times bigger. The insignificant p-value of the Sargan test of over-identifying restrictions is an indication that our results are valid and do not suffer from instrument proliferation.

6   Conclusion

The intent of our study is to examine the possible impact of the establishment of a currency union in West-Africa on trade volume within the region. This was done by comparing the 2 sub-groups (WAEMU and WAMZ) within the region on the basis of international trade volume between their members. A dynamic panel gravity model was created to address this objective after having introduced the lagged values of international trade volume into the specified model.

Our empirical findings are of great importance, most especially to policy makers saddled with the responsibility of making decisions about the modalities of the currency union in West Africa. The wide difference between WAEMU and WAMZ countries in terms of international trade volume (despite the fact that the economic size of WAMZ nations put together is bigger than that of WAEMU nations put together) clearly shows that the introduction of a currency union has been of great economic benefit to WAEMU member countries.

We find that countries that share CFA franc as common currency trade about 5 times more with each other than other West African countries with their individual currencies. We therefore argue that it is justifiable to establish a common currency for the entire region as proposed by policy makers. We however suggest a lot of caution in the establishment of the said single currency as other studies have pointed to the existence of fiscal policy distortions that may impede the process (Okafor 2013; Asongu 2014).

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Measuring the Financial Stability of Islamic and Conventional Banks in Turkey

Marei Elbadri and Eralp Bektaş

Abstract The objective of this study is to measure and compare the financial stability of Islamic and conventional banks operating in Turkey for the period of 2006–2015. The sample consists of twenty-nine banks, including five Islamic and twenty four conventional banks. The study focus on three kinds of variables: bank specific, banking sector, and macroeconomic. The study builds on quantitative tools using panel regression in which the z-score used as a proxy for financial stability. We find that financial stability for large commercial banks is less than for small commercial banks, and financial stability for large Islamic banks is less than for large commercial banks. Small Islamic banks tend to be financially more stable than large Islamic banks, large Islamic banks financial stability is less than large commercial banks, and small Islamic banks tend to be financially more stable than large Islamic banks. The major results show that the existence of a financial crisis has a negative and significant impact on financial stability of banking sector in Turkey. The findings also indicate that the bank size, loan to asset ratios, cost to income ratio, income diversity and HHI have a negative and significant impact on financial stability of banks operating in Turkey. Banks operating in Turkey with higher Islamic banks' share have contributed effectively to improve the financial stability in turkey. The study showed that the oil prices and political stability have a negative and significant effect, while stock prices have a positive and significant effect on the financial stability of the banks operating in Turkey. Macroeconomic variables GDP and inflation have significant effects on stability, which explains the importance of financial and economic policies of the government in increasing the financial stability.

Keywords Islamic Banking • Conventional Banking • Financial Stability • Financial Crisis

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1 Introduction

Recently, Islamic financial industry is in the focus of consideration in the traditional financial markets. At the same time, Islamic financial industry is a rapidly growing system of the financial world. In fact, Islamic financial industry is widely spread not only within Muslim countries but also to many other countries where there is an Islamic community. According to some statistics, more than two hundred and fifty financial institutions in more than forty five countries exercise some financial activities submissive with Islamic Shariah. Moreover, for the past 5 years the Islamic financial industry has been increasing greater than 15% annually. The recent yearly revenue of the market is approximated to be $350 million versus $5 billion in 1985. A detailed research was conducted in the 1970s which indicated the arrival of the Islamic banking industry. This industry was concentrating mainly on the feasibility and operation of deposit-accepting financial institutions. Yet, these institutions mainly functioned on the basis of profit and loss sharing partnerships instead of the payment or receipt of interest; the reason being Islam prohibits interest in its bylaws (Greening and Iqbal 2008).

Islamic banks depend on different business principles such as lender-borrower cooperation instead of interest, with profit and loss sharing. However, profit and loss sharing principle are applied through different approaches such as Musharakah approach which is used to finance long term projects. The project consists of the client contributing some of his own equity capital for investment but the remaining of the equity is provided by the bank Mudaraba. In this situation, all capital required to finance the project is provided by the bank; this is where the client provides his expertise and his labor. Ijara model is similar to the conventional operating lease but without the option of ownership for the client. This pattern of operation assists Islamic banks to be more constant because they persuade investors to expand and increase their profits. Therefore, the investment will raise and competence will advance (Ouerghi 2014).

Financial stability can be defined as the condition where the financial system is able to direct capital to its most profitable investment opportunities without major disturbances. In other words, the financial system is stable if it is capable of absorbing shocks without disrupting the financial intermediation process. Otherwise, it can collapse, with a related detrimental impact on the real economy. It follows that the financial system does not meet the stability definition when it is stable but does not have the capability of efficiently allocating capital (Babecky et al. 2010). The stability of the banking system is regarded as the basis of the stability of whole financial sector where banks play an important role especially in the money creation, financing of investment, economic growth and payment system. Moreover, to conserve economic and financial stability, central banks and other authorized institutions have a special interest in evaluating the banking system stability. The banking system stability is usually reflected by advantages such as bank runs or liquidity and following risks concerning to liquidity in the banking sector, which affect their customers and thereby their levels of confidence (Hussein 2010).

The recent financial crisis has led to re-focus on the relationship between financial reliability and Islamic banks; in particular, on the ability of the Islamic banking

system during the period of crisis. In the recent years academics and specialists of Islamic finance industry found the significant growth in Islamic finance. On the other hand, others have justified that the short of revelation to the type of resources are linked with most of the losses. These loses are faced by many traditional banks during the crisis period. The nature of Islamic finance based on the assets and risk sharing led to the protection of Islamic banks against the effects of financial crisis. Some have justified that Islamic banks resembling conventional banks, adopted on leverage in addition to large risks that make them exposed to the impact of the second global crisis (Hasan and Dridi 2010).

The Islamic banking industry is a rapidly growing sector in the financial system of the world. In fact, this industry in some countries has become important and in other countries it is largely ignored. There are many factors that have assisted this rapid growth. For instance, strong demand for Shariah-compliant products demand a grow by traditional investors for the purposes of diversification, developments in the framework of Islamic finance, regulatory and legality and the ability of Islamic banks to make several financial instruments that meets the majority of the needs for investors who estimate the indication that the Islamic banks size at the level of the world was about $820 billion at the end of 2008 (Hasan and Dridi 2010).

The most important reason underlying every financial crisis was the result of excessive and non-wise lending from banks during a long time period. Which raises the question, what makes banks resort to such unhealthy and incorrect practices, which destabilize the financial system and harm their interest in long-term (Ahmed 2010). The main reasons are the asymmetry of information for market participants. Excessive volatility in economy, such as, fluctuations in global interest rates, term of trade changes, changes in exchange rates, the massive expansion in granting bank credit, incentives to the flow of money followed by a surprise collapse in the prices of asset, which leads to a mismatch among the maturity of assets and liabilities for the banks are among the main reasons. In addition, growth of the money supply at a faster rate than Gross domestic product (GDP). Moreover, the massive intervention of government in the regulation of banks, and the absence of effective control early, weak legal and accounting systems for the banking sector. Sometimes financial crisis may be caused by a change of exchange rates through the purchase and sale of foreign currencies, or the occurrence of unexpected deterioration in value of real and financial assets of the bank. Such a case, central banks play a role to rescue the bankrupt bank, and thus prevent the occurrence of a banking crisis (Ghassan and Taher 2013).

1.1 Problem Statement

There has been a number of studies regarding Islamic banking system. The studies which have been carried was for the banking system without interest. It has been seen that there is a vital need to establish the appropriate tools for an early warning

system to anticipate bankruptcy especially in an Islamic banking system due to the Islamic banks' nature.

The damage of the financial crisis worldwide is limited for the Islamic banks. But this is not because these institutions are protected, it is because the Islamic banks competed between capitalized and traditional banks. As a result, the countries which follow the Islamic banking system are not affected by the global financial crisis. Nevertheless, there were a few cases of financial distress of Islamic banks, which must be taken into account. For instance, there was an incident of the Souk Al-Manakh Stock Market (1986–1987) that caused all the banks in Kuwait to become insolvent which was due to the large amount of debt arising from the collapse. There are other examples such as the liquidation of the International Islamic Bank in Denmark in 1986 as result to excessive exposure to finance a single client. Also Islamic investment companies of Egypt in 1988 closed as a result of weak corporate governance and management irresponsibility as well as inappropriate regulatory frameworks in respect to the entry of Shari'ah non-compliant activities. Additionally, the collapse of the Ihlas Finance House in Turkey in 2001 indicated the most serious case of Islamic bank failure. A recent crisis in late 2009 is known as the Dubai Debt Crisis when Dubai World requested a restructuring $26 billion in debts which left the world economies shaking. The major concern in this case was the delay in the repayment of a $4 billion to Islamic bond or sukuk, which matured on December, 2009 (Othman 2012).

According to the above discussions, these cases led us to conduct this study to measuring and comparing the financial stability of Islamic and conventional banks operating in Turkey.

1.2 Aim of the Study

The primary aim of the study is to measure and compare the stability of the Turkish banks, covering Islamic and conventional banks operating in Turkey, through the use of data from 2006 to 2015, which also covers the global financial crisis shocks (2007–2008).

1.3 Significance of the Research

The importance of this study stems from the importance of the banking sector, where the banking sector is considered to be one of the most important key sectors in the Turkish economy. This is not only for its important role in the mobilize domestic and foreign savings and finances. But it includes the investment which is the backbone of economic activity. This represents the most important communication tool with the outside financial world.

1.4   Organization of the Study

The study is organized as follows: following the introduction in Sect. 1, Sect. 2 discusses literature review, Sect. 3 describes data, methodology and the tools for measuring bank stability, Sect. 4 states empirical results and Sect. 5 gives the conclusion.

2   Literature Review

There are a few studies interested to measure and compare the financial stability in the Islamic and conventional banks, especially using quantitative methods and they will be summed up as follows:

Study of Kaleem (2000) attempted to evaluate and develop the demand for instruments compliant with Islamic Sharia, in the case of the dual banking sector. This empirical study aimed to examine the validity of the hypothesis that the financial instruments compliant with Islamic Sharia are as stable as that on the basis interest. In the case of the dual banking sector operating in Malaysia for the period of 1994–1999 to test the performance of the banking system. Pre and post of the financial crisis took place in the years between 1997 and 1998 and the results indicated that the banking system compliant with Islamic Sharia was more stable compared with the conventional banks operating in Malaysia.

Ali Mirzaei (2010) test the effect of Market Power on the stability of Islamic and conventional banks in the Middle Eastern countries. Used bank-level panel data assesses high returns relatively in the Islamic banking system. The study concluded that the banking system based on Islamic Sharia is biased towards the returns of market power hypothesis. As for the interest rates spreads seems to characterize the traditional system with the trade-off between returns and risk. Profitability was continuous and strong which shows that leaving the competitive structure of the market may be important.

Čihák and Hesse (2010) analyze and compare the financial stability between two types of banks which are Islamic and conventional banks, through the use of ZSCORE as an indicator to measure the financial stability. The data is obtained from the Bank Scope with the sample consisting of 20 countries. The study covered the period from 1993 to 2004. They concluded that the small Islamic banks were financially more stable than small conventional banks, the largest Islamic banks were financially weaker than large conventional banks. Also they found that small Islamic banks are stronger than large Islamic banks. This conclusion may reflect the challenges which large Islamic banks in the management of credit risk face. In addition, it was found that the market share of Islamic banks significantly does not have an effect on the financial strength of the conventional banks.

Iskenderoglu and Tomak (2013) examines the relationship between competition and stability in the Turkish banking sector using quarterly bank level data of 15

private commercial banks, covering the period of 2002–2012. They used Z-index and NPL's (The ratio of nonperforming loans to total loans) as dependent variables to measure for financial stability. As they used fixed assets to total assets and deposits to total assets on bank level, the log value of bank level Total Assets, Herfindahl–Hirschman Total Assets index, the Herfindahl–Hirschman Deposit index and Herfindahl–Hirschman Loans indexed as Independent variables. Therefore, their findings did not support well known theories that stand out on the relationship between competition and stability of the banking sector so far. These findings suggest that it is not possible to make any rigorous inference that one view is relevant to the Turkish banking system.

Rahim and Zakaria (2013) examined and compared financial stability between Islamic banks and conventional banks operating in Malaysia, during the period from 2005 to 2010. The sample of study consisted of 17 Islamic banks and 21 conventional banks by using a panel data analysis. The researchers used both the ZScore and non-performing loans to total loans as a proxy indicator for financial stability. The results indicate that Shariah-compliant banks compared to conventional banks were more stable. Also, the study found that all the factors that affect the stability of Islamic and conventional banks were similar with the exception of income diversity index. This showed the reason during the last financial crisis. At this time, Islamic Banks remained stable compared with the conventional banks while multiple sources of bank income were negatively affected.

Beck et al. (2010) studied bank products compliant with Islamic Sharia versus conventional banking through constructing and comparing indicators of business orientation, efficiency, asset quality and stability of both conventional and Islamic banks. The sample of study consists of the 100 largest banks in terms of assets for 22 countries, for the period from 1995 to 2007 and gets the data from Bankscope. The study found little statistically significant difference between few Shariah-compliant banks and conventional banks. There is a small difference between the two kinds of banks during the financial crisis clear difference in the variation between those banks, across countries and years with different market shares of Islamic banks. Also found in countries that have a larger share of Islamic banks that the conventional banks are less stable but more effective in terms of cost.

Altaee et al. (2013) assess and analyze financial stability for all Islamic and conventional banks operating in Gulf Cooperation Council (GCC) countries, for the period from 2010 to 2013 and this period is divided into two groups, the first covering the pre-financial crisis and the second post financial crisis. The study used the Z-core as a proxy for measuring financial stability. In addition, macro and micro-economic factors used as independent variables to measure their impact on financial stability. The micro-economic independent variables are total assets, loans/total assets, cost ratio, income diversity ratio, dummy variable of the bank and market share in the country; while the macroeconomic independent variables are consumer price index, governance and gross domestic product (GDP) growth. The study found that there is no significant difference between the financial stability of Shariah-compliant banks and conventional banks during the periods, before and after the financial crisis. Also the conventional banks usually tend to be stronger than Islamic banks for the period before the crisis.

Samad and Hassan (1998) measured and compared the performance of Islamic banks to conventional banks operating in Malaysia, during the period from 1984 to 1997. The study which was exploratory, aimed to evaluate intertemporal and interbank performance between the banks and the Berhad Islamic Bank in profitability, liquidity, risk, and solvency. The study found through comparison that the Islamic Bank (Berhad) is more liquid and less risky from conventional banks. In addition, this study identified the reason behind the idea that sharia-compliant banks are not popular in Malaysia. The study indicated that the most important reason is the lack of professional bankers with knowledge in evaluating and selecting and managing profitable projects.

Hasan and Dridi (2010) examine the effects of the global financial crisis that occurred recently in the Islamic and conventional banks in particular during the period from 2007 to 2008. In many countries conventional and Islamic banks are operating together, namely Saudi Arabia, Jordan, Qatar, Kuwait, Bahrain, Malaysia, Turkey, and UAE. A sample of 120 banks has been studied, including 25% were Islamic banks. The study was done by considering the impact of the financial crisis on credit and asset growth, profitability, and external classifications in a set of countries where a conventional and islamic banks have significant share of market. They found that the impact of the recent global crisis was different between the two types of banks. For example, it is found that the business model of Islamic banks is considered as one of the factors that helped in reducing the negative impact of the crisis on profitability. In 2009 risk management practices led to decline profitability of Islamic banks compared to conventional banks. The performance of Islamic banks are better than conventional banks in terms of credit and asset growth during the years from 2008–2009, respectively. Regarding credit and an asset growth, performance of Islamic banks were better than conventional banks in the years 2008–2009, respectively, and supporting economic and financial stability.

Ghassan and Taher (2013) measured the financial stability of bank sector in Saudi Arabia, Islamic and conventional banks, through the quarterly data which extends from 2005 to 2009. They used a sample which consisted of 2 Islamic banks and 4 conventional banks, which represented about 64% of the banks that are operating in the Saudi capital market. The study relied on the Z-Score as the dependent variable to see the stability of the banking sector. In addition, the three types of independent variables are bank specific, banking sector and macroeconomic variables. By using panel and pooled regressions they found that Islamic banks relatively reduced financial stability index, but at the same time contributed effectively in promoting financial stability through diversification of their financial instruments. In terms of the competitiveness of the banking sector in Saudi Arabia, it has a negative impact on financial stability. This may be due to the small number of Islamic banks which are operating in Saudi Arabia and may reflect negatively on improving financial stability.

In order to obtain additional information to help understand and configure the background on the relationship between Islamic banks and conventional banks, in terms of performance, competition, profitability, the effects of the financial crisis, global expansion, the researcher presented some literature review following for this purpose.

The study of Ariss (2010) analyzes competitiveness conditions of the Islamic banks compared to conventional banks, and detect potential differences between these markets. The study included several banks in 13 countries during the period from 2000 to 2006 through many indicators like PR H-statistic[1] index and market power index for banks (Lerner index). The findings indicate that Shariah-compliant banks allocated large share of its assets in financing activities compared with conventional banks, and also Islamic banks less competitive than conventional banks. Profitability increases significantly with the market power, but this does not justify the high profitability of Shariah-compliant banks.

Imam and Kpodar (2010) studied the several factors that affect the growth of the global market to Shariah-compliant banks using county-level data for 1992–2006. They used many of the factors that affect the global expansion of Islamic finance, for instance ratio the Muslim population in the countries, domestic financial system technology, the real interest rate, the average per capita income, the events of September 11, the degree of integration of the Middle East and oil prices. The findings explained that ratio of the Muslim population in the country; average per capita income and oil prices are associated with the Islamic banking development, as are economic integration with countries in the Middle East. Also rates of interest have negative effect on Islamic banking, which reflected implicitly the benchmark for these banks. The institution's quality does not matter. The September 11 attacks were not important. Prices of oil also are an important factor in the spread of Islamic banking. Islamic banks also seems to be complementary to conventional banks, but are not the alternative.

Javid et al. (2011) studied the factors that determine the profitability of the Pakistani banks, through Internal Factor Analysis. This study was aimed to analyze the determinants of profitability of the large 10 banks operating in Pakistan, through the concentration only on the internal factors, during the period 2004–2008. They used method of ordinary Least Squares to reveal the impact of assets, equity, deposits, and loans on one of the main profitability index return relative to asset. The findings indicate the presence of strong evidence that these variables have a strong impact on profitability.

Study by Bader et al. (2008) measures and compares the cost, revenue and profit efficiency of 43 Islamic and 37 conventional banks in 21 countries, the data in this study were collected between 1990 and 2005, and used Data Envelopment Analysis. This study aims to demonstrate how the Islamic banking sector reacted during the 1990 financial crisis. And past trends that could be used to extrapolate likely future behavior for both banking systems. The results indicate with respect to the creation of the profits that Islamic banks and Western were equally efficiently with the use of resources commensurate with their abilities. Regarding the efficiency of the performance, small Islamic banks were more efficient than conventional banks, due to their respective capital structure. Also due to that smaller conventional banks which were in greater competition there are negative consequences on their revenue. Also identified that both smaller and larger Islamic banks needed to pay more attention to cost and profit efficiency if they want maintain competitiveness. Lastly, Regarding bank efficiency and its relationship to geographical area, indicated in Africa,

Western banks outperform, in Asia Islamic banking performed better than Western banking in cost, revenue, and profits in Turkey and the Middle East.

Bashir (2001) performs regression analyses to consider the determinants of Islamic banks' performance during the period from 1993 to 1998 in eight Middle Eastern countries. And used a variety of characteristics of internal and external banking to forecasting profitability and efficiency. Broadly, his results show and confirm controlling for macroeconomic environment, taxation, and financial market structure, the finding indicates that high profitability comes from high leverage and large loans to asset ratios. The results also indicate that foreign-owned banks are more profitable than their domestic counterparts. Everything remaining equal, there is evidence that implicit and explicit taxes affect the bank performance measures negatively. Furthermore, appropriate macro-economic circumstances positively affect the performance indicators. Findings also indicate that stock markets are a complement to bank financing.

3 Data and Methodology

3.1 Data

The Turkish banking system consists of a set of banks; there are two distinguished types, conventional and Islamic banks. Thus, this study used a sample of the available data in order to examine and measure the financial stability of the banking sector operating in Turkey. The bank-level financial data on Islamic and commercial banks for the years 2006–2015 gathered from Bankscope sources. The number of banks both Islamic and Conventional are 29. Number of observations is almost 231. Banks which are studied and illustrated in Appendix 1.

3.2 Methodology

3.2.1 Measuring Bank Stability

There are many methods generally accepted and used to measure the stability of the financial system in general and the banking sector in particular. Altman model or z-score model are considered as the best among other methods. They are characterized by its ability to predict the possibilities of bank insolvency in the future, while other methods merely knowing what if the bank may face a problem of liquidity. It is based on the historical accounting data extracted from the banks financial statements. First, at the micro-level, the financial stability of bank is measured using Altman Z Score Formula, which has been published in 1968 by Edward I. Altman, originally formed for manufacturing firm. In 2002, Altman revised the old Z-Score model and produce a new model to accommodate companies whose fixed assets are not productive assets (Qamruzzaman 2014), the equation is given below:

$$Z = 6.56T1 + 3.26T2 + 6.72T3 + 1.05T4 \tag{1}$$

Where: T1 = (Current Assets − Current Liabilities)/Total Assets.
T2 = Retained Earnings/Total Assets.
T3 = Earnings Before Interest and Taxes/Total Assets.
T4 = Market Value of Equity/Total Liabilities.
Zones of discriminations: Z > 2.9 "Safe" Zone. A higher z-score indicates a lower default risk and vice versa.

3.2.2 Financial Stability Model

At this stage we turn to regression analysis in order to separate the impact of financial stability of the Islamic nature of a bank from other impacts. In addition, to conduct the empirical analysis the panel data have been used. Panel regression deals with multi-dimensional data that contained observations of measurements obtained over multiple time periods for the same firms. Also to know whether all variables are stationary, we conduct tests on panel data, this test is a Fisher- type unit-root test. We have also prepared descriptive statistics and the correlation matrix to know whether the multicollinearity is a problem. In the end, we analyzed with making some models by using fixed effect for the omitted variables, which may be correlated with other independent variables, and random effect regression for the variables are not omitted, which are not correlated with other independent variables, and make them unbiased.

Model Specification

We formulate or estimate a general class of Panel data model as follows:

$$Stab_{it} = \beta 0 + \beta 1\, BSPI_{it} + \beta 2\, BSEI_{it} + \beta 3\, MAEI_{it} + E_{it} \tag{2}$$

Where Stab stands for the bank stability measure. BSI is stands for bank specific indicators. BSEI is the banking sector indicators. MAEI denotes macroeconomic indicators, and the term ε refers to the unobserved stochastic errors.

Variables of the Study

The index of financial stability influenced by a three groups of variables related to bank specific, banking sector and macro-economic.

A. **The bank specific variables**

   1. The z-score or bank's stability index, which is used for forecasting financial distress. And indicate to the probability of insolvency. The higher value of

z-index denotes a higher bank stability and less overall bank risk (Qamruzzaman 2014).

2. Total assets (LAST), we use the log of total assets to control for bank size. Financial stability is expected to increase with bank size for large banks, as result to a scale economies, and decrease for smaller banks. Also larger banks are expected to be less risky because of the increased ability to diversify their sources of income, in all spectrums including geographic, customer and industry.

3. Ratio of credits to assets (RCA) for conventional banks, ratio of financial activity of assets for Islamic banks. Banks with higher ratios of loan to asset expected to have lower financial stability.

4. Ratio of operating costs to income (RCI). This ratio is used as a measure shows how banks manage their total costs relative to their income, higher ratio refers the inefficiency. Whenever the ratio is high, it leads to deterioration of financial stability index.

5. Income diversity (IDV), here positive relationship is expected. The greater the income diversity index, this indicates that the greater support to the financial stability in the banking system.

6. Islamic bank dummy variable, in order to catch the effect of a specific bank effect on financial stability, there are two dummy variables, one for Islamic banks (IBD), the other for conventional banks (CBD). If the bank is an Islamic bank, a bank dummy variable takes the value of 1, and 0 if it is a commercial bank. It is used in order separating the effect of bank type on financial stability. This variable take a negative sign in the regression interpreting financial stability, if Islamic banks are weaker than commercial banks (Čihák and Hesse 2010).

7. The time effect, a dummy variable to capture the impact of international financial shocks on the Turkey from the subprime mortgage crisis and the government debt crisis, which assumes a value of 1 for the period 2007 to 2008 and zero otherwise.

B. **The banking sector variables**

1. Herfindahl–Hirschman Index (HHI), defined as the sum of squared market shares of all banks in the country. Measured in terms of total assets with Herfindahl –Hirschman Total Assets index, which measures the competition in bank sector. It takes the value between zero and one. The higher HHI indicates, that mean higher degree of competition, Higher competition to be associated with higher stability. In other words, if this index has a negative sign, this means that the banking system suffer a weak competition, which in turn reflects on the financial stability (Iskenderoglu and Tomak 2013)

2. The share of Islamic banks (SHIB). We calculate the market share of Islamic banks yearly through assets (Total assets of Islamic banks/The total bank assets). This ratio used to test the impact of Islamic banks on the rest of the banking sector and the hypothesis that the presence of Islamic banks reduces the systemic financial stability. A negative sign for the interaction of the

Islamic banks' market share and the Islamic bank dummy would indicate that a higher share of Islamic banks reduces their soundness, which means reduces their financial stability index, and vice versa (Čihák and Hesse 2010).

C. **The macroeconomic variables**

When considering financial stability of banking sector, several macro-economic variables can negatively or positively influence it (Chakroun & Gallali 2015).

1. Real rate of economic growth (GDP). It is used to control for the macroeconomic cycle and its effects on the level of bank risk. Economic recession indicate a suffering condition for banks and thus increases the likelihood of bank insolvency, while an economic upswing will have the positive effect. Also banking system stability is considered a great incentive of future GDP growth, Durations of instability which followed by a decline in the real rate of economic growth.
2. Rate of inflation (INF). The negative impact on financial stability index, explains the role of financial and economic policies of the government in backing the financial stability in the banking sector.
3. Political Stability (PS), it is capturing perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including politically-motivated violence and terrorism.
4. Stock price volatility (SPV), we also test the banking Z-score and stock price volatility. High volatility of stock price increases uncertainty, which decreases the confidence of investors in the stock market, therefore increase the capital cost. Also, by the last quarter of 2008, the affected banks showed serious signs of liquidity strain as the stock price collapsed by 70% (Emenike and Ani 2014).
5. Oil Price Volatility (OPV), we utilize deviations of oil prices from their underlying trend, proxied by the Hodrick-Prescott filter (Poghosyan and Hesse 2009). there are powerful relationship between oil price fluctuations and NPLs as well negative feedback effects from instability in banking sectors (Alodayni 2016).

4 Empirical Results

In this section, we start to measure the financial stability without separating the effect of Islamic banks, banking sector and macroeconomic factors. Then we turned to regression analysis, in which the panel data have been used.

Panel regression deals with multi-dimensional data that contained observations of measurements obtained over multiple time periods for the same firms. Also to know whether all variables are stationary, we conduct stationarity tests on panel data. Additionally, we conduct Hausman Test to see which model we should use, a fixed or random effect.
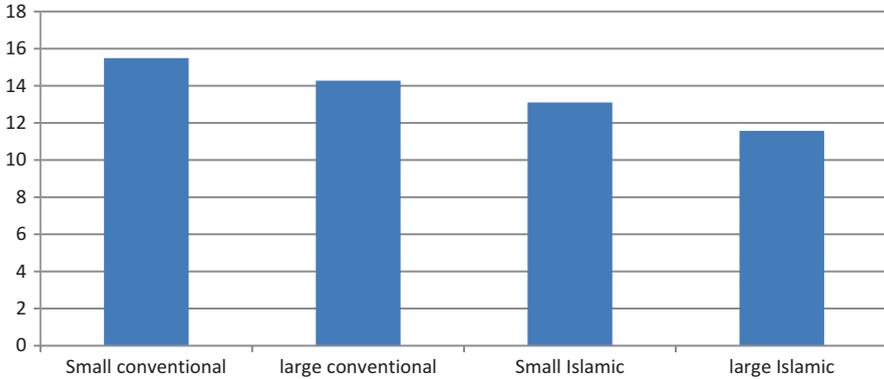
Fig. 1 Comparison of average Z-scores to the banking sector operating in Turkey. Source: authors' calculations, based on data from Bank-Scope

We have also prepared descriptive statistics and the correlation matrix to know whether there are multicollinearity problem, finally, regression models (fixed or random effect) are used for the analysis.

4.1 Measuring Bank Stability

The numbers shown in the graph below can be summarized as follows; Small conventional banks are more stable than large conventional banks. Small Islamic banks more stable than large Islamic banks. And large conventional banks more stable than large Islamic banks. That is mean Conventional banks are more stable and sharia-compliant banks are less stable in banking sector operating in Turkey (Fig. 1).

4.2 Regression Analysis

4.2.1 Panel Unit Root Tests

As a starting point of the analysis, this study applies Panel unit root test, which tend to exhibit a time trend and therefore stationary; i.e., the variables in question have means, variances, and covariances that are time invariant. So as part of the study, we conducted tests on panel data (see Appendix 2). This test is a Fisher-type unit root test, which works well with an unbalanced panel. The Hypothesis: H_0: All panels contain unit roots, against H_1: At least one panel is stationary. We found compelling evidence against the null hypothesis, and therefore conclude that all variables are stationary.

4.2.2 Hausman Test

As a second stage of the analysis is to find out the appropriate model to estimate results. In other words, panel data models are usually estimated using either pooled ordinary least squares (OLS), fixed effects or random effects model. Therefore, we shall apply Hausman Test to find out the right model. The Hypothesis: H_0: Random effect model is appropriate, against H_1: Fixed effect model is appropriate. Based on our test, we reject the null hypothesis (Prop > chi2 = 0.0013, P-value less than 5%) that is mean fixed -effects model is the most appropriate to our data.

4.2.3 Descriptive Statistics

Table 1 shows the descriptive statistics for each dependent and independent variables used in this study for all Banks. Descriptive statistics include Mean, Median, Maximum and Minimum, and standard deviation.

The mean of financial stability index for all banks is 15.208. The median is 14.553, and the financial stability index has a standard deviation of 6.941. This table indicates that the loans constitute more than 61% of the bank's total assets. The cost to net income ratio is 59.3%. Also income diversity ratio of 53% is considered low. Furthermore, the market share of Islamic Bank is 4%, which is very low.

We found that the descriptive statistics make sure the result of comparison of average Z-scores to the banking sector operating in Turkey. Conventional banks are the more stable then Islamic banks operating in the Turkish banking system. Table 2 shows us that the mean and the median of the conventional banks are 15.554 and 14.917, respectively. While the mean and the median of the Islamic banks are 13.252 and 13.526, respectively.

Table 1 Descriptive statistics for all banks

Variable	Mean	Median	Std. Dev.	Min	Max
ZSCOR	15.208	14.553	6.941	−8.348	66.533
LZSCOR	1.147	1.163	0.195	0.320	1.823
LAST	6.915	6.957	0.696	5.055	8.077
RCA	0.611	0.646	0.144	0.011	0.825
RCI	0.593	0.543	0.171	0.332	1.580
IDV	0.531	0.53	0.210	0.014	0.986
TE	0.193	0	0.395	0.000	1.000
IBD	0.158	0	0.366	0.000	1.000
SHIB	0.039	0.038	0.330	0.014	0.057
HHI	0.105	0.104	0.020	0.087	0.199
GDP	0.043	0.046	0.041	−0.048	0.092
INF	0.083	0.085	0.012	0.063	0.104
PS	0.161	0.156	0.047	0.095	0.271
OPV	−0.243	0.0015	0.391	−1.063	0.231
SPV	0.283	0.277	0.050	0.223	0.399

Table 2 Descriptive statistics of L Z-SCORE for islamic and conventional banks

	Mean	Median	Std. Dev.	Min	Max
Conventional Banks	15.554	14.917	6.969	−8.348	66.533
Islamic Banks	13.252	13.526	6.526	−1.358	26.010
All Banks	15.208	14.553	6.941	−8.348	66.533

In order measuring the variability. Theoretically, the standard deviation is best viewed as the average distance that individual data points are from the mean. Conventional Banks have higher standard deviations than Islamic Banks. Results for the Conventional banks sample show a standard deviation of 6.969 which is significantly wider dispersion than results for Islamic banks sample with a standard deviation of 6.526. This may be caused by Islamic banks' lower sample size.

4.2.4 Correlation Matrix

This Matrix is a table that contains coefficients of correlation among many variables in different timeframes. Table 3 shows cross correlation matrix of variables. This Analysis is applied to anticipate how independent variables will be correlated each other. Therefore, the main objective of Correlation Analysis is to find out if the independent variables have high correlation with each other or no, in other words, to examine for multicollinearity problem.

Before starting the analysis, we must take into account two things, firstly, sign of correlation, positive or negative correlation between two variables. Secondly, size of correlation, Equal to 1, means perfectly linear relationship between two variables, close to one, means stronger linear relationship between two variables, and close to zero, means weaker linear relationship between two variables.

A correlation matrix is offered in Table 3 which does not indicate any main multicollinearity problem among our explanatory variables, except for the Islamic bank dummy variable (IBD) and the share of Islamic banks (SHIB). Therefore, we have made more than one model to separate the two variables.

4.2.5 The Regression Results

In order to conduct empirical analysis the panel data has been used on the bank specific variables, the banking sector variables, and the macro-economic variables. We analyzed with making some models by using fixed effect model. In our study, we also evaluate the robustness of the results with regard to the selected sample. In order to do so, we make three regressions for different variables with fixed-effect model [see Table 4]. We estimate the regressions separately for sub-samples of variables and for all variables.

Logarithm of total assets (LAST) has a significant negative sign in the regressions for banks at the level of the 1%. The negative relationship between z-score and

Table 3 Correlation matrix

	LAST	RCA	RCI	IDV	TE	IBD	SHIB	HHI	GDP	INF	PS	Oil	SPV
LAST	1												
RCA	0.204	1											
RCI	-0.538	-0.147	1										
IDV	-0.026	-0.274	-0.005	1									
TE	-0.041	-0.049	-0.139	-0.065	1								
IBD	-0.012	0.328	-0.157	0.228	0.001	1							
SHIB	0.042	-0.375	0.148	-0.222	-0.006	-0.966	1						
HHI	-0.033	-0.042	-0.158	0.151	0.441	0.177	-0.154	1					
GDP	0.022	0.041	-0.083	-0.070	0.205	0.002	-0.003	-0.073	1				
INF	-0.047	-0.022	0.015	-0.052	0.004	0.014	0.009	0.318	0.049	1			
PS	-0.132	-0.148	-0.013	0.193	0.010	0.044	0.017	0.561	-0.202	0.261	1		
OPV	0.035	0.019	0.087	0.055	-0.766	-0.010	0.010	-0.474	-0.259	-0.299	-0.087	1	
SPV	-0.047	-0.050	-0.195	-0.029	0.841	0.014	-0.005	0.389	0.520	-0.070	0.130	-0.638	1

Table 4 Regression results - fixed Effects-dependent variable is LZSCOR

Independent variables	Expected sign	Model 1			Model 2			Model 3		
		Coef.	t-sta.	P-value	Coef.	t-sta.	P-value	Coef.	t-sta.	P-value
Constant	+/–	2.894	3.400	0.001***	5.695	8.670	0.000***	4.605	7.510	0.000***
Bank specific										
LAST	–	-0.631	-8.550	0.000***	-0.554	-7.270	0.000***	-0.400	-5.960	0.000***
RCA	–	-0.159	-1.270	0.207	-0.337	-2.640	0.009***	-0.159	-1.300	0.196
RCI	–	-0.629	-6.550	0.000***	-0.533	-5.360	0.000***	-0.550	-5.350	0.000***
IDV	+	-0.143	-2.480	0.014**	-0.151	-2.480	0.014**	-0.148	-2.350	0.020**
TE	–	-0.250	-4.520	0.000***	-0.227	-3.880	0.000***	-0.111	-2.150	0.033**
IBD	+/–	–	–	–	-0.007	0.070	0.945	-0.021	-0.220	0.828
Banking sector										
SHIB	+	4.208	4.800	0.000***	–	–	–	–	–	–
HHI	+	-0.061	-0.100	0.917	-0.526	-0.860	0.389	-1.367	-2.320	0.021**
Macroeconomic										
GDP	+	-0.715	-2.330	0.021**	-0.634	-1.950	0.052*	-0.089	-0.300	0.768
INF	–	-1.391	-1.900	0.059*	-1.059	-1.370	0.173	-1.370	-1.720	0.087*
PS	+/–	-2.301	-5.970	0.000***	-1.341	-3.840	0.000***	–	–	–
OPV	+/–	-0.162	-4.720	0.000***	-0.162	-4.450	0.000***	-0.147	-3.930	0.000***
SPV	+/–	0.891	1.880	0.062*	1.051	2.100	0.037**	0.281	0.590	0.555
Prob . F				0.000			0.000			0.000
Observations				231			231			231
R Squared				0.43			0.36			0.31

Notes: (1) Z-score and total assets variables are in natural log
(2) ***, ** and * indicate the coefficients are significant at 1%, 5% and 10% respectively

the Bank Size means that a larger banks operating in Turkey tend to have lower z-scores, perhaps because they engage in riskier activities than smaller banks. Our findings suggest that Turkish banks to be more stable, needs to drive to be a smaller, nevertheless taking into account that the small banks may be more risky because of lower diversification ability in all spectrums including geographic, customer and industry.

Credit or loan to assets ratios (RCA) or finance to assets ratios for all banks has the expected sign. A significant negative sign at the level of 1% in the regressions for banks. This slope coefficient is negative; it confirmed that bank stability decreased with increase in loan to asset ratio. In other words, banks which have high loan to asset ratios move toward low index of financial stability. Banks with higher loan portfolios on their balance sheets relative to their total assets might be more likely to experience problems with non-performing loans and thus be riskier. Furthermore, the rapid growth in credit is strongly associated with financial instability and the risk of financial crisis (Čihák and Hesse 2010).

The cost-to-income ratios (RCI) for banks have the expected sign. They have a negative significant sign in the regressions for banks at the level of 1%. So, this results consistent with the fact that the ratio of costs to income have an almost negative role in improving the index of financial stability (e.g., Čihák and Hesse 2010, and Mirzaei 2010). Greater operating cost to income ratios lead to deterioration of financial stability index. This ratio is used as a measure to show how banks operating in Turkey manage their total costs relative to their income. The higher this ratio shows the cost inefficiency. Inefficient banks in terms of their cost-to-income ratio are less likely to cover their costs when hit by adverse shocks, so they tend to be riskier.

Income diversity (IDV) has a significant negative sign in the regressions for banks at the levels of 5% and does not consistent with the expected sign. This is in line with the part of the literature on banking sector (e.g., Altaee et al. 2013). The ratio of Income diversity can range from zero to one. One means, the total operating income of a bank is divided equally between net interest income and other operating income. Zero means, there is no diversification and a bank depends on a few sources to generate the total operating income. In other words, a weak income diversity leads to decrease financial stability in banks operating in Turkey, and reflects the simple support to the financial stability index in the banking system in Turkey via the diversification of financial products.

Also, this might be interpreted as the banks in turkey become more stable by specialization. They can generate more income across time from a few sources that increases the return on assets resulting an increase in the stability of the banks. This illustrates that Turkish banks depend on lending-based operation instead a move to other income sources in order increase financial stability to these banks. Because income diversification leads to diversify the risk associated with this income, thus mitigating the effects of these risks. A number of studies propose that as banks move away from their traditional lending activities (those generating interest incomes) and diversify their product mix, they will be less subject to economic cycles associated with loan portfolios.

In this study, we examined the time effect (crisis dummy variable) on the financial stability of the banking system in Turkey. The evidence indicates that the time effect has negative and significant changes during the period of the financial crisis in Turkey at the level of 1%.

We found Islamic Dummy Variable taken negative sign and insignificant effect on financial stability indicator in the regressions for banks. Thus, according to the regression results, there is no empirical evidence denotes that there is a significant difference between the financial stability of CBs and IBs in Turkey for the period 2006–2015, which requires the increased attention to find out the reasons behind this the weak role of the Islamic banks compare to the conventional banks in Turkey.

Regarding the impact of a higher presence of Islamic banks on banking stability, the slope coefficient of the "share of Islamic banks" variable is positive and significant in the regression for banks operating in Turkey at the level of 1%. Based on this estimated slope coefficient, we can say that a higher share of Islamic banks increases financial stability in the Turkish banking system. That is mean banks operating in Turkey with higher Islamic bank share have contributed effectively to improve the stability of banking sector by diversifying in their assets that is consistent with Čihák and Hesse (2010).

Herfindahl–Hirschman Index have a negative significant impact on the financial stability of the banking system in the regressions for banks operating in Turkey at the level of 5%. This means that the banking system suffer a weak competition, which in turn reflects on the financial stability.

Regarding the macroeconomic variables, real rate of economic growth (GDP) is used to control for the macroeconomic cycle and its effects on the level of bank risk. Economic recession indicate a suffering condition for banks and thus increases the likelihood of bank insolvency, while an economic upswing will have the positive effect. Also banking system stability is considered a great incentive of future GDP growth, Durations of instability which followed by a decline in the real rate of economic growth. We found real GDP growth appears to have and a negative significant impact on the financial stability of the banking system in the regressions for banks operating in Turkey at the level of 5 and 10%. That denotes the shortcoming of the Turkish macroeconomic conditions. It may also reflect the inability of the economy to create wealth.

The inflation rate which measures the rate of increase of price indices, has a negative and significant effect on financial stability indicator at the level of 10%. Inflation indicate there are structural problems in the economy, or public dissatisfaction which may in turn lead to instability. As the inflation increases, people need more money for their consumptions and expenditures, hence affecting their total saving and deposits negatively. High levels of inflation would signal structural weakness in the economy and increased levels of indebtedness, potentially leading to a tightening of monetary conditions. Conversely, low levels of inflation could potentially increase the risk appetite in the financial markets.

The evidence about the political stability on these banks tends to be negative in models 1 and 2 in which it entered. Our results are significant at the 1% level. This is unexpected sign, where it is known that the best political stability is generally

correlated with higher z-score (Cihák and Hesse 2010). Also, Political uncertainty rose by disturbance in the region shaking confidence of international investors (Ghenimi et al. 2015). Chai et al. (2010) indicated that two kinds of political instabilities (individual country and neighboring countries) result in reducing the balances, assets and liabilities in banking sector, as well the problems of inefficiency in the use of funds, allocation of asset and liability. On the other hand, instability of regional countries raising the assets and liabilities balances. They have concluded that all kinds of political instabilities have main effects on development of banks and efficiency of the banks.

For the analysis of the volatility of the oil price and stock prices on banking stability, results show that stock price volatility has a negative and statistically significant at the levels of 1% relation for banks, while stock price volatility has a positive and statistically significant at the levels of 5% and 10% relation for banks. Oil price and stock prices are considered to be major determinants of NPLs across banks and the overall financial stability. Consequently, declines in oil prices increase NPLs (Alodayni 2016). Higher oil prices are also associated with higher liquidity and therefore deposits inflows than can be intermediated into lending, a positive relationship between oil prices and banks is likely (Poghosyan and Hesse 2009). Finally, the macroeconomic variables explain the important role of the government through the financial and economic policies in increase financial stability of the banks operating in Turkey.

5 Conclusion

This study investigated the financial stability of Islamic banks relative to conventional banks operating in Turkey, through the use of Z-index as a measure of financial stability. We found that conventional banks are the more stable and Islamic banks are less stable in banking sector operating in Turkey, where small commercial banks have financial stability more than large commercial banks, large commercial banks have financial stability more than large Islamic banks, and small Islamic banks appear to have financial stability more than large Islamic banks.

The major results show that the existence of a financial crisis has a negative and significant impact on Financial Stability of banking sector in Turkey. The findings also indicate there a negative relationship between the size of the bank and financial stability. Banks which have high loan to asset ratios moves toward low index of financial stability. The cost-to-income ratio has a significant negative sign, this result consistent with the fact that a ratio of costs to income has an almost negative role in improving the index of financial stability. Greater operating cost to income ratio have a negative sign, as such greater operating cost to income ratios lead to deterioration of financial stability index. Income diversity leads to decrease in financial stability of banks operating in Turkey. Banks operating in Turkey with higher Islamic bank share have contributed effectively to improve the financial stability through the diversification of their assets. Herfindahl–Hirschman Index have a negative and significant impact on the financial stability of the banking system, this

means that the banking system suffer from a weak competition, which in turn reflects on the financial stability. Regarding the macroeconomic variables GDP and inflation have significant effects on stability, which explains the importance of financial and economic policies of the government in increase the financial stability. The study showed that there is negative relationship between the oil prices and political stability with the financial stability. Stock price volatility has a positive relation for the banks operating in Turkey. The evidence indicates that the time effect has negative and significant changes during the period of the financial crisis in Turkey.

Appendix 1: Turkish Banks

NO	Bank Name	Groups
1	Kuveyt Turk Katilim Bankasi A.S.-Kuwait Turkish Participation Bank Inc	Islamic banks
2	Turkiye Finans Katilim Bankasi AS	
3	Albaraka Turk Participation Bank-Albaraka Turk Katilim Bankasi AS	
4	Asya Katilim Bankasi AS-Bank Asya	
5	Ziraat Katilim Bankasi A.S.	
6	Turkiye is Bankasi A.S. – ISBANK	Conventional banks
7	Turkiye Garanti Bankasi A.S.	
8	T.C. Ziraat Bankasi A.S.	
9	Akbank T.A.S.	
10	Yapi Ve Kredi Bankasi A.S.	
11	Turkiye Halk Bankasi A.S.	
12	Turkiye Vakiflar Bankasi TAO	
13	Denizbank A.S.	
14	Finansbank A.S.	
15	Turk Ekonomi Bankasi A.S.	
16	ING Bank A.S.	
17	HSBC Bank A.S.	
18	Sekerbank T.A.S.	
19	Odea Bank AS	
20	Alternatifbank A.S.	
21	Anadolubank A.S.	
22	Citibank A.S.	
23	Burgan Bank AS	
24	Fibabanka As	
25	ICBC Turkey Bank A S.	
26	Arab Turkish Bank-Arap Turk Bankasi	
27	Turkish Bank A.S.	
28	Bankpozitif Kredi ve Kalkinma Bankasi AS-C Bank	
29	Turkland Bank AS-T- Bank	

Appendix 2: Fisher-Type Unit-Root Test

	Inverse chi-squared (56)		Inverse normal		Inverse logit t(144)		Modified inv. chi-squared	
	P		Z		L*		Pm	
Variables	Statistic	p-value	Statistic	p-value	Statistic	p-value	Statistic	p-value
LZSCOR	135.504	0.000	−5.991	0.000	−6.052	0.000	7.512	0.000
LAST	222.071	0.000	−6.385	0.000	−9.856	0.000	15.234	0.000
RCA	349.309	0.000	−8.681	0.000	−16.108	0.000	27.047	0.000
RCI	142.896	0.000	−4.737	0.000	−5.551	0.000	7.882	0.000
IDV	289.621	0.000	−6.905	0.000	−13.298	0.000	21.505	0.000
TE	141.784	0.000	−7.826	0.000	−7.679	0.000	9.178	0.000
BID	170.913	0.000	−8.391	0.000	−8.661	0.000	10.858	0.000
SHIB	116.857	0.000	−3.564	0.000	−3.862	0.000	5.465	0.000
HHI	189.188	0.000	−3.264	0.001	−7.658	0.000	12.181	0.000
GDP	272.076	0.000	−8.602	0.000	−13.717	0.000	19.877	0.000
INF	550.102	0.000	−19.402	0.000	−28.756	0.000	45.691	0.000
PS	132.511	0.000	−2.906	0.002	−4.939	0.000	6.918	0.000
OPV	115.827	0.000	−4.624	0.000	−5.133	0.000	5.369	0.000
SPV	126.440	0.000	−6.879	0.000	−6.593	0.000	7.299	0.000

The null hypothesis of this test is that all panels contain a unit root. So we reject this hypothesis. If we look at our tests P, Z, L* and Pm, we get a value for these test statistics, and in the next column you see the p-value. Since they are all smaller than 0.01, we can reject the null hypothesis at the 1% level of statistical significance. This means there are no unit roots in your panels under the given test conditions (included panel mean and time trend). Here we found overwhelming evidence against the null hypothesis of a unit root. Therefore, conclude that all variables are stationary

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Divergent Media Channels for Expediting Financial Literacy Outreach

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Abstract Financial inclusion is imperative for the development and growth of any economy which eventually materializes only through financial literacy. Financial literacy is the understanding about financial products/services and individual's ability and confidence, to make informed choices based on risk and opportunities to improve financial wellbeing. Although the financial literacy movement has gained momentum but still there remains a question about whether financial literacy campaigns and programs really meet the desired outcomes as set. There are evidences that individuals under-save, lack to understand the financial products/services, fail to invest wisely resulting indebtedness. Customers everywhere would benefit from having greater financial knowledge and is relevant for all regardless of wealth and income. The research aims to study the role of media in stimulating financial literacy and in what way effective usage of different channels of media can facilitate in achieving higher financial literacy rate in India.

1 Introduction

Financial education is a process where the users of financial services/investors improve their understanding for financial products, notions and risks and on the bases of information, instructions and objective advice develop the skills and confidence in strengthening information about financial risks and occasions, make decisions on the bases of good information, are acquainted with the fact where to find help and take other effective measures for improving their wealth (Zarcadoolas

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et al. 2006). Innovation and globalization of individuals enables the access to more and a larger range of products and services that should suit different needs and states. The technological progress, new electronic channels for the transmission and linking financial markets have widened the range of offered services and methods where the services are accessible. But the products for layman are complicated and they find it difficult to evaluate their success in the future, they realize more and more that there is a lack of skills for dealing with financial matters at a later stage (OECD 2005). By data of the European Commission (2010) 30 million Europeans, older than 18 years even do not have a bank account. Indicators of development and economic success of each country are strongly linked to the level of financial literacy, financial exclusiveness and the efficacy of programmes for financial education (Commission of the European Communities 2007). The programme of financial education should be oriented to make aware of the importance, necessity and the advantage of a lifelong financial education; universality: to assure access to information that are free of charge, impartial, honest, concrete, qualitative and easy to understand and that are available to all and do not present a channel of marketing of a specific bank or for a specific financial product/service; guidance and consulting activities facilitating the ability of individuals in understanding and dealing with financial products/service and risk. In India, though the activity of financial inclusion started as early as 1950, from the year 2005 onwards financial inclusion has been considered a Policy Priority for Reserve Bank of India (RBI), India's central bank, which has given several directions and guidelines during the past one decade. It looks at Financial Inclusion (FI) as an effective tool for inclusive growth ensuring equality of opportunity for all. RBI confides that FI as an effective tool for inclusive growth ensuring equality of opportunity for all. From 2006 more enabling environment was being created with opening of No-Frill Accounts, Overdraft facility for Saving Bank Accounts, Relaxed Know Your Customer norms, permitting the banks to use the services of intermediaries-Business Correspondents) and Business Facilitators however the challenges prevailing in the financial literacy interventions are: rapid financial innovations due to deregulation, Lack of understanding of financial products and services, Absence of incessant financial learning curve, Hurdles in determining the effectiveness of the financial literacy initiatives.

2 Review of Literature

The themes of open and distance learning, information and communication technologies (ICTs) and literacy have assumed a global prominence in the light of international agendas (Bhola 2006). There is an essential need to establish a literate and learning society using innovative approaches (Tahir 2005). This included the integration of different approaches to literacy promotion. Some of these include literacy shop, Each-One-Teach-One, Real Literacy Material, and literacy by radio in the delivery of basic education including adult literacy. In countries where near-universal secondary education has already been achieved, access to education

tends to mean access to formal schooling provided through primary and secondary schools and higher education (Bhola 2006). The same can be held true for financial literacy awareness too. While adult men and women may have formal education, they lack basic and in depth knowledge about the various financial products and services. The delivery medium that will help facilitate this process must be multi-channel. According to (Haddad 2007) "to tech or not tech education is not therefore the question; the real question is how to harvest the power of ICTs to make education relevant, responsive and effective. The technologies include radio, television and print besides the internet. These technologies are readily available in homes and offices and have proven to be effective and inexpensive ways of enabling high-quality educational materials to reach remote clientele and overcome geographical and cultural hurdles (Haddad 2007). ICT applications in open and distance learning have not only created possibilities for social interactive learning, but have also created new opportunities to provide learner support that takes into account all aspects of the learner's experiences and needs (Aderinoye 2008). According to (Keegan 2000), the internet is the most successful educational tool to have appeared in a long time because it offers a global open platform for information storage, display and communication. It contributes and integrates text graphics, audio and video with communication tools such as e-mail, bulletin boards and chat rooms to promote synchronous and asynchronous interaction. Information learned by these media (motion pictures and television) appears to be retained at least as well as that learned by conventional teaching methods (Allen and Norberg 1959). The pivotal work on the impact of financial education has reported that middle age individuals who took a personal financial management course in high school tended to save a higher proportion of their incomes than others who did not which Evidences the fact that financial learning is a continual process however there has not been much studies to understand the relationship between the learning behavior of the individuals and the knowledge propagation.

3   Rationale of Research

(National Financial Strategy 2011) Study discusses financial literacy as the ability to make informed decisions by households is vital for the basic functioning of any society, the decisions range from accounting for income, savings, spending, budgeting, and planning for retirement, marriage, education and purchase of any asset. These decision making abilities have a profound impact on the financial decision making, financial security and wellbeing of the households. The paper tries to explore the effective practices in delivery of financial literacy initiatives and an effort has been made to contribute to the identification of innovative ways of delivering financial literacy based on the learning styles of the households as the learning styles impacts the efficacy of captivating the financial management discipline in the lives of the households.

4 Objectives and Hypothesis

The research aims to study the following aspects:

  (i) To identify financial literacy delivery interventions
 (ii) To assess the preferred learning modes of the households
(iii) To map the different modes of learnings with the financial delivery intervention

4.1 Hypothesis

Based on the objectives, the following hypotheses have been developed:

H1: There is no relationship between learning modes of households and source of financial information.
H2: Awareness level about financial products and services are not dependent on the source of financial information.

5 Research Methodology

The research approach for this study consisted of literature review of the financial literacy interventions and the current practices in delivery and evaluation of the various financial literacy measures. The data was obtained by administering a questionnaire. Data has been analyzed by descriptive statistics: Cross tabs and Chi Square has been used to test the hypothesis. Section I of the study will detail the demographics of the respondents with their learning styles and source of financial education. Section II will gauge the awareness level of respondents of the banking products and services.

5.1 Data Analysis

The authors opine that the effectives of financial education can be derived through merging the delivery and learning styles of the individuals. Survey was administered on 250 respondents of different age groups, instrument used was structured questionnaire consisting questions on the demographic profiling of the respondents and the attributes based on seeking financial education. The success rate was 88%, as 220 completed questionnaires were finally considered for the study.

6 Analysis

The author's opine that the effectives of financial education can be derived through merging the delivery and learning styles of the individuals. Survey was administered on 250 respondents of different age groups, instrument used was structured questionnaire consisting questions on the demographic profiling of the respondents and the attributes based on seeking financial education. The success rate was 88% as 220 completed questionnaires were finally considered for the study.

The author's first tries to study the demographic characteristics of the respondents based on the results of the survey. Against this backdrop the study is divided into three sections, Section I – Demographic Characteristics of the Respondents, Section II focuses on the awareness level about the banking products and services and the channel used for acquisition of financial information.

6.1 Section I

6.1.1 Demographic Analysis of the Respondents

The data was obtained from a total of 220 respondents out of which 89 were females and 131 were males. The other demographic variables studied were age, income, regularity of income and education level of the respondents. Figure 1 indicates the age wise classification of the respondents.

The demographic data shows that out of a total of 220 respondents, 49.09% respondents were in the age group of 30 and 50, 33.18% were below the age of 30 and the remaining 17.72% were above 50 years of age (Table 1).

Based on occupation 67.27% of the respondents were salaried individuals, 21.8% were self-employed and 10.45% were home makers. Only 1 respondent was unemployed as he was in the career transition phase. Data reveals that 66.8% of the respondents had a regular and stable income while the remaining 33.2% were not earning on a regular basis (Table 2).

The income level classification of the respondents shows that 43.63% of the respondents fall in the income group 200,000–500,000 and 33.63% in the range of 500,000–800,000.12.27% (27) of the respondents earn less than Rs 200,000 per annum and 10.45% earn above Rs 800,000 per annum. Of the 220 respondents majority were post graduates (71.36%), Graduates (28.18%) and 4.5% had a qualification below graduation. The overall demographic analysis exhibits that majority of the respondents are in the age group of 30–50 years and are post graduates. Most of them are salaried with a regular income bracket of Rs 200,000–500,000 (Table 3).

Close association can be observed between the educational level and the learning methods of individuals, post graduates preferred more of video based learnings followed by workshop and training methods. Equal agreement was found amongst the graduates for audio and print media.
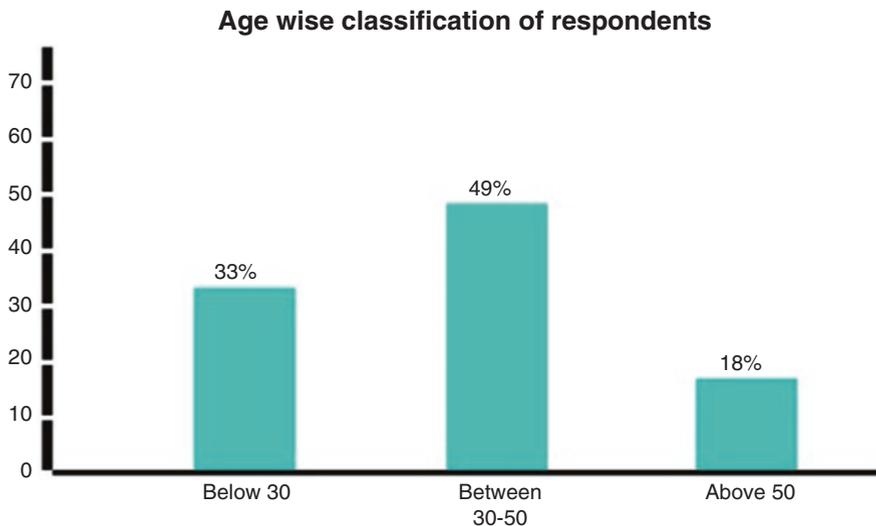
Age wise classification of respondents

Fig. 1 Age classification

Table 1 Relation between nature of job and nature of income

		Nature of income		Total
		Irregular	Regular	
Nature of job	Unemployed	0	1	1
	Home maker	21	2	23
	Salaried	35	113	148
	Self employed	17	31	48
Total		73	147	220

Table 2 Relation between education and annual income

		Annual Income				Total
		Below 2,00,000	2,00,000–5,00,000	5,00,000–8,00,000	Above 8,00,000	
Education	Graduate	20	31	5	2	58
	Post Graduate	8	65	69	20	162
Total		28	96	74	22	220

6.2   Section II

Divergent Media channels can become core elements for fostering transformative learnings within the society which will illustrate how theory can be related to practice, financial education dissemination requires exposure of learners to real life situations, challenging them with questions about money and its relationship to their

Table 3 Association between the education level and preferred learning mode

		Preferred learning mode				
		Video	Audio	Print	Kinesthetic	Total
Education	Graduate	17	14	14	13	58
	Post Graduate	51	38	33	40	162
Total		68	52	47	53	220

Table 4 Linkage between learning mode and source of financial information

		Source of financial education						
		Internet	Newspaper	Mobile	Television	Bank branch	Training	Total
PLM	Video	17	12	21	4	10	4	68
	Audio	11	7	20	2	8	4	52
	Print	11	9	15	3	2	7	47
	Kinesthetic	10	9	15	4	6	9	53
Total		49	37	71	13	26	24	220

PLM preferred learning mode

lives and probable benefits of financial independence. Efficacy of the financial education can be measured in terms of the increased financial behavior amongst the individuals and in making informed financial decisions, to test linkage between channel of information and the learning attitude we formulated the null hypothesis that there is no relationship between learning modes of persons and source of financial information however the following results were found.

7 Results

The Analysis of Table 4 suggests 32% prefer mobile based learning, 22% preferred internet as a source of learning mode followed by Newspaper 14.5%. Least preferences were observed for training and television. However few respondents favored visiting bank branch for seeking information on financial aspects. It is observed at 5% confidence interval calculated p value = $0.787 > p = 0.05$ which rejects the null hypothesis (H1) establishing that there exists a strong association between the learning mode and source of financial information.

Table 5 reveals that for most of the banking products and services Mobile, Internet and Newspaper are the preferred sources of financial information. Of the total responses 32% weightage has been given to mobile, 22% to Internet and 17.33% to newspaper as a source of financial information.12% of the respondents prefer to visit the bank branches to seek information and 10% prefer the methodology of training and workshops for the same. Least preference has been given to television which accounts for 5.65%. Based on the outcomes of Table 6

Table 5 Relationship between source of financial education and financial awareness

Awareness of Banking products & services	Source of financial education							
	Internet	Newspaper	Mobile	Television	Bank Branch	Training	Total	p value
Savings Account	33	32	59	10	22	17	173	0.195
Women Savings Account	10	11	13	3	6	8	51	0.633
Recurring Deposit	30	24	53	10	19	19	155	0.496
Term Deposit	37	29	48	10	19	18	161	0.862
Current Account	30	22	36	7	16	17	128	0.602
Casa Account	22	11	20	3	10	9	75	0.414
PMJDY	33	22	43	8	17	15	138	0.974
Salary Account	35	30	43	8	16	16	148	0.344
Housing Loan	30	30	56	9	22	12	159	0.016
Personal	42	35	62	12	23	18	192	0.360
Vehicle Loan	40	28	62	10	23	20	183	0.650
Asset Backed Loan	13	9	20	3	3	6	54	0.700
Education Loan	35	24	49	8	17	13	146	0.766
Internet Banking	36	33	62	10	22	21	184	0.311
Banc Assurance	8	6	15	2	6	11	48	0.075
Debit Card	48	36	68	13	24	23	212	0.814
Credit Card	45	34	65	10	25	22	201	0.518
Remittances	30	30	56	9	22	12	159	0.016
ATM	48	35	69	13	26	21	212	0.175
Wealth Management	9	9	18	3	3	4	46	0.703
Bill Payments	39	28	55	9	18	15	164	0.636
Prepaid Cards	14	13	21	3	5	7	63	0.832
Locker Facility	34	21	41	7	15	15	133	0.787
Total	701	552	1034	180	379	339	3185	

Table 6 4 Point scale of level of financial awareness

Percentage	0–25%	25–50%	50–75%	75–100%
Category (level of awareness)	Highly Insignificant	Insignificant	Significant	Highly Significant.

a scale was developed ranging from 0% to 100%. The researchers converted the responses related to awareness level into percentages and classified them in to four. The percentages and the respective classification are:

Financial awareness covers the basic literacy about the banking products and services and simultaneously its upgrade at different time intervals for making informed decisions. Willis (2008) places the stress on cognitive points of view for financial literacy that include knowledge, education and information about different financial fields, about how to manage money and sources, about banking, deposits, credits, insurances and taxes (Willis 2008).

Based on the information regarding the awareness level of the respondents in the Table 7, it is found that the respondents are least aware about products like women's saving account, asset backed loans, banc assurance and wealth management. They are somewhat aware of CASA and prepaid cards. The respondents are aware about Recurring deposit, term deposit, Current Account, PMJDY, Salary account housing and educational loan, remittances and Locker facility. The respondents have complete knowledge about products like savings account, personal and vehicle loan, internet banking, debit and credit cards, ATM and bill payments. This suggests that there is a need to improve the awareness level of products and services falling under the category 0–25%. Individuals were aware of the internet banking facilities, leveraging on this medium in expediting financial literacy amongst the persons.

As is evident from the Table 8 the preferred learning mode for WS, BANC, WM and PRCARD is video.

Cross tabulation between the age group of the sample and their preferred learning modes Table 9 indicate for age group below 30 years the most preferred learning methods are Video and Audio, age group of 30–50 years preference was found for Video and training based learning's and for respondents above the age of 50 years preference for training and Print media. Based on the different age group divergent media can be used for effective delivery of financial literacy programs.

8 Discussion

Video and audio based learning's were preferred by the respondents as against the print media, higher acceptance was found for workshop based learnings also, the most favored medium for seeking financial information was Mobile and Internet which shows there has been a drift from the conventional method of learnings to virtual interface, these can be leveraged maximum for promoting financial education and can be cost effective model for transmission of financial knowledge

Table 7 Scale of awareness level of banking products and services

Scale		Products and Services							
Highly Insignificant	0–25%	Women Savings Account	Asset Backed Loan	Banc assurance	Wealth Management				
Insignificant	25–50%	CASA Account	Prepaid Cards						
Significant	50–75%	Recurring Deposit	Term Deposit	Current Account	PMJDY	Salary Account	Housing Loan	Education Loan	Remittance	Locker Facility
Highly Significant	75–100%	Savings Account	Personal	Vehicle Loan	Internet Banking	Debit Card	Credit Card	ATM	Bill Payments

Table 8 Preferred learning methods for highly insignificant banking products (0–50%)

Preferred learning Mode	WSV	ABL	BANC	WM	PRCARD	CASA	Total
Video	19	15	17	13	9	3	68
Audio	10	10	8	11	6	0	52
Print	8	12	10	10	3	3	47
Kinesthetic	14	17	13	12	3	4	53
Total	51	54	48	46	21	10	220
Calculated p value	0.450	0.446	0.593	0.972	0.426	0.267	

WSV Women's Saving Account, *ABL* Asset Backed Loans, *BANC* Banc Assurance, *WM* Wealth Management, *PRCARD* Prepaid Cards, *CASA* Current Account Savings Account

Table 9 Age wise preferred learning mode

		Preferred learning modes				Total
		Video	Audio	Print	Kinesthetic	
Age	Below 30 years	21	21	19	12	73
	30–50 years	39	23	18	28	108
	Above 50 years	8	8	10	13	39
Total		68	52	47	53	220

amongst the individuals at rural and urban level. Financial knowledge about a financial product or service may not be equivalent to financial literacy which implies that an individual have the ability and confidence to use his financial knowledge for financial decisions. Financial behavior is closely related to the awareness level of the person about a financial product. Assuming that channel of financial information creates financial awareness about banking products and services a null hypothesis was formulated as awareness level about financial products and services are not dependent on the source of financial information.

To check for the relationship between the level of awareness and the source of financial information, Chi square test has been used. The results show that for most of the products and services, the awareness level is dependent on the source of financial information. Except for three products, namely, Housing loan, Debit Card and Remittances whose calculated p value (0.016, 0.075 and 0.016) < p = 0.05 all other products and services show a significant association with the various learning mode. **Hence, the hypothesis H2: Awareness level about financial products and services are not dependent on the source of financial information stands rejected.**

Recent studies have demonstrated that both young and older adults lack the basic knowledge required to make good financial decisions which were raised in the report by OECD emphasizing that financial illiteracy is widespread across the age groups and the geographical areas. So while developing a financial literacy instrument it is essential to identify whether a person knows about the financial product or service or can he apply it appropriately in his life. Assessing the economic behavior of the individual is complex phenomena as human behavior is based on socio, economic and cultural background. Insufficient financial practice

is a result of average low financial literacy rate thus the discipline can be accentuated through appropriate financial education. Literacy is necessary knowledge and skill; it is a preliminary condition for a successful and creative personal growth and responsible acting in professional and social life (Commission of the European Communities 2010).

OECD (2005) describes financial education as a process of Understanding, Information, Instructions and Advice thus the intermittent process of information and instruction can be made effective through identification of learning styles of individuals and the financial education delivery channels. Besides the awareness level, the medium of communication used to achieve the objective should also be appropriate and as per the preferences of the respondents. After mapping the requirements of the customers, video CDs can be provided to the customers containing detailed information about the products and services. These can be distributed at the time of opening an account or as desired by the customers. The videos can be incorporated via Television as a part of customer awareness programmes. Since most of the respondents were post graduates, it is advisable to introduce these videos via business news channels-both English and Hindi. A series of videos can be created and uploaded on YouTube, starting from the basics and then moving on to the nuances. Short films in the form of stories and documentaries can also be useful for the target audience. Webinars can also be good source of providing and enhancing the financial literacy of the audience. For ABL and CASA the preferred learning mode is Kinesthetic followed by video. Kinesthetic involves learning by doing rather than listening to an audio or watching a video. This could include workshops and trainings being conducted by banks to provide better insights and understanding about the products and services to the customers. Practical knowledge gives a first-hand feel to the customers and they are in a better position to not only understand the nature of the product but also resolve their queries as and when they arise. The training programmes can be conducted at the bank branches or at the customers' societies. Simulations and Role plays can form an integral part of these trainings. Regularity of the workshops and training programmes holds the key to effectiveness of the delivery channels.

For some of the products print media also falls in the preference list of the respondents. Initiative like "UTI Swatantra" is an example of the print media providing investment related information to customers. Similar initiatives can also be taken for banking products and services. Institutions can provide pamphlets or booklets to customers which can provide any time reference material. The ideal alternative will be to provide a combination of audio video and print to enhance the efficacy of delivery channels. Financial market deregulation has enabled access to numerous new financial services in the field of deposits, credit, insurance and wealth management at lower costs. Former generation has more access to savings and loan accounts but today the varieties of financial services today are incomparable larger, insufficient understanding of these products and services can lead to wrong financial decisions.

8.1 Recommended Alternate Channels of Financial Literacy Dissemination Through Media

Technology plays a pivot role in the delivering of financial education. Leveraging technology through collaboration with different media channels can enable in achieving the agenda of financial inclusion. The age bracket up to 30 years comprise of vulnerable youth who enter into the financial markets with partial knowledge, these are the most active consumer segments for banking products and services. Interactive multilingual voice response based training facility on mobile phones depending on the role and competencies of the participants for financial products especially on credits, insurance and wealth management advisory. Youth tends to earn at early age with increased financial life cycle, adequate personal financial management discipline will facilitate in curbing the spending habits and divert funds in productive investments. For banks these will be low cost service delivery channel with adequate coverage of targeted population both urban and rural. For schools and colleges multilingual simulation based financial games based on the concept of money, savings and banking can be developed which should run parallel to their curriculum. Banking and capital market exposure must be taught to the youth though mobile based gaming technology which will expose them to real life situations and will assist them in taking informed financial decision constituting an experiential based learning.

Adult learning centric programs can be designed where banks should collaborate with the corporate employers for financial literacy campaigns and fairs. E learning based modules with virtual trading platforms should be persuaded at this level as the focus is more on wealth accumulation, wealth creation and financial planning at large. Training should be on loan amortizations, deposit interest calculations, insurance products and investment avenues. Frequent certified training by the banks and financial institutions would render to upgrade oneself with the changing dynamics of the financial industry. Financial gaming zones can be developed at employers place as part of leisure activity which can be an interface for continuous learning. Community based learning centric programs such as social media can be mechanism to share, collaborate and build new financial learning communities.

Adults over a period of time has built on their skills and knowledge through their life experiences accordingly financial education to adult ought to be flexible and should be contemplated considering their physical and psychological aspects thus the financial knowledge deliverables should be practical incorporating variety of written, visual and interactive ways to engage learners and accommodate them to different learning styles which in a way would facilitate the learners an opportunity to analyze, apply and converse on the topics familiar to them and to acquaint with new financial skills. Formation of financial club in consonance with the retired personnel groups or old age homes, the focus is more on security aspect than investment aspect in late 60's specially thus investment options with assured returns become a prerequisite. Sound money management can be imparted through trainings and workshops through two communications and dialogues. Digital learning's through webinars and video conferencing enable in experiential learning through dialogue exchanges.

9   Conclusion

The costs of financial education programs should outweigh potential benefits. Informal learning is a tacit learning process which is gained out of incidental and unintentional experiences both at work and at leisure, blend of formalized and informal methods can eliminate financial illiteracy. The financial education has to be a continual process cascaded gradually over the individual's life span at a countless frequency rate to patch up with the changing arena of financial products; one point education may disadvantage the retention rate of financial lessons learnt earlier. Financial inclusion is one of the top most policy priorities of the regulators and one of the most visible aspects of the governance has been agenda of social inclusion of which financial inclusion is an integral part. Individuals learning abilities if identified and capitalized through the right source of delivery through effective technology can enhance the understanding of the financial concepts equipping mastery and prosperity to the household.

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Analysis of the Effect of Developments in Banking Sector on the Economic Development: The Case of Turkey

Gökhan Işıl and Esra Erik

Abstract Banks, which are the building blocks of the financial system, manage the loanable fund supply and demand in economics through their "mediation" function. Enlargement of financial market volume also brings increase in national income and employment. Other important function of the banks in macroeconomic aspect is the fact that the provided funds to the financial system guide to sectors which will provide the most value to the economic growth. In this respect, existence of a strong financial system depends on a healthy growing and developing financial sector. In a country, such as Turkey, which has a saving gap, the importance of the banking sector on best usage of financial savings and procurement of economic growth through a stable economic development is undeniable.

In this work, based on this point of view; the relationship between the developments in the banking sector and the economic development, within Turkey's economy, is tested by regression analysis method. Within this work, Human Development Index (HDI), as a dependent variable, is used to define the economic development. In order to show the development of the banking sector, independent variables, part of banking sector in finance sector (BGY), monetary easing (M2GY), development in the total credit volume of the banking sector (KGY), development in the total deposits volume of the banking sector (MGY) and development in the total assets of the banking sector (AGY) variables are used. As a result of the regression analysis and performed tests, it is concluded that HDI variable will increase by 14% if AGY variable increases by 1%, HDI variable will increase by 18% if KGY variable increases by 1%, HDI variable will increase by 17% if MGY variable increases by 1%, HDI variable will increase by 27% if BGY variable increases by 1% and HDI variable will increase by 21% if M2GY variable increases by 1%. As a result of the

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literature work and the analysis performed, it is concluded that the developments in the banking sector positively effects the economic development in Turkey.

Keywords Banking Sector • Economic Development • Regression Analysis

1 Introduction

In economics, sustainable increase in real income is defined as economic growth. Economic is also defined as increase of goods and services production in a country. The basis of macro-economic variables which shows this production is Gross Domestic Product (GDP). It can be measured by two means as Current and Real GDP. Between this two methods, Real GDP is the most import sign of the economic growth.

The most basic function of banks is mediation function. Banks mediate for those who demand funds by taking funds from those who have fund surplus. Hence, banks provide credit facilities so as to direct funds from those who have over savings to investments. Banks, by this function, play a very important role in supply the needs of the reel sector. Accordingly, banks mediate for contribution to economic growth by increase through production in national income Importance in this mediation function will increase as a result of growth and development of the banking sector.

Economic growth has become one of the most basic aims for countries in our current global world economy in which the relationship and integration among countries have rapidly increased. However, while the economic growth is very important for a country, the other factors of economic development such as welfare, happiness and consumption. Because, growth only shows the numeral production increase. It does not involve any information on welfare of those who participate in production. Accordingly, economic growth in a country may not provide improvement in life standards since the disordered income distribution. There, development is very import for economics of countries.

In first part of the work, theoretical frame regarding economic development and relevant literature is examined. In second part of the work, relationship between the development in Turkish banking sector and economic development is tested by regression analysis.

2 Economic Development: Theoretical Frame

In our day, where the economic integration has accelerated, countries give importance to economic growth to be able to compete with each other in the world's market. For economic growth and economic strength, development and economic development in the financial system are also very important besides to the economic

growth. In this sense, efficient usage of and deepening of financial resources while increases the growth in the reel sector also participates to developments in other sectors. Accordingly, various academic works have been made regarding the importance of economic development and its economic effects.

In the work made by C. Clark (1939) and I. Fisher (1940) production activities have been divided into three sectors as primary (agriculture, forestry, mining etc.), secondary (manufacturing, constructing) and tertiary (services). While the developing countries allocate their resources to the primary sectors, developed countries allocate their resources to the secondary and tertiary sectors. It asserted that with increase in personal incomes amount spent on primary products will decrease while the amounts spent on other products will increase. As a reasoning for this "Engel's Law" is propounded. It asserts that while the income flexibility of demand on primary products is low, the income flexibility of demand on secondary and tertiary products will be higher. It also asserts that, during the economic development phase, first industry then services sectors will take the lead.

According to S. Kuznets (1955), there is a relationship between the change in the total income and consumption, production, trade and income distribution. It has been concluded that while the income distribution is not steady in primary phases of growth, this inequality problem is avoided in the later stages. In other words, increase in power of growth and purchasing damages the income distribution at first, however, corrects it later on. In literature, this relationship is defined as "Inverted U Curve".

According to A. Lewis (1954), the most important component and determiner of growth is agriculture sector. Pursuant to Lewis's theory, production actualizes as industrial and agricultural production. He asserts that those who become unemployed in agriculture sector become employed in industry sector. Hence, labor who works with low efficiency in agriculture starts working more efficiently in industry sector. This supports the increase in production. He asserts that the speed of the economic growth is determined based on the investment level in industry sector and capital stock of a country. According to Lewis, societies which are in modernization phase change their economic, political and socio-cultural structure based on modernist models. Therefore, modern and outdated lifestyles exist together in developing countries.

Hirschman (1958), saying economic development resembles a puzzle, emphases the versatility of economic development. According to this, as the place of pieces are determined, the other pieces starts falling into place as well. However, finding places of all pieces while only a single piece has found its place would be very difficult. Hirschman, who says economic development resembles a puzzle, asserts that when there is a development in a sub-factor of economic development (economic, social political, cultural, theoretic mechanism etc.) this will contribute to development of other factors as well.

According to H.B. Chenery (1960), personal income increase will be parallel to industrial development in a country as per Engel's law. However, he asserts that this may show difference in countries which have different integral dynamics. According to Chenery, in order for countries to reach the level of developed countries, there

must be structural changes and increase income and welfare. Pursuant to this, the structural changes which need to be made are; changes in consumer demands with increasing income; need for physical and humane capital to increase income per capita; access to technology in international trade.

Ragnar Nurkse (1962), in his work, asserts that policies which simultaneously apply supply and demand development model in developing countries will create a vicious circle. According to Nurkse; personal low income causes insufficient savings, insufficient savings causes insufficient capital, insufficient capital causes low efficiency, and low efficiency causes low income. On the other hand, investment amounts of entrepreneurs are limited with market broadness. Purchase power which is the most determinative factor of a broad market is very weak in developing countries. Therefore, low efficiency and insufficient capital in developing countries decreases investments. According to Nurkse, there is a supply and demand oriented vicious circle.

According to W.W. Rostow (1990), there are five stages which underdeveloped countries must overcome to become developed countries. This is; traditional society stage, preparation to development stage, development stage, maturity stage and mass consumption stage. According to Rostow, the most important of all is the development stage. Because in the stage, required environment for a stable growth is created. There some requirement for development stage;

- Share of investment in national income must be more than 10%
- There must be a rapid development at least in one of the types of manufacturing industry
- Development within the scope of politic, social and corporate must be reached to benefit from broadness of modern sectors.

Maturity stage is the stage where resources are used for modern technology and activity. With new sectors, production of industry becomes varied. According to Rostow, the last stage is the mass consumption stage. At this stage, the number of consumed goods is infinite. Societies that reach this level are able to choose from concepts of welfare, international defense and political power.

Goulet (1995) defines the economic development as changes in economic, technologic, social and political values. According to Goulet, if a developing country is resisting to a change, the main reasons for this are poverty, weakness and hopelessness.

3 Literature Examination Regarding the Relationship of Economic Development and Banking Sector

Countries need to procure development in their growth and progress in a rapidly changing and broadening global economy. Therefore, in order to have a strong economic structure, countries' stable and sustainable growth and development goals take the priority. In order to have a stable and sustainable growth, a country needs to

have a strong financial system. Banks, which are the most important and basic actors of the financial systems, plays the role of locomotive to reach these goals.

In many literature works, role of banks in sustainable economic development has been examined and the positive relationships between the developments in financial sectors and economic growth-development have been determined. Therefore, it can be said that banking sector makes huge contributions to economic growth-development phases.

Demirgüç-Kunt et al. (2011) who have made works on the importance of banks in economic growth-development, has determined a positive relationship between the banking sector and economic growth-development. Also, they asserted in their analysis that number of large scale banks increases with developing banking sector and this can result in creation of a strong and healthy working financial system. Similarly, Ahmed and Ansari (1998), in their work to determine the relationship between the development of financial sectors and economic growth, found a high-rated meaningful relationship between development of financial sector and economic growth-development, and stated that the financial sector developments are triggering power for the economic growth. In parallel with other relevant works, in a work made by Hurlin and Venet (2008), as a result of causation test with reference to examples of 28 developed countries and 35 developing countries, in total 63 countries, it has been determined that; both for the developed and developing country groups, there is a strong causation relationship between financial systems and economic growth. In Goldstein (2001)'s theoretical work, is stated that, in order for reforms made in financial sectors to have a positive effect on sustainable economic development, these must be as incentive reforms by which take account of actors in financial sector (such as green banking that provides tax advantage).

In a work made by Yanık (2008), the effects of developments in banking sector on economic development has been examined. In this analysis, it is emphasized that banking sector is the main instrument to reach a fast economic growth and development, and that the banks do not only provide monetary control, but also are the ultimate power for provision of re-structuring of economy and long-term sustainable macroeconomic stability. Also, in this work, it is stated that, in order for developments in banking sector in Turkey to have a positive effect on economic growth in a long-term, banking systems must be developed as a whole, size and institution of banking system must be allowed to be varied, saving volumes, by broadening, must be directed to efficient investment areas. In a work made by Ndikumana (2005), effect of financial mediation, which influences investments, on growth is examined. As a result of this analysis; it is concluded that easing of the financial limitations of financial mediation provides firms to increase investment and effect the internal investments. Moreover, it is also concluded that decreasing of expenses for financial mediation empowers the account owners and investors so as to ease the developments in banking sector and, this provides speed to economic growth and development of a country by triggering investments.

In the work of Anwar et al. (2011); relationship between the development of banking sector and continues economic development is tested and it is determined that there is a long-term stable relationship between these two items. It has been

emphasized that the positive relationship between financial mediation and economic growth is very important for provision of capital activity and that it provides economic development through investment channel. Moreover, Levine and others (2000), in their work, tried to prove whether the financial mediation institutions (banks and other mediation institutions etc.) have any effect on economic growth. In this work, in a long-term, a strong and positive relationship is determined between development in financial mediation and economic growth. It is especially stated that in order to provide increase in economic efficiency, loan facilities provided to private sector is very important. Therefore, the effect of the financing provided by these creditors to these firms, together with the legal regulations and reforms in financial markets, on economic growth-development has been researched. In the work made by Kanberoğlu and Kara (2016), as a result of the multi variable regression analysis to measure the effect of developments in financial sector on economic development; it is determined that each financial indicator has a different effect on sustainable economic development. Moreover, in this work, it is decided that financial institutions such as banks, social security institutions and capital market institutions, directly and indirectly, effect the economic development.

Yüksel and Özsarı (2017), in their work, determined a long term relationship between bank loan facilities and bank accounts, and asserted the importance of banking sector in development of Konya Ovası Projesi (KOP). Similarly, Yaran (2011) in his work, by analyzing the development differences among geographical areas of Turkey; stated the importance differences in economic development of Turkey's east and north areas from middle and west areas. In this work, Black Sea region is examined, in the relationship between personal GDP and banking sector, an effect has been determined from economic growth to financial growth. However, the relationship between the increase in personal GDP and developments in financial system is found to be a weak relationship. As reasoning for this, the fact that in regions with low income, increases in incomes do not have a strong effect on banking sector is given.

Berger and others (2004), determined a strong and significant relationship between developments in financial sector and economic growth. Also, in the analysis of the causation relationship between the depth of transactions in financial markets and economic growth, they concluded that causal relation in developing countries is more than those in industrialized countries. Also, Levine and Zervos (1998), examined the relationship of banking and stock market and economic growth, and, as a result of the analysis, concluded that there is positive and strong relationship between the developments in banking sector and increase in the economic growth, capital accumulation and efficiency.

Nourry (2008), in his work, analyzed the existence of weak sustainable economic development in French economy by using various indexes. Nourry, by interpreting the tables he created based on considering movements of economic development indicators, asserted that it will not be possible to procure continues financial and economic growth-development based on natural capital and environmental factors of France. Rusko and Koraus (2010), examined the relationship between the financial sector and sustainable economic development by Slovakia

example, and concluded that environmental factors do have a close relationship with finance and economy. Similarly, Tandoğan and Özyurt (2013) in their works, asserted that economic development notion, economic growth and social and environmental factors must be evaluated together. As a result of the empirical work they have performed; they concluded that in order to have progress on social and environmental areas in economic development, "banking sector" must be used as an active tool. Tandoğan (2012) in his analysis, as a general outcome, found out that the banking sector plays an important role in economic development and growth phases.

In addition to these works, Calderon and Liu (2002) in their analysis, detected set important indications in causation relationship between development of financial sector and economic growth. First indication is that developments in financial sector causes economic growth, second indication is that there is a bi-directional from development sin financial sector to economic growth and from economic growth to developments in financial sector, third indication is that causation relationship between developments in financial sector and economic growth is much more in developing countries than developed countries, fourth indication is that financial development has a long term relationship with economic growth, and fifth and final indicator is that the effect of developments in financial sector on economic growth occurs with capital accumulation and technological improvements.

4 Data Set, Econometric Method and Evaluation of Findings

Works which examine the relationship between the banking sector, which is the most important institution in financial development, and the economic development have been scanned. As a result of this research, generally, works regarding determination of the relationship between financial sector, development of financial sector, banking sector, development of banking sector and economic growth have been made. There are only limited numbers of works which examine the financial development and banking sector and it is shared in Table 1 with a chronological order.

4.1 Definition of Data

In the work, independent variables which are thought to effect the development and regression model has been analyzed. Variables that are used in model for years 1998–2015 and their definitions are stated under the Table 2.

In the work, as a dependent variable, Human Development Index-HDI is examined. In the literature work, in the effect financial developments on growth, HDI is used. Accordingly, in our work, while examining the effect of developments in banking sector on growth, HDI is used. Independent variables of the work which are AGY, KGY and MGY, are used to show the development of financial sector.

Table 1 Studies on the relationship between economic development and the banking sector

Author (s)	Period of study and elected countries	Method	Used indicators	Results
Ahmed and Ansari (1998)	In the period of 1973–1991 Three Majors South-Asian Economies, namely, India, Pakistan and Sri Lanka	Cobb-Douglas Production Function, The Standard Granger Causality Tests	The Ratio of Board Money to Nominal Gross Domestic Product (GDP), The Ratio of Quasi-Money to Nominal GDP, The Ratio of Domestic Credit to Nominal GDP	In this article, first result of the correlation analysis indicate a high degree of association between financial sector development and economic growth. Second, the results form the Granger Causality Tests provide strong support for the supply-leading hypothesis, i.e., financial development causes economic growth.
Levine and Zervos (1998)	Data on 47 Countries from 1976 through 1993	Cross-Section Analysis	Real Per Capita GDP Growth, Real Per Capita Capital Stock Growth, Private Savings as a Percent of GDP, Productivity Growth, Bank Credit to the Private Sector as a Share of GDP, Value of the Trades of Domestic Shares as a Share of GDP, Value of Domestic Shares as a Share as a Share of GDP	Statistically, stock market liquidity and banking development are positively and robustly correlated with current and future rates of economic growth. Also, this investigation provides empirical evidence on the major theoretical debates regarding the linkages between stock markets and long-run economic growth.
Levine and Others (2000)	Data for 71 Countries are Averaged Over The Period 1960–1995	Dynamic Panel Analyses, Cross-Sectional Analyses	The Growth Rate of The Real Per Capita Gross Domestic Product (GDP), Liquid Liabilities /GDP, Commercial-Central Bank The Ratio of Commercial Bank Assets and The Value of Credits by Financial Intermediaries to The Private Sector Divided by GDP	The result of this analysis is that the relationship between financial intermediaries (banks and non-bank intermediaries) and economic growth is strong and positive; in addition, it has been argued that the increase in productivity in economy has led to an increase in the loans granted by banks in the private sector.

Goldstein (2001)	In the Period 1950 and 1999 Costa Rica	Theoretic Studying	Financial Markets, Innovations in Financial Markets, Policy Reforms, Competition in Capital Mobility, Government Financial Market Regulations, Environmental Degradation, Crisis, Sustainable Development Sector, Green Banking, A Conservation Lending Certification Body, Moving from State-to Market-Led Finance, A Costa Rican Green Bond Market	The origin of this work, which is a theoretical work; How can financial sector reform be designed specifically so that it enhances the prospects for sustainable development? In particular, this study, Costa Rica's reform process and unusual depth of experience in pursuing sustainable development make it an ideal place for such financial market innovations to be attemped. A set of market-based "green" financial reforms is proposed, including tax-advantaged banking and bond programs, rural group lending, and a single certification entity for potential borrowers in these programs.
Calderon and Liu (2002)	Data of total 109 Developing and Industrial Countries for the 1960–94 Period	Panel VAR Techniques, Granger Causality Test, Geweke Decomposition Test	The Ratio of Broad Money (M_2) to GDP, Financial Intermediaries to the Private Sector to GDP, The Real GDP per Capita Growth	The study finds that financial development generally leads to economic growth; the Granger causality from financial development to economic growth and the Granger causality from economic growth to financial development coexist. Moreover, financial deeping contributes more to the causal relationships in the developing countries than in the industrial countries.
Berger and Others (2004)	Data on 49 Nations from 1993–2000 (for 21 Developed Nations and for the 28 Developing Nations),	Time Series, Simple Regression Analysis	GDP Growth, Market Shares of the Banks in the Financial System, The Overall-Bank- Lending-to-GDP Ratio, The Number of Bank Employees	Statistically, there is a positive (+) and significant relationship between financial sector and economic growth. There is also a bidirectional causality between these two variables. In fact, it has been suggested that developing countries have a greater causality relationship between economic development and deeping financial transactions than industrialized countries.

Table 1 (continued)

Author (s)	Period of study and elected countries	Method	Used indicators	Results
Ndikumana (2005)	A Sample of 99 Countries Including Developed and Developing Countries for the Period 1965–1997	Cross-Section and Panel Data Regression Analysis	M_3 (%GDP), Liquid Liabilities, Credit to the Private Sector, Net Domestic Credit and Bank Credit each as Percentage of GDP and The Ratio of Banks Assets as a Percentage of The Sum of Banks Assets Plus The Assets of The Central Bank	It is argued that financial intermediaries increase investments. There is a correct relationship between the development of financial intermediaries, especially the banking sector, and the economic growth-development processes.
Yanık (2008)	In Turkey for the Years Between 1987 and 2007	For Econometric Analysis of Time Series; Unit Root Test, Static Analysis, Static Analysis, Granger Causality Test, VAR Analysis	The Ratio of Deposits, Loans and Equity to Gross Domestic Product (GDP)	As a result of the test results, a long term relation has been established between the development of banking sector in Turkey and economic growth and sustainable macroeconomic stability.
Nourry (2008)	The Period of 1990 and 2000 France	Analytical Analysis – Table Interpretation	Green National Net Product, Genuine Savings, Ecological Footprint, Indicator of Sustainable Economic Welfare, Genuine Progress Indicator, Pollution-Sensitive, Human Development Indicator, Sustainable Human Development Indicator	Empirical results of measures of well-being show that French development was improving between 1990 and 2000. However, it seems that French development was weakly sustainable but unsustainable in the strong sense over the period examined.

Hurlin and Venet (2008)	A Sample of (total) 63 Industrial and Developing Countries Over the 1960–1995 and 1960–2000 Periods	Panel Granger Causality Test	Liquid liabilities / GDP ratio, GDP ratio of lending given by deposit banks to private sector, GDP ratio of loans given by deposit banks and other financial institutions in the private sector	As a result of analysis, the results provide support for a robust causality relationship from economic growth to the financial development. Also, this result is valid for both developed and developing countries.
Rusko and Koraus (2010)	Slovakia for the 1987–2004 Period.	Theoretic Studying	Indicators such as Sustainable Development, Environmental Management Systems and Quality Management Systems have been used	In this theoretical work, from the Slovakian example, it is emphasized that environmental issues are closely related to finance and economy.
Demirgüç-Kunt et al. (2011)	In the Period of 1980–2008 72 Countries	Panel Regression Analysis	Gross Domestic Product (GDP) Ratio of Loans Granted by Banks in Private Sector, Financial Structure Gap, Stock Value Value Traded, Stock Market Capitalization, Securities Market Capitalization, Financial Structure Ratio	This study examines the evolving importance of banks and markets during the process of economic development. According to the econometric result; there is a positive and significant relationship between economic growth and financial sector. As economies grow, both the banking system and financial markets become more developed, but the sensitivity of economic output to bank development tends to fall while the sensitivity of economic output to securities market development tends to increase.
Anwar and Others (2011)	Annual data from the period of 1973 to 2007 Pakistan	Granger Causality Test, Auto Regressive Distributed Lag (ARDL)	The Ratio of M_2 Minus Currency in Circulation to Nominal GDP, The Ratio of Domestic Credit to Private Sector to Nominal GDP, The Assets with the Central Bank to GDP Ratio, The Ratio of External Debt to Exports Ratio	The study empirically investigated the contribution of financial sector in sustainable economic development of Pakistan. It was concluded that financial sector had positive impact on the sustainable economic development in short run as well as in the long run.

(continued)

Table 1 (continued)

Author (s)	Period of study and elected countries	Method	Used indicators	Results
Yaran (2011)	Based on the Data of 1999–2009 Turkey	Simple Regression Analysis	Gross National Product per Capita Change and Savings Deposits, Loans, Bank Branch Number, Number of Employees at Bank Branch	In this article analyzes the differences in economic development between the various geographic regions in Turkey. Also, the Black Sea Region's banking sector and its relation to Gross National Product per capita are a straightforward relationship.
Tandoğan (2012)	Annual data for the Years Between 1980–2010 The Developing Countries, OECD Countries (total 49 countries)	The Toda Yamamoto Causality Test, Static Panel Regression and Dynamic Panel Causality Analyses	Sustainable Human Development Index, Domestic Loans, Bank Deposits, Private Sector Loans, Monetary Indicator (M2P), Per Capita Income, Human Development Index, Central Bank Assets and Assets of Deposit Banks, Educational Indicator; Public Expenditure Share Foreign Direct Investments, Index of Openness	This study comes up with the finding of the fact that banking sector has a positive role in the economic growth and sustainable economic development for developing countries, OECD countries and for Turkey as well.
Tandoğan and Özyurt (2013)	In Turkey for Years Between 1981 and 2009	The Toda Yamamoto Causality Test, VAR, Unit Root Tests	Per Capita Income, Domestic Credits, Bank Deposits, Private Sector Loans, External Debt Sustainability, Sustainable Human Development Index (SHDI), The Series of Human Development Index (HDI)	The findings reveal the linear relationships from banking sector to both sustainable economic development and economic growth. These empiric results suggest that banking sector could be used as an effective tool to make progress in economic growth and social and environmental fields.

Kanberoğlu and Kara (2016)	In the Period of 1980–2012 Turkey	Multivariate Regression Analysis	Per Capita Income, M2/Gross Domestic Product (GDP), Stock Value/GDP, Private Sector Loans/ GDP, Financial Asset Stock/GDP	As a result of the econometric application, we have reached the conclusion that each financial indicator in the model affects sustainable development in different directions. Moreover, it has been emphasized that the financial system formed by institutions such as banks, social security institutions, capital markets, etc. Has direct and indirect effects on sustainable development.
Yüksel and Özsarı (2017)	Annual Data for the Period Between 1992 and 2013 Turkey	Engle-Granger Cointegration Analysis	Bank Loans, Bank Deposit, With Respect to Regional Development GDP Growth for Each Cities	This situation explains that the importance of banking sector is very high for KOP region. In other words, it was identified that banking operations lead to increase the quality of life style of the people who live in KOP region.

Table 2 Definitions of variables used in the research

Variables	Definitions
Dependent Variable	
HDI	Human Development Index (Human Development Index-HDI)
Independent Variables	
AGY	Total Assets of Banking Sector /GDP
KGY	Total Loans and Receivables of Banking Sector / GDP
MGY	Total Accounts of Banking Sector/ GDP
BGY	Part of Banking Sector in Finance Sector
M2GY	M2/GDP

The reason is that the active size of the banking sector, amount of loan facilities it provides, and accounts size are considered to be indicator of level of development in banking sector. The other used dependent variable BGY is the most basic variable which show the size of banking sector in Turkish finance sector. Hence, AGY, KGY, MGY and BGY are variables which shows the development level of finance sector in Turkey. The other independent variable in the work is M2GY. This variable shows the monetary easing in Turkey. Thinking that banks are the most important tool in financial markets, monetary easing must positively affect the banking activities. Therefore, in order to explain the development of banking sector, M2GY variable is used.

4.2 Findings and Evaluations

Analysis have been made under Newey-West algorithm in regression solution which is used for broadness of banking sector that is thought to effect the development index, HDI (Table 3).

Independent variables which are dealt with explain HDI variable with 67.8% ratio. As the F test which shows the significance of the model is $p < 0.05$, H1 hypothesis, that shows the significance of the model is accepted. If AGY variable increases by 1%, HDI variable will increase by 14%. If KGY variable increase by 1%, HDI variable will increase by 18%. If MGY variable increases by 1%, HDI variable will increase by 17%. If BGY variable increases by %1, HDI variable will increase by 27%. If M2GY variable increases by %1, HDI variable will increase by 21%.

When looked to index size, BGY and M2GY variables show the most effect. Analysis has resulted in a similar way to the works in literature. In the work, determination of effects of developments in banking sector on economic development has been aimed. Therefore, the fact that as a result effects of BGY and M2GY variables is huge on HDI variable means that developments in Turkish banking sector positively effects the economic development. Moreover, the fact the BGY variable affects the HDI the most, shows that in financial system banks have very important effect on economic development.

Table 3 Regression analysis estimate results

Independent variables	Index	Std. error	t statistic	Probability
AGY	0.140243	0.032069	4.373216	0.0000[a]
KGY	0.185553	0.095892	1.935031	0.0560[a]
MGY	0.170217	0.062059	2.742813	0.0073[a]
BGY	0.274851	0.022881	12.01221	0.0000[a]
M2GY	0.216581	0.035643	6.076381	0.0000[a]
fixed	0.015735	0.001301	12.09492	0.0000[a]
R-squared	0.678490	Mean dependent var		0.014858
Adjusted R-squared	0.650833	S.D. dependent var		0.015489
S.E. of regression	0.009152	Akaike info criterion		−6.465544
Sum squared resid	0.007790	Schwarz criterion		−6.233929
Log likelihood	338.7427	Hannan-Quinn criter.		−6.371755
F-statistic	24.53248	Durbin-Watson stat		2.134779
Prob(F-statistic)	0.000000	Wald F-statistic		43.976731
Prob(Wald F-statistic)	0.000000			

[a]Significant at 0.05 level

Table 4 Normality test results

	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Error Mar	.145	18	.200[a]	.951	18	.436[a]

[a]normal allocation is provided

Table 5 Breusch-Godfrey Serial Correlation LM Test results

F-statistic	0.092024	Prob. F(2,10)	0.9128
Obs*R-squared	0.325300	Prob. Chi-Square(2)	0.8499

Table 6 Harvey test results

| F-statistic	0.402949	Prob. F(5,12)	0.8377
Obs*R-squared	2.587663	Prob. Chi-Square(5)	0.7632
Scaled explained SS	1.771012	Prob. Chi-Square(5)	0.8798

For testing of model's assumption tests, as a first stage, Kolmogorov-Smirnov and Shapiro-Wilk test are applied. As it can be seen form the Table 4, since the error margin is $p > 0.05$, H0 hypothesis, that stated normal allocation, is accepted.

As a second step, LM test is applied (Table 5).

As it can be seen from the table, since the result is "$p > 0.05$" H0 hypotheses, which shows there is no autocorrelation, is accepted.

As a third stage, for   heteroscedasticity, Harvey test is applied (Table 6).

As it can be seen from the table, since the result is "$p > 0.05$" H0 hypotheses, which shows homoscedasticity, is accepted.
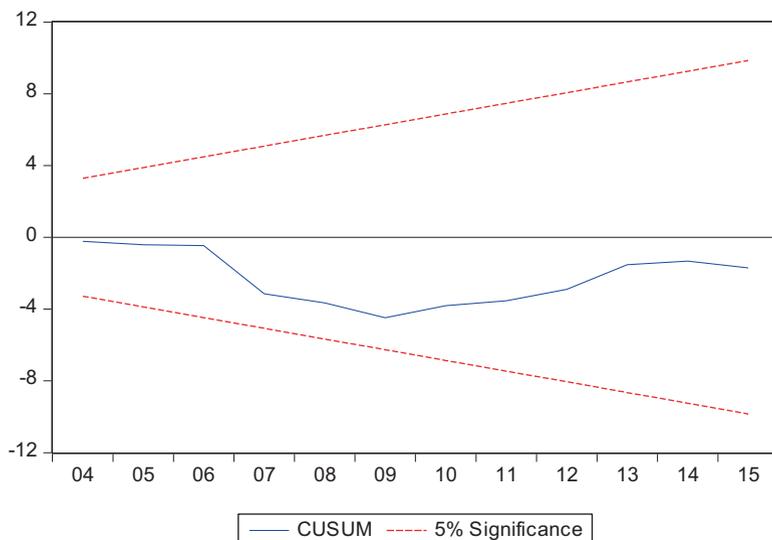
Graphic 1 CUSUM test results

In the structural determination test of the model, CUSUM test is used.

When Graphic 1 is examined, it is concluded that, as the data is in secure territory, there is not a structural fraction and that the structural determination is ensured.

Accordingly, assumptions are ensured and it is proved that indications with respect to the model reflect the truth.

5 Conclusion

The phenomenon which came into prominence in globalizing world is that in order for countries to compete each other, they need to have a rapidly developing economy. Banks have the most important mediation function for provision of basic funds to have a rapid economic growth in this necessity. Accordingly, having a developed and smooth operating banking system is required to have a strong economic structure. In this respect, in recent years, countries started to have primary goals to have a developed financial system and to have a rapid economic growth. However, besides to economic growth, economic progress indicators such as welfare, happiness and consumption are very important as well. The reason for that is, growth only show numerical production increase. It does not contain any information on financial welfare of individuals which participate in production. Therefore, while having a growth in a country, it is possible to face with derogation in lifestyles as a result of income inequality. For this reason, the most important matter for a country's

economy is "provision financial progress with financial developments based on developed and strong foundations".

In order to have financial development, investment in economy must be increased and countries must have a financial system that can provide funds for financing of such investments. In this respect, primary actor in the relation of financial developments, financial growth and progress is "banks".

In the work, the relationship between development of banking sector in Turkey and financial development is tested by regression model. In the model, as variables to show the size of banking sector, total assets of banking sector in GDP, percentage of total loan facilities and receivables in GDP, percentage of total accounts in GDP and part of banking sector in finance sector have been examined. As an indicator of size of the finance sector, monetary easing have been taken into account. As a variable defining the financial development, human development index has been used. The variables used in this work are detected as a result of the literature scan and it is concluded that examination is required. In the regression model of the econometric analysis, it is concluded that there is a positive relationship between the dependent variable, human development index, and the independent variables. Within this perspective, it is concluded that developments in banking sector existing in Turkish financial system positively effects the financial progress.

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Effect of Oil Price Volatility on Clean Energy Stock Market Performance

Negar Fazlollahi and Saeed Ebrahimijam

Abstract Recently clean energy firms become more attractive for the investors, this leads to the more comprehensive studies in this field. Thus the aim of this study is investigating the impact of oil price volatility on the performance of S&P500 clean energy market by contributing oil price and technology market performance. To explore this relation the Zivot-Andrews test was conducted to check the stationarity of the time series, since a structural break is found during year 2007–2008, and then Bound test co-integration is applied, because of different levels of integration among time series in order to check the probable existence of the long-run relationship in the model. The results indicate that clean energy sector performance converges to its long-run level by 1.09% speed of weekly adjustment. The most magnitude finding of this paper is that, oil price volatility has significant long-run effect on the performance of clean energy sector. However, no significant short-run impact is observable.

Keywords Bound test • Clean energy stock price • Oil price • Oil price volatility • Technology stock price

1 Introduction

Concentrating on clean energy is appealing magnitude attention recently (Bohl et al. 2015), even though the cost to produce clean energy is relatively high. It's necessary to highlight the current debate over climate and clean energy; worries around the natural surroundings of the weather variations. Thus supporting the clean energy through financial investment is essential. In order to obtain this goal understanding the financial mechanism behind clean energy will assistance us. One issue that provokes investment in clean energy is oil prices.

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Rising in oil prices have a negative impact on economic activities, because it causes the inflationary burden on the society (Sadorsky 1999). Meanwhile increasing in the prices of oil negatively affects financial activities; for example, most of the oil shocks lead to recession in the U.S market place (Hamilton 1983). However, there are plenty of industries that benefit from increasing in the oil prices, such as; clean energy industry or alternative energy industry. When oil prices raise investors are trying to find an alternative energy sources, this leads to an increase in the clean energy stock prices. Therefore, it is valuable to investigate the relationship among clean energy stock prices and oil prices.

Another issue that arouses investment in clean energy is technology. In the late 1990s, investors treat investment in clean energy stocks as investment in high-technology stocks (Henriques and Sadorsky 2008), because clean energy is somehow the product of high-technology companies, and during the years the behavior of clean energy firms are alike to high-technology firms. Technological firms stocks react deeply to business cycles, and one of the magnitude factors of business cycles are oil prices (Kumar et al. 2012). There is a positive relationship among clean energy stocks, technology stocks, and oil prices (Managi and Okimoto 2013). This suggests that, as oil prices surges, other energy stocks become expensive, investors are trying to find a substitute energy source, thus they will invest in clean energy stocks, because clean energy which is the result of technological development is a good substitution. However, clean energy stocks have higher relation with technology stocks than with oil prices (Sadorsky 2012), because the performance of clean energy firms often tied to the performance of technology firms.

We contribute to the literature in a way that, another issue which stimulates investment in clean energy is oil price volatility. Volatility in oil prices demonstrates an essential role in the economy. Oil price volatility effect both consumers and producers in oil industries also transportation. When volatility in oil prices happen industrial consumers may alter their investment decisions and manufacturing producers modify their oil productions (Sadorsky 2006). Thus the aim of this paper is investigating the long-run relationship among oil price, oil price volatility, technology stock price, and clean energy stock price by applying bounds test.

The rest of the paper is structured as follows. Next section reviews related literature surrounding the influence of oil price, oil price volatility, technology stock price on the S&P 500 stock price of clean energy. Section 3 illustrates the data used in the study, and explains the methodology conducted. Sections 4 and 5 provide empirical findings and conclusion respectively.

2   Literature Review

Managi and Okimoto 2013 investigating the relationship among clean energy stock prices, oil prices, and technology stock prices, considering structural changes in the market. They apply Markov-Switching Vector Autoregressive Model (MSVAR), to capture the structural breaks. They come to the conclusion that there is a positive

correlation among clean energy stock prices, oil prices, and technology stock prices, after structural break of the late 2007; when oil prices significantly increased, also in 2005 to the early 2008; when recession happened in the US. The effect of structural changes on this relationship proposes that by improvement in technology, and increasing oil prices people are trying to find the alternative energy sources, thus clean energy can be a good substitute.

Henriques and Sadorsky 2008 exploring the relation among alternative energy stock prices, oil prices, technology stock prices, and interest rates. They run a four variable Vector Autoregressive Model to study the empirical relation. Concluding that oil prices granger cause alternative energy companies stock prices; it means movements in oil prices can explain the movements of alternative energy companies stock prices, and stock prices of technology granger cause alternative energy companies stock prices.

Kumar et al. 2012 study the relationship among stock prices of clean energy, oil prices, carbon prices, and technology stock prices. They use a weekly five-variable VAR model, to find that oil prices and technology stock prices are individually affect clean energy stock prices, also there is a positive relationship between oil prices and clean energy stock prices, because when oil prices are increased, clean energy is a very good substitution to energy sources. Meanwhile investors look at stocks of high technology firms as clean energy stocks.

Sadorsky 2012 examines the volatility spillover among stock prices of clean energy, stock prices of technology, and oil prices. He conducts four various multivariate GARCH models. Recognizing that, the dynamic conditional correlation among stock prices of clean energy companies and stock prices of technology companies are higher than the correlation between stock prices of clean energy companies and oil prices. This results suggesting that clean energy companies relate more closely with technology companies than they do with the oil marketplaces.

There is plenty of studies concerning the relationship between oil price volatility and macroeconomic variables (Lee et al. 1995; Ferderer 1996; Yang et al. 2002; Chen and Chen 2007), however there is few studies regarding the relationship among oil price volatility and financial sectors, such as; Huang et al. 1996 illustrates the volatility spillover among stock prices and oil price volatility, by applying VAR model. Sadorsky 1999 demonstrates a relationship among real stock returns, oil price, and oil price volatility, by conducting unresticted vector autoregression method. Concluding that oil price changes, and oil price voltility can explain movemnets in real stock returns. Sadorsky 2006 displays the relaionship among oil price volatility and financial markets by applying Generelized Autoregressive Conditional Hetroscedstic (GARCH) model.

The literutre concerning oil price volatility relates to oil shocks. In a study done by Cong et al. 2008 the relationship among oil price shocks and stock market of China is investigating, applying multivariate VAR model. Concluding that oil price shocks have impact only on some oil firms and manufacturing index among Chinese stock market indices. Another conlcusion is that oil price voltiltiy increses the stock returns of petrochemical and mining firms. In another study done by Park and Ratti 2008 the relationship among oil price volatility and oil price shocks on real stock

returns of thirteen European countires and US over 1986–2005 is examined. The study uses VAR approach. The results of the study demonstrate that in the U.S. increases in the oil price volatility will increase the real stock returns, however in many European countries increases in oil price volatility decrease the real stock returns.

3 Data and Methodology

3.1 Data

In this paper we use the weekly data similar to other studies, such as;(Radchenko 2005; Henriques and Sadorsky 2008; Arouri 2011; Fan and Xu 2011; Broadstock et al. 2012; Managi and Okimoto 2013) who investigate the performance of clean energy stocks in different market conditions. The model of this study applies on some variables including; SPGCLTE as the index of clean energy firm stocks which are publicly traded in S&P500, extracted from the date stream. Clean energy companies are working on cleaner technology containing solar, hydrogen fuel and wind. The proxy for oil price is World Texas Intermediate (WTI) known as WTI_OIL in the data stream; AMXTECH is the price index of the technology company stocks knowing as the Arca tech 100 index. This index comprising of 100 listed stocks from 15 various industries traded in NYSE, which is extracted from Chicago Board Option Exchange (CBOE) that provides many volatility indexes. OVX is the measure of oil volatility and used as a proxy for oil price fluctuations, and is explored from CBOE data stream. The sample period is chosen from the 15th of May 2007 to 19th of May 2015 in order to cover the required fluctuations, inclusive of 419 observations for each time series. The descriptive statistics for natural logarithm form of variables are mentioned in the Table 1 below.

Table 1 Descriptive statistics of variables (2013–2014)

	LSPGCTLE	WTI_OIL	LOVX	LAMXTECH
Mean	6.918171	4.426320	3.515784	5.581667
Median	6.878274	4.494685	3.493777	5.565210
Maximum	8.256778	4.959482	4.533459	6.077596
Minimum	5.986547	3.495901	2.674149	4.875045
Std. dev.	0.625524	0.256583	0.374953	0.260626
Skewness	0.655606	−1.095785	0.229046	−0.188849
Kurtosis	2.405550	4.117057	3.007549	2.809923
Jarque-Bera	36.18502	105.6369	3.664598	3.121293
P-value J-B	0.000000	0.000000	0.160045	0.210000
Sum	2898.714	1854.628	1473.114	2338.719
Sum sq. dev.	163.5553	27.51894	58.76642	28.39293
Observations	419	419	419	419

Table 2 Correlation matrix

	LSPGCTLE	WTI_OIL	LOVX	LAMXTECH
LSPGCLTE	1			
LWTI_OIL	−0.0034797	1		
LOVX	0.28850126	−0.5827597	1	
LAMXTECH	−0.46354769	0.32085803	−0.641103444	1

Jarque-Bera test demonstrates that the changes in the clean energy stock price (LSPGCTLE), and the changes in the oil price (LWTI_OIL) are both normally distributed, however the changes of oil price volatility (LOVX), and the changes in technology stock price (LAMXTECH) are not normally distributed. Standard deviation illustrates that the changes in the clean energy stock price (LSPGCTLE) is approximately two times that of the other variables, nevertheless changes in the standard deviation of Oil price, technology stock price, and oil price volatility are very close to each other.

The correlation among these four variables is illustrated in the Table 2. The correlation table displays almost a strong negative correlation between changes in technology stock price and clean energy stock price, a moderate positive correlation between changes of oil price volatility and clean energy stock price, finally a weak negative correlation between changes in the oil price and clean energy stock price.

3.2 Methodology

3.2.1 Model Specification

According to the above discussion and literature review, the econometric model in this regard considers crude oil price, technology sector stock performance and oil price volatility as the independent variables and clean energy sector stocks price index as the dependent variable. The model is specified as:

$$SPGCTLE = f(WTI\_OIL, AMXTECH, OVX) \qquad (1)$$

SPGCLTE is the S&P500 market clean energy sector price index. The proxy for oil is West Texas Intermediate futures price contract (*WTI_OIL*) that is widely used by the US market researchers as a benchmark for oil market (Milonas and Henker 2001). According to the previous studies mentioned in the literature review, technology sector performance has a great impact on the performance of clean energy companies. To this end, AMXTECH is added to the model. It is the NYSE technology companies' performance index. In this study we are trying to examine the impact of oil price volatility on clean energy sector performance, to obtain this goal *OVX* is added to the model to figure out the impact ofoil price volatility on the clean energy sector performance. All variables are stated as natural logarithm form in the model to reduce heteroskedasticity in the data.

$$\ln\left(\text{SPGCTLE}_t\right) = \beta_0 + \beta_1 \ln\left(WTI\_OIL_t\right) + \beta_2 \ln\left(\text{AMXTECH}_t\right) \\ + \beta_3 \ln\left(\text{OVX}_t\right) + \in_t \tag{2}$$

3.2.2 Zivot and Andrews Unit Root Test

Traditional tests for checking the presence of unit roots in a time series data are the Augmented Dickey Fuller (Dickey and Fuller 1979) and Phillips-Perron (Phillips and Perron 1988). However, these tests are unable to capture the presence of structural breaks in the data set. Consequently, these traditional tests might provide spurious results. In this study, because of the existence of structural breaks we conduct Zivot and Andrews (Zivot and Andrews 1992) for checking unit root in the date set. The Zivot and Andrews proposed a new method which considers all of the points as potential for probable break point in term of time and runs a different regression for every possible break date sequentially nevertheless captures a most significant structural break in the series.

$$y_t = \hat{\mu} + \hat{\theta}\, DU_t\left(\hat{T}_i\right) + \hat{\beta}\, t + \hat{\alpha}\, y_{t-1} + \sum_{k}^{j=1} \hat{c}_j\, \Delta y_{t-j} + \hat{e}_t \tag{3}$$

$$y_t = \hat{\mu} + \hat{\beta}\, t + \hat{\gamma}\, DT_t\left(\hat{T}_i\right) + \hat{\alpha}\, y_{t-1} + \sum_{k}^{j=1} \hat{c}_j\, \Delta y_{t-j} + \hat{e}_t \tag{4}$$

$$y_t = \hat{\mu} + \hat{\theta}\, DU_t\left(\hat{T}_i\right) + \hat{\beta}\, t + \hat{\gamma}\, DT_t\left(\hat{T}_i\right) + \hat{\alpha}\, y_{t-1} + \sum_{k}^{j=1} \hat{c}_j\, \Delta y_{t-j} + \hat{e}_t \tag{5}$$

The ZA model checks the possibility of any shift in the intercept by dummy variable DUt (model 3) as well as trend DTt (model 4) or both the intercept and trend (model 5) at time t. For empirical estimations, we used the third model which considers both intercept and trend at one model (5). Here, in the above equations, DUt is 1 if $t > TB$ and else it is zero and DTt is $t − TB$ if $t > TB$, and it is Zero if $t < TB$.

The null hypothesis (H0) is $\alpha = 0$. The critical values of statistical testing for the hypothesis are different for each model and came from tables' Zivot and Andrews 1992.

3.2.3 Bound Test Co-integration

When a nonstationary series is regressed on another nonstationary time series, the result might be a spurious regression. Co-integration test is to investigate the existence of long-run equilibrium relationship among variables which are integrated at least in first difference I(1). If the time series variables are integrated at different

levels (I(0) and I(1)), and under the condition that the dependent variable is integrated at first order I(1), investigating for co-integration is only conductible with ARDL (Auto Regressive Distributed Lag) method.

The ARDL modified model is given by following equation:

$$\Delta y_t = \alpha_0 + \alpha_i \Delta X_t + \sum_{p-1}^{j=1} \beta_j' \Delta Z_{t-j} + \varepsilon_t \qquad (6)$$

The bounds test which is proposed by Pesaran et al. 2001 illustrates in five different models; considering different conditions on trend and intercepts (Nieh and Wang 2005):

Model 1: no intercept, no trend;

$$\Delta y_t = \alpha' \Delta X_t + \sum_{p-1}^{j=1} \beta_j' \Delta Z_{t-j} + \pi_{yy} y_{t-1} + \pi_{yX,X} X_{t-1} + \varepsilon_t \qquad (7)$$

Model 2: restricted intercept, no trend;

$$\Delta y_t = \alpha' \Delta X_t + \sum_{p-1}^{j=1} \beta_j' \Delta Z_{t-j} + \pi_{yy} \left(y_{t-1} - \mu_y \right) + \pi_{yX,X} \left(X_{t-1} - \mu_X \right) + \varepsilon_t \qquad (8)$$

Model 3: unrestricted intercept, no trend;

$$\Delta y_t = c_0 + \alpha' \Delta X_t + \sum_{p-1}^{j=1} \beta_j' \Delta Z_{t-j} + \pi_{yy} y_{t-1} + \pi_{yX,X} X_{t-1} + \varepsilon_t \qquad (9)$$

Model 4: unrestricted intercept, restricted trend;

$$\Delta y_t = c_0 + \alpha' \Delta X_t + \sum_{p-1}^{j=1} \beta_j' \Delta Z_{t-j} + \pi_{yy} \left(y_{t-1} - y_y t \right) + \pi_{yX,X} \left(X_{t-1} - y_x t \right) + \varepsilon_t \quad (10)$$

Model 5: unrestricted intercept, unrestricted trend;

$$\Delta y_t = c_0 + c_1 t + \alpha' \Delta X_t + \sum_{p-1}^{j=1} \beta_j' \Delta Z_{t-j} + \pi_{yy} y_{t-1} + \pi_{yX,X} X_{t-1} + \varepsilon_t \qquad (11)$$

Where, Δ is the difference operator, y_t is dependent variable, X_t are independent variables, Z_t are the lags of variables $Z = f(X_t, y_t)$, t is the trend term, ε is the disturbance.

Then the model should be checked for serial correlation and stability. To test the co-integration, the null hypothesis must be considered as $\pi_{yy} = \pi_{XX} = 0$ (no co-integration) that is tested by Wald test which should be rejected in term of long-run

relationship between variables. The critical values of F-statistics came from Narayan 2005. Significant F test implies a co-integration. Table 4 will display ARDL co-integration results.

3.2.4 Error Correction Mechanisms

The last step of our research methodology is the error correction mechanism (ECM) developed by Engle and Granger 1987.Error correction model estimates the speed at which an endogenous variable returns to equilibrium after any change in exogenous variables and shows how to reconcile the short-run behavior of a time series economic variable with its long-run behavior (Pesaran et al. 2001). Given VAR model the ECM would be calculated from the below equation:

$$\Delta y_t = \alpha' \Delta X_t + \sum_{p-1}^{j=1} \beta_j' \Delta Z_{t-j} + \pi_{yy} y_{t-1} + \pi_{yX,X} X_{t-1} + \gamma \, ECT_{t-1} \tag{12}$$

Where, γ is the estimated coefficient of ECT_{-1}(the first lag of error correction term) and ECT are the residuals of the estimated model. Next section would discuss about the empirical results of applying the mentioned techniques on time series data and model.

4 Empirical Results

The main purpose of this study is to examine the relationship among clean energy stock prices, technology stock prices, and oil prices along with possible impact of oil price, while there is a structural change in data. This section presents the empirical results found for the variables employed in this study. Before following formal tests of stationarity, it's necessary to plot the logarithmic form of time series variables, as we have done in Fig. 1. These graphs clarify the nature of the series. Meanwhile the below graphs are presenting the probability that perhaps are series are not stationary, because there is a structural break in each series during year 2008.

The LSPGCTLE time series shown in Fig. 1a has downward trend, in other words, over the period of study LSPGCTLE has been decreasing. The mean of LSPGCTLE has been changing, suggesting perhaps the series is non-stationary, also there is a structural break in 2008. In the WTI_OIL and LOVX which are displays in Fig. 1b, d respectively, there is no clear trend, however the presence of structural break in 2008 is clear. The LAMXTECH time series illustrated in Fig. 1c is increasing over time with an upward trend, the mean of the variable is changing, proposing possibly LAMXTECH is non-stationary, and it has structural break in 2008.This overview is a starting point for the formal test of stationarity.

To check stationarity of the time series formally Zivot and Andrews unit root test has been conducted, due to the structural breaks indicated in time series. According

Table 3 Zivot and Andrews unit root tests results

Variables	Test statistics	Break date	
Panel A. Test at level			
LSPGCLTE	−3.59	−	−
LWTI_OIL	−3.02	−	−
LOVX	−3.75	−	−
LAMXTECH	−5.58*	02/09/2008	I(0)
Panel B. Test at first difference			
ΔLSPGCLTE	−11.18*	02/12/2008	I(1)
ΔLWTI_OIL	−11.26*	30/12/2008	I(1)
ΔLOVX	−24.42*	23/12/2008	I(1)
ΔLAMXTECH	−	−	I(0)

Note: * represent for significant level at 1%

Table 4 ARDL bounds test for co-integration

	Unrestricted intercept with deterministic trend						Unrestricted intercept without deterministic trend				
	F_{IV}	Lag	F_V	Lag	t_V	Lag	F_{III}	Lag	t_{III}	Lag	Conclusion
$f_{gspc} =$ (Y_t/X_{it})	6.08*	(1)	7.19*	(1)	−3.76*	(1)	0.06	(1)	−0.02	(1)	Reject null.

Note: According to Schwartz (SBC) Information Criterion first lag of Bound test scenarios are considered. ARDL was selected as (2,1,3,1) for different scenarios of the co-integration test: FIII denotes the F-stat of the model with unrestricted intercept and no trend, FV is the F-stat of the model with unrestricted intercept and trend, FIV represents the F-stat of the model with unrestricted intercept and restricted trend and tV and tIII are the t ratios for testing model (3) and model (2) with deterministic trend and without deterministic trend. In the table, Y represents the dependent variable LSPGCTLE; Xs are representing independent variables LWTI_OIL, LOVX and LAMXTECH
*, **, *** represent for significant level at 1%, 5% and 10%, respectively

to Table 3, which are the results of the Zivot and Andrews unit root test, it indicates that *LOVX* is stationary at level (Panel A), but the rest of time series are all stationary in the first difference (Panel B). As it can be seen in panel B of Table 3, one break point has been explored in 2008 for each time series, it is consistent with the fact due to the year 2008 financial crises(Arouri 2011).

4.1 ARDL Co-integration

Co-integration test is conducted to discover any long-term relationships, among S&P500 market clean energy stock price, crude oil price, technology stock price, and the volatility of crude oil price. Due to the different level of integration at I(0) and I(1) in time series, and under the condition that the study dependent variable
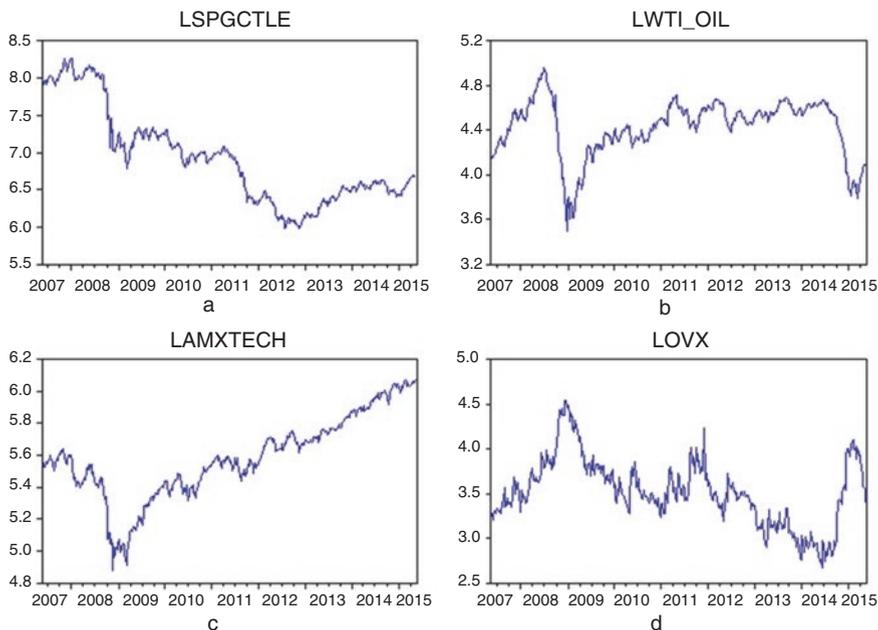
Fig. 1 Time series plots of the logarithmic form of variables

(clean energy stock price) is I(1), the ARDL is applied as the co-integration test. ARDL optimal lag structure test is based on Schwartz Information Criterion which proposes; ARDL (2, 1, 3, 1) as an appropriate ARDL model. Then the model is estimated and no serial correlation is found and according to stability diagnostic CUSUM test, the model is stable. Thus, the selected ARDL (2, 1, 3, 1) model displayed as below Fig. 2.

$$\Delta SPGCLTE_t = \beta_0 + \beta_1 LWTI\_OIL_{t-1} + \beta_2 LAMXTECH_{t-1} + \beta_3 LOVX_{t-1}$$
$$+ \beta_4 \Delta LSPGCLTE_{t-1} + \sum_2^{j=1} \beta_{5j} \Delta LSPGCLTE_{t-j} + \beta_6 LWTI\_OIL_{t-1} \qquad (13)$$
$$+ \sum_3^{j=1} \beta_{7j} \Delta LAMXTECH_{t-j} + \beta_8 \Delta LOVX_{t-1}$$

Table 4, demonstrates the results of Bound test for co-integration. According to the significant numbers in the Table 4, the model is co-integrated in three of the scenarios, with unrestricted intercept and restricted trend (F_{IV}), unrestricted intercept and trend (F_V) and unrestricted intercept and restricted trend (t_V). This means that there is a long run relationship between variables in the first lag according to Schwartz Information criterion.
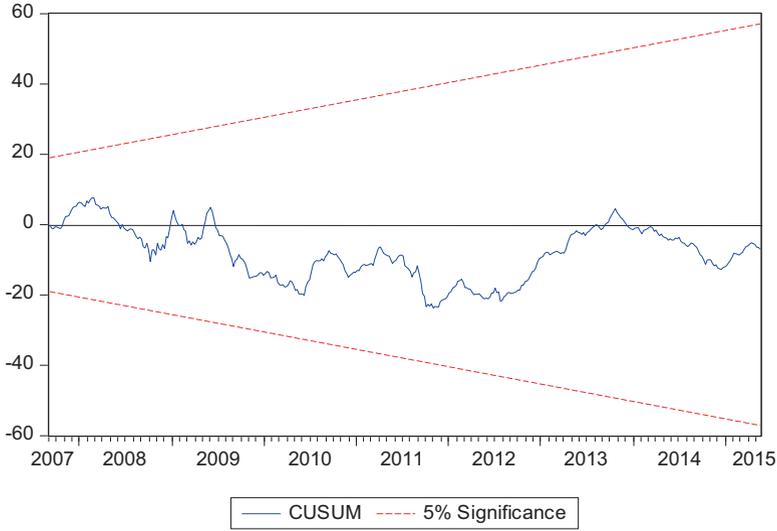
Fig. 2 CUSUM stability test result for ARDL (2,1,3,1)

Table 5 Long-run ARDL model coefficient (LSPGCLTE is endogenous variable)

Variables	Coefficient	t-statistics
WTI_OIL	0.519419*	4.044143
LOVX	0.202959**	1.871154
LAMXTECH	−1.089435*	−8.136757
C	9.986360*	7.748747

Note: *, ** represent for significant level at 1% and 5%, respectively

Table 5, exhibits the estimated long-run ARDL model coefficients. Results indicate that all the coefficients are significant; 1% increase in oil price (*WTI_OIL*) would lead to an increase of 0.51%, in the clean energy stocks sector index (*SPGCLTE*) in the long-run. One percent increase in oil price volatility (*OVX*) would increase the clean energy stocks sector index in the long-run by 0.20%. One percent increase in changes of technology companies stock price index (*AMXTECH*) leads to a decrease of 1.08% in clean energy stocks sector index in the long-run.

The above estimation is necessary to determine ECM which can capture the short-run causality as well as the long-run equilibrium relations among time series variables. The short-run model would be estimated as following equation:

$$
\Delta LSPGCLTE_t = \beta_0 + \sum_2^{j=1} \beta_{1j} \Delta LSPGCLTE_{t-j} + \beta_2 \Delta LWTI\_OI_{t-1}
$$
$$
+ \sum_3^{j=1} \beta_{3j} \Delta LAMXTECH_{t-j} + \beta_4 \Delta LOVX_{t-1} + ECT_{t-1}
$$

(14)

Table 6 Short-run ARDL model coefficient (LSPGCLTE is endogenous variable)

Variables	Coefficient	t-statistics
DLSPGCLTE(−1)	−0.245232*	−5.910107
DLWTI_OIL (−1)	0.226643*	4.248018
DLAMXTECH(−1)	0.602491*	7.430351
DLAMXTECH(−2)	0.873200*	10.29630
DLOVX(−1)	−0.006857	−0.295174
C	−0.000114	−0.042191
ECMT(−1)	−0.010917*	−3.340911

Note: *represent for significant level at 1%, respectively

The results of the error correction model, illustrates in Table 6, are about the short-run estimations state that, according to ECMT coefficient, which is negative and significant, the clean energy sector of S&P500 goes to its long-run with 1.09% of its weekly adjustment by the contribution of oil market, technology market and oil price volatility, which is very less. Considering the results, 1% increase in last week *SPGCLTE* index, would decreases today's *SPGCLTE* with 0.24%. One percent increase in last week oil price would increase today's *SPGCLTE* with 0.22%. One percent increase in last week technology stock index would increase today's *SPGCLTE* with 0.60%. One percent increase in 2 weeks ago technology stock index would increase today's *SPGCLTE* with 0.87%. According to the obtained results *OVX* has no significant short-run impact on clean energy stock price sector.

This result displays that volatility in oil price would rise the clean energy stock prices in the long-run, because the volatility in oil price directly increases the production cost of the oil dependent firms and indirectly increase the clean energy companies' profit margin; consequently investors might become reluctant to invest in oil dependent firms.

5   Conclusion

Recently the clean energy firms become one of the favorite choice of investment, due to the new and continues advancement in the technology. Investors by considering the parameters influencing the stock of clean energy can provide a proper investment in the energy markets, and react to the changes in this market. Thus it is essential to find the significant variables that might impact on clean energy sector performance. According to the literature the oil price is one of the important parameters of clean energy market performance, also technology companies have an impact on clean energy stock market. We contribute to the literature by testing the probable impact of oil price volatility on the performance of clean energy firms. In order to maintain this objective the long-run relationship among oil prices, technology stock prices, and oil prices volatility on clean energy stock prices is

investigated. The study conducted bound test due to the properties of the data. The weekly data used in the paper includes 419 observations. The results imply that clean energy sectors in S&P 500 stock market index (SPGCLTE) converges to its long-run level by 1.09% speed of weekly adjustment by the contribution of oil price, technology stock price and oil price volatility, which is very less. While all the variables have long-run impact on the clean energy stock market price index, the technology firm's stock price (AMXTECH) has the highest impact on the clean energy stock price in both long-run and short-run. Investors can consider technological advancement as a sign leading to a surge in clean energy firms stock price, because they are presenting a similar pattern, this pattern is also recognized in the other studies such as; Henriques and Sadorsky 2008; and Managi and Okimoto 2013. The findings also highlight that changes in the oil price volatility (OVX) have long-run impact on clean energy firms, however no short-run influence is found in the study, because when fluctuations in the oil price market happened, the risk of the oil market is getting higher which motivate the investors to invest in the companies which are oil independent. On the other hand the clean energy company's benefit from high risky oil market, eventually can boost their profit. In the short run no significant impact can be seen, because oil market is high volatile market, and any short-term fluctuations cannot convince the invertors to invest in the clean energy market. Meanwhile changes in the oil prices (WTI_OIL) have both long-run and short-run positive effect on clean energy firms, because when oil prices rise, investors are reluctant to invest in oil industries energy sector, as a substation of that, they prefer to invest in clean energy sectors, this result is in line with Kumar et al. 2012. The extension of this study can explore this relationship conducting different time series methodology, to capture more than one structural break in the sample data.

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