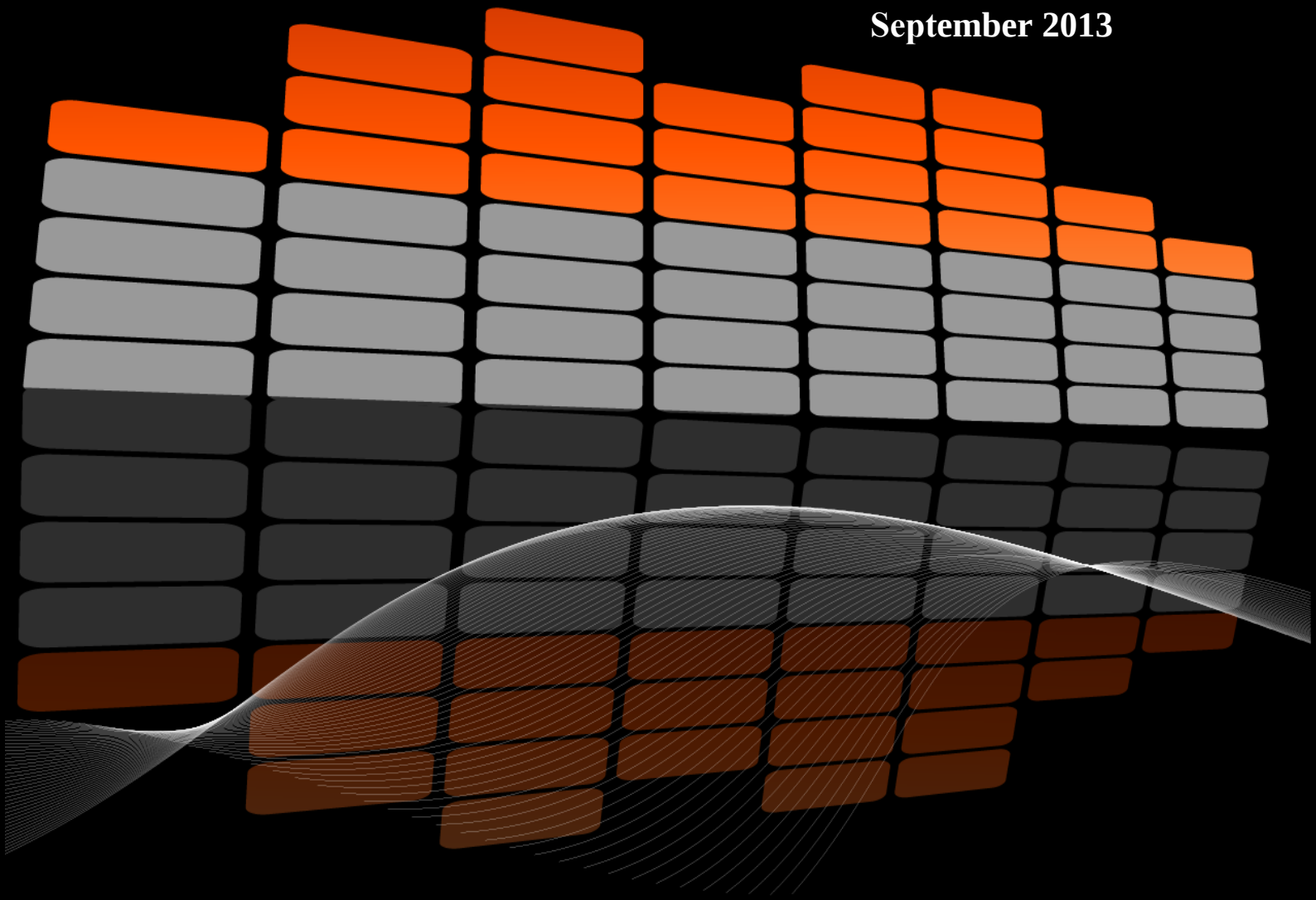
International Journal of Latest Trends in Finance & Economic Sciences

E-ISSN: 2047-0916

Volume 3 No. 3

September 2013



Web: excelingtech.co.uk

ojs.excelingtech.co.uk/index.php/IJLTFES

Editorial Board

Editorial Board

Editor in Chief

Managing Editor

Editorial Board Members

Abstracting / Indexing

International Journal of Latest Trends in Finance and Economic Sciences (IJLTFES) is abstracted / indexed in the following international bodies and databases:

- EBSCO
- Google Scholar
- DOAJ
- Scirus
- Getcited
- Scribd
- NewJour
- citeseerx

Table of Contents

1. **How to Classify a Government-Can a perceptron do it?..... 523**

   António Caleiro

2. **Combining Time Series Analysis and Multi-Criteria Decision Making Techniques for Forecasting Financial Performance of Banks in Turkey 530**

   Emrah Önder, Ali Hepşen

3. **Globalization, Regime-Switching, and EU Stock Markets: the Impact of the Sovereign Debt Crises..... 556**

   Nuno Ferreira, Rui Menezes, Sónia Bentes

4. **The Seveso Directives and Their Application to Enterprise Risk Management 563**

   Manuel da Cruz, Sonia R. Bentesecki

5. **Determinants of Economic Growth in G20 Countries: A Panel Data Approach..... 572**

   Nihat Taş, Emrah Önder, Ali Hepşen

6. **Effect of Internal-marketing-mix on Customer-pyramid-oriented banking service performance. An Indian Experience 583**

   Selvarasu Appasamy Mutharasu, Krishnaswamy Natarajan, José António Filipe

Int. Jour. Of Latest Trends in Fin. & Eco. Sc. Vol-3 No. 3 September, 2013

How to Classify a Government Can a perceptron do it?

António Caleiro

[#]Departamento de Economia and CEFAGE-UE, Universidade de Évora, 7000-803 Évora, Portugal
caleiro@uevora.pt

Abstract – **The electoral cycle literature has developed in two clearly distinct phases. The first one considered the existence of non-rational (naive) voters whereas the second one considered fully rational voters. It is our view that an intermediate approach is more appropriate, i.e. one that considers learning voters, which are boundedly rational. In this sense, one may consider perceptrons as learning mechanisms used by voters to perform a classification of the incumbent in order to distinguish opportunistic (electorally motivated) from benevolent (non-electorally motivated) behaviour of the government. The paper explores precisely the problem of how to classify a government showing in which, if so, circumstances a perceptron can resolve that problem. This is done by considering a model recently considered in the literature, i.e. one allowing for output persistence, which is a feature of aggregate supply that, indeed, may turn impossible to correctly classify the government.**

Keywords - *Classification, Elections, Government, Output Persistence, Perceptrons.*

1. Introduction

An electoral cycle created by governments is a phenomenon that seems to characterise, at least in some particular occasions and/or circumstances, the democratic economies. As it is generally accepted, the short-run electorally-induced fluctuations prejudice the long-run welfare. Since the very first studies on the matter, some authors offered suggestions as to what should be done against this electorally-induced instability. For some authors, ever since the seminal paper of Nordhaus (1975), a good alternative to the obvious proposal to increase the electoral period length is to consider that voters abandon a passive and naive behaviour and, instead, are willing to learn about government's intentions.

The electoral cycle literature has developed in two clearly distinct phases. The first one, which took place in the mid-1970s, considered the existence of non-rational (naive) voters. In accordance with the rational expectations revolution, in the late 1980s the second phase of models considered fully rational voters. It is our view that an intermediate approach is more appropriate, i.e. one that considers learning voters, which are boundedly rational. In this sense, one may consider perceptrons as learning mechanisms used by voters to perform a classification of the incumbent in order to distinguish opportunistic (electorally motivated) from benevolent (non-electorally motivated) behaviour of the government. The main objective of this paper consists precisely on studying the problem of how to classify a government showing in which, if so, circumstances a perceptron, can resolve that problem. To achieve this objective we will consider a recent version of a stylised model of economic policy, i.e. a version based on an aggregate supply curve embodying output persistence. See Gärtner (1996,1997,1999,2000) and/or Caleiro (2009,2012).

The rest of the paper is structured as follows. Section 2 offers the analysis of the bounded rationality approach as a motivation for the use of perceptrons as learning devices. Section 3 then presents the characteristics of the perceptron, which will be used to perform the classification of the government task. Section 4 explores the problem of how to classify a government showing in which, if so, circumstances the perceptron can resolve that problem. Section 5 concludes.

2. The Bounded Rationality Approach

Generally speaking, learning models have been developed as a reasonable alternative to the unrealistic informational assumption of rational expectations models. Moreover, through learning models it is possible to study the dynamics of adjustment between equilibria which, in most

rational expectations models, is ignored. Although a number of different studies modelling learning have been presented, two main classes of models can be distinguished: rational learning and boundedly rational learning models.[1] In rational learning models, it is assumed that agents know the true structural form of the model generating the economy, but not some of the parameters of that model. In boundedly rational learning models, it is assumed that agents, while learning is taking place, use a 'reasonable' rule, e.g., by considering the reduced form of the model.

Salmon (1995) is, to the best of our knowledge, one of the very few references where an innovative bounded rationality approach such as neural networks learning has been applied in a policy-making problem. We propose to use this approach within a political business cycles context (see also Caleiro, 2013). That being said, we will consider that bounded rationality voters have to classify economic policies and outcomes as coming from opportunistic or from benevolent government behaviour.

3. The Methodology of Perceptrons

Given the characteristics of perceptrons it, thus, seems appropriate to consider that the above mentioned classification task can be performed under this formulation of bounded rationality agents. Given that (artificial) neural networks are simulations of how biological neurons are supposed to work, the structure of human brains, where processing units, the so-called neurons, are connected by sinapses, is approximated by (artificial) neural networks. In our case, a single-layer linear classifier, known as perceptron, will be used to perform the classification task or, in other words, will be used to determine the vector of weights and bias specifying a line on the space output-inflation such that two sub-sets of points – obviously the opportunistic and benevolent ones – are defined.

4. The Classification of the Government

In the electoral business cycle literature, one of the most crucial conclusions is that the short-run electorally-induced fluctuations prejudice the long-run welfare. In fact, because the electoral results depend on voters' evaluation, we can consider that, if electoral business cycles do exist, it is because voters, through ignorance or for some other reason, allow them to exist. This point introduces a well-known problem of electorally-induced behaviour punishment and its related problem of monitoring. In reality, voters often cannot truly judge/classify if an observed state/policy is the result of a *self-interested/opportunistic government* or, on the contrary, results as a *social-planner/benevolent* outcome, simply because voters do not know the structure, the model or the transmission mechanism connecting policy values to state values.

Even so, voters do 'anticipate' the possible economic damage resulting from such *myopic* behaviour by governments and, especially closer to the elections, start to *classify* policies and outcomes as potentially being the result of an 'electoralist' strategy. This is done in order not to be 'fooled' by the incumbent government or simply to punish the incumbent government in case of clear *signals* of electorally-induced policies. In other words, a classification is made, so that for a sufficiently small sub-set of policies classified as 'electoralist', voters usually do not take that as a serious motive for punishment, but others, regarded as serious deviations, are punished. Note the difference between this approach and the one considered, for instance, in Minford (1995). Here, it is assumed that "*voters penalise absolutely any evidence that monetary policy has responded to anything other than news*", by 'absolutely' meaning that there is enough withdrawal of voters to ensure electoral defeat. In general, this classification task is made difficult by ignorance of the structural form of the model transforming policies in outcomes and also simply because information gathering costs money and time.

4.1. The model

Recently some authors have assumed an extended version of the standard aggregate supply curve $y_t = \bar{y} + \beta\left(\pi_t - \pi_t^e\right)$, where y_t denotes the level of output (measured in logarithms) that deviates from the natural level, $\bar{y}$, whenever the inflation rate, π_t, deviates from its expected level π_t^e, by considering

[1] Westaway (1992) prefers to distinguish closed-loop learning, where agents learn about the parameters of the decision rule, from open-loop learning, where agents form an expectation of the path for a particular variable which they sequentially update. As is pointed out, closed-loop learning will be virtually identical to the parameter updating scheme using Kalman filtering.

$$y_t = (1-\eta)\bar{y} + \eta y_{t-1} + \delta(\pi_t - \pi_t^e), \quad (1)$$

where η measures the degree of output persistence. See Gärtner (1999) for an output persistence case and/or Jonsson (1997) for an unemployment persistence case. As acknowledged in Gärtner (1999), only at that time authors have started to pay due attention to the consequences of considering that relevant macroeconomic variables, *in reality*, show some degree of persistence over time. In fact, a casual observation on reality shows that Europe has been facing a problem in what concerns unemployment which indeed reflects persistence. Given the close connection between unemployment and output, it should be possible to 'translate' our results in terms of output to results in terms of unemployment.

When normalizing the natural level of output such that $\bar{y} = 0$ the aggregate supply curve reduces to:

$$y_t = \phi y_{t-1} + \alpha(\pi_t - \pi_t^e), \quad (2)$$

where, following the hypothesis of adaptive expectations,

$$\pi_t^e = \gamma \pi_{t-1}, \quad (3)$$

where $0 \le \phi \le 1$ and $0 \le \gamma \le 1$.

As said before, a most common kind of linear classifiers for classification purposes is the so-called perceptron. In order to perform the task of classifying the government, in what concerns its behaviour during the mandate, it is required the determination of the opportunistic and benevolent solutions. These solutions differ in accordance with the way time periods are discounted: whereas for society, therefore also for a benevolent government, future periods should be less important than present ones, this is not the case with an opportunistic government, as future moments, i.e. those closer to the election day, are more vital than present ones, in order to explore the decay in the memory of voters.

Having said that, concerning the government's objective function, we make the standard assumption that the incumbent faces a mandate divided into two periods, t =1,2, such that society's welfare during the mandate, i.e. the benevolent government's objective function is given by:

$$U = U_1 + \rho U_2, \quad (4)$$

where ρ is the social rate of discount, whereas opportunistic government's objective function is :

$$V = \mu V_1 + V_2, \quad (5)$$

where μ is the degree of memory of the electorate. In (4) and (5) we also admit that

$$U_t = V_t = -\tfrac{1}{2}\pi_t^2 + \beta y_t. \quad (6)$$

In these circumstances it is worth immediately noticing that, in general, excepting if $\mu\rho = 1$, the policies that maximise social welfare (4) are not the ones that maximise popularity (5). As it plausible to assume that both ρ and μ do not exceed 1, it is immediately clear that only in the case of perfect memory, i.e. $\mu = 1$, and both periods being equally important for society, i.e. $\rho = 1$, an opportunistic government will behave exactly as a benevolent one. This fact allows for making it plausible to ask the question: how to classify a government?, whose answer is supposed to be given by a perceptron when separating optimal outcomes into two parts: the opportunistic and the benevolent ones. In other words, the opportunistic and benevolent solutions (policies and outcomes) will constitute the necessary inputs for the perceptron application. Given the classification task format, let us precisely define what will be called *opportunistic* or 'electoralist' *inputs*, that is policies, and *opportunistic outputs*, that is outcomes, to be compared with *benevolent inputs* and *benevolent outputs*.

Clearly, the opportunistic policy and outcomes will be, respectively, the values of inflation and output which result from the maximisation of (4) and (5) subject to (2) and (3). This immediately leads to the optimal policies:[2]

$$\pi_1^B = \alpha\beta(1 - \rho(\gamma - \phi)), \quad (7)$$

$$\pi_2^B = \alpha\beta, \quad (8)$$

$$\pi_1^O = \alpha\beta\left(1 - \frac{\gamma - \phi}{\mu}\right), \quad (9)$$

$$\pi_2^O = \alpha\beta. \quad (10)$$

Those policies lead to the optimal output levels:

[2] From this point onwards, the superscripts *B* and *O* identify an element as, respectively, concerning the benevolent and the opportunistic government.

$$y_1^B = \phi y_0 + \alpha\left(\alpha\beta\left(1-\rho\left(\gamma-\phi\right)\right)-\gamma\pi_0\right), \quad (11)$$

$$y_2^B = \phi\left(\phi y_0 + \alpha\left(\alpha\beta\left(1-\rho\left(\gamma-\phi\right)\right)-\gamma\pi_0\right)\right)+\alpha\left(\alpha\beta-\gamma\alpha\beta\left(1-\rho\left(\gamma-\phi\right)\right)\right), \quad (12)$$

$$y_1^O = \phi y_0 + \alpha\left(\alpha\beta\left(1-\frac{\gamma-\phi}{\mu}\right)-\gamma\pi_0\right), \quad (13)$$

$$y_2^O = \phi\left(\phi y_0 + \alpha\left(\alpha\beta\left(1-\frac{\gamma-\phi}{\mu}\right)-\gamma\pi_0\right)\right)+\alpha\left(\alpha\beta-\gamma\alpha\beta\left(1-\frac{\gamma-\phi}{\mu}\right)\right). \quad (14)$$

Before proceeding with the classification task, it is relevant to note that there are, in fact, two possible patterns for the political business cycle: i) a typical one, where inflationary expansions take place immediately before the elections and ii) an atypical one, where the inflationary expansions take place immediately after the elections.[3] Given that:

$$\pi_2^B - \pi_1^B = \alpha\beta\rho\left(\gamma-\phi\right),$$

$$\pi_2^O - \pi_1^O = \alpha\beta\frac{\gamma-\phi}{\mu},$$

the typical pattern will be observed when $\gamma > \phi$ and the atypical one when $\gamma < \phi$. Plainly, when $\gamma = \phi$ there will be no cycle at all.

Given the optimal solutions, (7) to (14), it is straightforward to verify that, because

$$\pi_1^B - \pi_1^O = \alpha\beta\left(\gamma-\phi\right)\frac{1-\mu\rho}{\mu},$$

$$\pi_2^B - \pi_2^O = 0,$$

$$y_1^B - y_1^O = \alpha^2\beta\left(\gamma-\phi\right)\frac{1-\mu\rho}{\mu},$$

$$y_1^B - y_1^O = -\alpha^2\beta\left(\gamma-\phi\right)^2\frac{1-\mu\rho}{\mu},$$

the typical pattern will then be characterised by $\pi_2^B > \pi_1^B$, $\pi_2^O > \pi_1^O$, $\pi_1^B > \pi_1^O$, $\pi_2^B = \pi_2^O$ and $y_1^B > y_1^O$, $y_2^B < y_2^O$, whereas the atypical pattern will be characterised by $\pi_2^B < \pi_1^B$, $\pi_2^O < \pi_1^O$, $\pi_1^B < \pi_1^O$, $\pi_2^B = \pi_2^O$ and $y_1^B < y_1^O$, $y_2^B < y_2^O$.

Given that, in the previous mandate, no matter the kind of government, $\pi_0 = \alpha\beta$ it is possible to further simplify the optimal output levels expressions, (11) to (14), to:

[3] This means that, in general, not possible to always use the observed pre-elections expansions as empirical evidence supporting the existence of an opportunistic behaviour of the government as, in fact, even some experienced scholars incorrectly do.

$$y_1^B = \phi y_0 + \alpha^2\beta(1-\rho(\gamma-\phi)-\gamma), \quad (15)$$

$$y_2^B = \phi^2 y_0 + \alpha^2\beta\left(\phi - 2\phi\rho\gamma + \rho\phi^2 - \phi\gamma + 1 - \gamma + \gamma^2\rho\right), \quad (16)$$

$$y_1^O = \phi y_0 + \alpha^2\beta\,\frac{\mu + \phi - \gamma - \gamma\mu}{\mu}, \quad (17)$$

$$y_2^O = \phi\left(\phi y_0 + \alpha^2\beta\,\frac{\mu+\phi-\gamma-\gamma\mu}{\mu}\right) + \alpha\left(\alpha\beta - \gamma\alpha\beta\left(1-\frac{\gamma-\phi}{\mu}\right)\right). \quad (18)$$

4.2. The classification task

The optimal inflation rates, (7) to (10), and output levels, (15) to (18), define the coordinates of four points in the (y,π) space. This space is to be partioned, if possible, in two sub-spaces by a linear decision boundary – in that consists the classification task – by the perceptron. See figure 1.

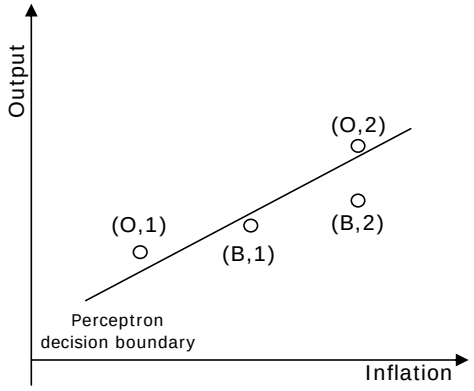


Figure 1 – The perceptron classification

Figure 1 allows visualising the opportunistic and benevolent trajectories in the inflation-output, (y,π), space, showing an example where the classification of the government is possible to be achieved by the perceptron.

There are, therefore, four points located in the (y,π) space, two of each type, *O* and *B*. This makes possible to draw two line segments connecting the two points of each kind. If these two line segments cross, it is impossible to obtain a decision boundary. This can be checked by a system of equations involving two convex combinations between these points defining the intersection between the straight line segments. They cannot be separated if the two parameters, λ_1, λ_2 in the convex combinations:

$$\lambda_1\begin{bmatrix} y_1^B \\ \pi_1^B \end{bmatrix} + (1-\lambda_1)\begin{bmatrix} y_2^B \\ \pi_2^B \end{bmatrix} = \lambda_2\begin{bmatrix} y_1^O \\ \pi_1^O \end{bmatrix} + (1-\lambda_2)\begin{bmatrix} y_2^O \\ \pi_2^O \end{bmatrix}, \quad (19)$$

are both between 0 and 1.

Given the optimal inflation rates, (7) to (10), and output levels, (15) to (18), the solutions for λ_1, λ_2 in (19) are:

$$\lambda_1 = \frac{\alpha^2\beta}{\phi\mu}\,\frac{(\phi-\gamma)^2}{(1-\phi)y_0 + \alpha^2\beta(\gamma-1)}, \quad (20)$$

$$\lambda_2 = \frac{\alpha^2\beta\rho}{\phi}\,\frac{(\phi-\gamma)^2}{(1-\phi)y_0 + \alpha^2\beta(\gamma-1)}.^4 \quad (21)$$

Plainly, in general, the possibility to classify the government depends upon the initial level of output, y_0.[5] Figure 2 thus represents those two solutions (20) and (21) as a function of y_0.

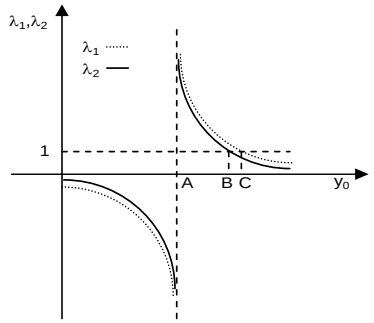


Figure 2 – The influence of initial output level

[4] Note that $\lambda_1 - \lambda_2 = \frac{1-\rho\mu}{\mu}\,\frac{\alpha^2\beta}{\phi}\,\frac{(\gamma-\phi)^2}{(1-\phi)y_0 + \alpha^2\beta(\gamma-1)}$.

[5] When $\phi = \gamma$, both λ_1, λ_2 are equal to zero, meaning that both types of governments behave the same.

In order to have $\lambda_1 = 1$ in (20), – point C in figure 2 – the initial level of output must be:

$$y_0 = \alpha^2 \beta \frac{(\phi - \gamma)^2 + \phi(1-\gamma)\mu}{\phi(1-\phi)\mu}, \qquad (22)$$

whereas, in order to have $\lambda_2 = 1$ in (21), – point B in figure 2 – the initial level of output must be:

$$y_0 = \alpha^2 \beta \frac{\rho(\phi - \gamma)^2 + \phi(1-\gamma)}{\phi(1-\phi)}. \qquad (23)$$

As y_0 given by (22) is higher than y_0 given by (23),[6] this means that for

$$y_0 > \alpha^2 \beta \frac{(\phi - \gamma)^2 + \phi(1-\gamma)\mu}{\phi(1-\phi)\mu}, \qquad (24)$$

$\lambda_1 < 1$ and, therefore, also that $\lambda_2 < 1$. Moreover,

$$y_0 > \alpha^2 \beta \frac{1-\gamma}{1-\phi} \qquad (25)$$

guarantees that both λ_1, λ_2 are positive. See point A in figure 2. After noticing that y_0 given by (22) is higher than y_0 given by (25),[7] it is possible to consider an initial condition

$$y_0 > \alpha^2 \beta \frac{(\phi - \gamma)^2 + \phi(1-\gamma)\mu}{\phi(1-\phi)\mu}, \qquad (26)$$

such that it is impossible to associate *all* the observed behaviours to the correct type of government. In all the other cases, the classification task can be resolved by the perceptron.

Notwithstanding that conditionally, there is a fundamental exception. When output does not show any persistence over time, *i.e.* $\phi = 0$, which is, indeed, the most considered case in the literature, it is possible to show that a straight line with intercept between $\alpha^2 \beta \gamma (\gamma\rho - 2)$ and $\alpha^2 \beta \gamma \frac{\gamma - 2\mu}{\mu}$ and slope equal to $\alpha(\gamma + 1)$ will always divide the space in a correct way, this being eventually the result of the perceptron classification.[8]

Plainly, in practical terms, given that a learning process takes place, from the training of the perceptron does not usually result a straight line with the above mentioned characteristics. Most importantly, given that the two straight lines connecting the two pairs of points in the output-inflation space are parallel, this guarantees that the space is linearly separable. Figure 3 shows this situation.

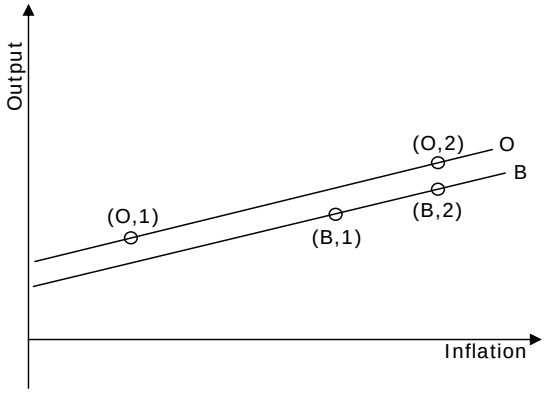


Figure 3 – A particular(ly interesting) case

5. Concluding Remarks

The paper explores a crucial aspect in the issues of political business cycles by considering the effects of boundedly rational voters, a fact that has been largely ignored by the literature (Caleiro, 2013). The classification task performed by that kind of voters is done by the use a perceptron in a model allowing for output persistence. It is shown that when output does not persist the classification task can always be resolved. Conversely, the resolution of the classification task, when output persists over time, depends crucially on the initial conditions.

As a direction for future improvements we would like to explore the possible dynamics of convergence for output in order to check, in the long-run, the real importance of the initial level of output. As, indeed, the steady state cycle, for each kind of government are characterised by a level of output below the one identified by (26), hypothetically the resolution of the classification task may become more probable over time.

[6] Note that
$\alpha^2 \beta \frac{(\phi-\gamma)^2 + \phi(1-\gamma)\mu}{\phi(1-\phi)\mu} - \alpha^2 \beta \frac{\rho(\phi-\gamma)^2 + \phi(1-\gamma)}{\phi(1-\phi)} = \alpha^2 \beta (\phi-\gamma)^2 \frac{1-\mu\rho}{\phi\mu(1-\phi)} > 0.$

[7] Note that
$\alpha^2 \beta \frac{(\phi - \gamma)^2 + \phi(1-\gamma)\mu}{\phi(1-\phi)\mu} - \alpha^2 \beta \frac{1-\gamma}{1-\phi} = \alpha^2 \beta \frac{(\phi-\gamma)^2}{\phi\mu(1-\phi)} > 0.$

[8] The mathematical details are available upon request.

Acknowledgments

I would like to thank the editor-in-chief for having respected the normal practice of not having prevented the publication of the article claiming that the existence of a working version of it would make it impossible. I also would like to thank Steffen Hörnig for an extremely useful suggestion. Obviously, the usual disclaimer applies. It is also my obligation to acknowledge financial support from Fundação para a Ciência e a Tecnologia and FEDER/COMPETE (grant PEst-C/EGE/UI4007/2011).

References

[1] Caleiro, António (2009), How upside down are political business cycles when there is output persistence, *Research in Economics* 63(1), 22-26.

[2] Caleiro, António (2012), Output Persistence in Portugal, *International Journal of Latest Trends in Finance and Economic Sciences* 2(3), (September), 206-210.

[3] Caleiro, António (2013), A Self-Organizing Map of the Elections in Portugal, *The IIOAB Journal, Special Issue (Neuroscience in Economic Decision Making)* 4(3), (April-June), 9-14.

[4] Gärtner, Manfred, (1996), Political business cycles when real activity is persistent, *Journal of Macroeconomics* 18, 679-692.

[5] Gärtner, Manfred (1997), Time-consistent monetary policy under output persistence, *Public Choice* 92, 429-437.

[6] Gärtner, Manfred (1999), The Election Cycle in the Inflation Bias: Evidence from the G-7 countries, *European Journal of Political Economy* 15, 705-725.

[7] Gärtner, Manfred (2000), Political Macroeconomics: A Survey of Recent Developments, *Journal of Economic Surveys* 14(5), 527-561.

[8] Jonsson, Gunnar (1997), Monetary Politics and Unemployment Persistence, *Journal of Monetary Economics* 39(2), (June), 303-325.

[9] Minford, Patrick (1995), Time-Inconsistency, Democracy, and Optimal Contingent Rules, *Oxford Economic Papers*, 47(2), (April), 195-210.

[10] Nordhaus, William D. (1975), The Political Business Cycle, *The Review of Economic Studies* 42(2), (April), 169-190.

[11] Salmon, Mark (1995), Bounded Rationality and Learning: Procedural Learning, in Kirman, Alan, and Mark Salmon (eds.), Learning and Rationality in Economics, Oxford: Basil Blackwell, 236-275.

[12] Westaway, Peter (1992), A Forward-Looking Approach to Learning in Macroeconomic Models, *National Institute Economic Review* 2, (May), 86-97.

Combining Time Series Analysis and Multi Criteria Decision Making Techniques for Forecasting Financial Performance of Banks in Turkey

Emrah Önder[#1], Ali Hepşen[*2]

[#] Department of Quantitative Methods, School of Business, Istanbul University, Istanbul, Turkey
[1]*emrah@istanbul.edu.tr*

[*] Department of Finance, School of Business, Istanbul University, Istanbul, Turkey
[2]*alihepsen@yahoo.com*

Abstract **– Forecasting plays a major role in financial planning and it is an essential analytical tool in banks' strategies. In recent years, researchers are developing new techniques for estimation. Financial performance evaluation of banks is a kind of multi-criteria decision making (MCDM) problem which has developed rapidly. It is very important for a firm to monitor a wide range of performance indicators in order to ensure that appropriate and timely decisions and plans can be made. Suitable performance measures can ensure that managers adopt a long-term perspective and allocate the company's resources to the most effective activities. The aim of this study is to evaluate the financial performance model of Turkish Banks during 2012-2015 using forecasting (based on 2002-2011 data) methods and multi criteria decision techniques. As forecasting analysis tools, classical time series methods such as moving averages, exponential smoothing, Brown's single parameter linear exponential smoothing, Brown's second-order exponential smoothing, Holt's two parameter linear exponential smoothing and decomposition methods applied to financial ratios data. After forecasting techniques Analytical Hierarchy Process (AHP) and Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) methodologies are used for the outranking of banks. This model is applied to a case study for the financial performance evaluation of 3 state banks (Ziraat Bank, Halk Bank and Vakıflar Bank); 9 private banks (Akbank; Anadolubank; Sekerbank; Tekstil Bank; Turkish Bank; Turk Ekonomi Bank; Garanti Bank; Is Bank and Yapı Kredi Bank) and 5 foreign banks (Denizbank; Eurobank Tekfen; Finans Bank; HSBC Bank and ING Bank) in Turkey. Financial performances of a bank is divided into ten groups including Capital Ratios, Balance Sheet Ratios, Assets Quality, Liquidity, Profitability, Income-Expenditure Structure, Share in Sector, Share in Group, Branch Ratios and Activity Ratios as described by the Banks Association of Turkey.**

Keywords *- Financial Performance Evaluation, Analytical Hierarchy Process (AHP), TOPSIS Method, Turkish Banking Sector, Multi Criteria Decision Making, Forecasting, Time Series Analysis*

1. Introduction

The nature of forecasting revolves around future expectations. In the banking industry forecasts are inputs into the financial planning process, so that current resources can be utilized efficiently to achieve corporate objectives. Financial decisions within the banking industry have become increasingly complex, with a wide range of alternative sources and uses of funds, and a shifting emphasis away from safety toward high profit performance and growth. Accurate financial forecasting, focusing on both the economic environment and internal financial variables, has become a critical input into the decision-making process. Forecasting of financial process of a bank is a multi-faceted function that analyzes potential portfolio decisions over some planning horizon. This function would normally require the prediction of the future external economic environment facing the individual bank and internal financial variables. A bank's current financial position is the result of past decisions for acquiring deposits and funds from other sources and investing these funds in alternative investment opportunities, such as loans and bonds. A bank's current decisions on acquiring and investing funds

will affect the bank's future financial position. These decisions should be the result of financial planning based on the bank's existing financial position and the expected external environment, with the expectation of meeting financial performance standards within the framework of management objectives. Initially, the forecasting function should be concerned with the economic variables relevant to the future external environment of the bank; i.e., the both the national and regional levels. Of primary concern are such factors as potential deposit levels, loan demand, and interest rates. Once a bank has a forecast of these variables for the planning horizon, the impact of the variables on the future financial position of the bank can be analyzed. For example, a forecast of strong economic growth may lead to expectations of rising deposit levels at financial institutions, increased loan demand, and an upward trend of most interest rates. Accurate forecasts of the specific variables impacting on the bank's portfolio then become crucial to the planning function and, ultimately, to management decisions. In the context of a banking framework, financial forecasting is most relevant to the interrelated concepts of: (1) assets and liability (balance sheet) management; and (2) profit planning. Balance sheet management is concerned with the simultaneous management of the asset, liability, and capital accounts of a bank as a portfolio for financial planning. Balance sheet management techniques typically have a time horizon of several years, but require review and revision on a regular basis. Profit planning (and control) is defined as a managerial process that produces formal plans to achieve desired goals and then measure the results achieved against them. From these points of view, the purpose of this study is to evaluate the financial performances of Turkish Banks during 2012-2015 by using forecasting methods and multi criteria decision techniques based on 2002-2011 data.

2. Literature Review

In the literature, there are a large number of performance evaluation methods and researches. Stankeviciene and Mencaite (2012) used a multi-criteria decision making approach, particularly the AHP model to evaluate the performance of Lithuanian commercial banks. They created and described a system of indicators and assigned each indicator a different degree of significance taking into account the needs and priorities of both internal and external evaluators. They have concluded that the AHP model is appropriate for using it in the process valuating bank performance.

Ayadi et al. (1998) applied data envelopment analysis to 1991-1994 data on ten Nigerian banks to assess their relative efficiency. They discussed the consistency of the findings with other research and concluded on the root causes of Nigeria's banking problem like government interface, poor management, unprofessional practices etc.

Al-Nimer et al. (2012) provided a view of the present role of performance evaluation measures to identify the extent of usage of performance evaluation measures and examined the contingent variables in order to find out their effect upon the extent of usage in the Jordanian banks. Their results revealed that there is a lack of use of non-financial measures that are considered as contemporary management accounting practices and financial measures were considered as the highest practice being utilized.

Sayed and Sayed (2013) chose CAMELS (C - Capital Adequacy, A - Assets Quality, M - Management Efficiency, E - Earning Quality, L - Liquidity and S - Sensitivity to Market Risk) model which rates the performance of banks on five points scale for evaluating the performance and quality of Indian banks. Their analysis result shows that on an average Kotak Mahindra Bank stands at the top position.

Mamo Bekana and Abitie (2012) evaluated the financial performance of Construction and Business Bank (CBB) of Ethiopia. Their study emphasized on financial performance measurement ratios to evaluate the bank's financial performance. They concluded that some important financial ratios computed for analysis of the financial performance of the company are in a going up pattern excluding loan deposit ratio, assets turnover ratio and the long term debt to equity ratios.

Abbott et al. (2013) presented some measures of the performance of banks operating in Australia since the deregulation of the Australian financial system in early 1980s including the periods of financial market instability. They used standard financial indicators and applied Data Envelopment Analysis (DEA) to determine Malmquist indices of the levels of the changes in the efficiency and productivity of Australian banks. Obtained empirical results demonstrate the effect of deregulation and periodic financial crisis's on the

performance of individual banks, and the major part of the Australian banking sector.

Almazari (2011) measured the financial performance of seven selected Jordanian commercial banks for the period 2005-2009. The financial performance of banks was studied on the basis of financial variables and ratios. The research shown that banks with higher total deposits, credits, assets, and shareholders' equity do not always mean that has better profitability performance. It was also found that there exists a positive correlation between financial performance and asset size, asset utilization and operational efficiency.

Minh et al. (2013) estimated and compared efficiency performance of 32 commercial banks in Vietnam during 2001-2005 and identified possible factors determining such efficiency performance. Efficiency was measured by a DEA model and super-efficiency measure through a slacks-based model (SBM) under the assumption of variable returns to scale (VRS). They found that there were a small number of efficient banks and large banks do not guarantee high super efficiency scores in comparison with small banks.

Grigoroudis et al. (2013) presented a real-world study for measuring the relative efficiency of a set of bank branches using a DEA approach. They proposed a multistage DEA network model using a set of performance indicators that combine customer satisfaction, employee evaluation, and business performance indices. The found results estimate the contribution of the assessed performance indicators to the branch's overall efficiency, and determine potential improvement actions.

Bao et al. (2012) studied an improved hierarchical fuzzy TOPSIS model to combine the multilayer safety performance indicators into one overall index by incorporating experts' knowledge for a case study of a given set of European countries.

Pinter and Psunter (2013) discussed the overall success of a construction project as a multi-criterion problem and presented a new approach to it based on the multi-criteria decision method M-TOPSIS.

Sooreh et al. (2011) did a measurement and investigation using Importance-Performance Analysis (IPA) and TOPSIS methods to define and measure entrepreneurial universities in Iranian context. The result of the study is a set of building blocks of entrepreneurial universities, which include a number of prioritized variables.

Zavadskas et al. (2010) proposed an assessment model which covers method of TOPSIS, method with attributes values determined at intervals (TOPSIS-grey) and a new method of Simple Additive Weighting with Grey relations (SAW-G). A case study of the assessment of contractors' competitive ability was used to demonstrate the applicability and the effectiveness of the proposed approach. The results show that the methods of grey relations methodology can be implemented as an effective decision aid for tasks with uncertain data.

Yu and Hu (2010) developed an integrated multi criteria decision making approach that combines the voting method and the fuzzy TOPSIS method to evaluate the performance of multiple manufacturing plants in a fuzzy environment. They used voting to determine the appropriate criteria weights and used proposed approach to evaluate the performance of five chosen manufacturing plants.

Jajimoggala et al. (2011) considered supplier selection as a multi criteria decision problem and suggested a comprehensive decision method for identifying top suppliers. They proposed a hybrid model which incorporates the technique of Analytic Network Process (ANP) and TOPSIS. They illustrated the effectiveness and feasibility of the suggested model and identified the most potential supplier.

Nili et al. (2012) offered a new method for evaluating performance in production industries. Five large plants were selected as a sample and a method based on the Balance Score Card (BSC) system and TOPSIS technique was implemented in them. They found which indexes should be considered when evaluating performance in the chosen plants.

Pal and Choudhury (2009) suggested that customers distinguish four dimensions of service quality in the case of the retail banking industry in India, namely, customer-orientedness, competence, tangibles and convenience. They used TOPSIS to evaluate and ranking the relative performance of the banks across the service quality dimensions.

Manian et al. (2011) constructed an approach based on the modified fuzzy TOPSIS and balanced scorecard (BSC) for evaluating an IT department in Tehran Province Gas Company. The BSC concept is applied to define the hierarchy with financial, customer, internal business process, and learning and growth perspectives and for each perspective, performance indicators are selected. By using a fuzzy TOPSIS approach, obtained results provided guidance to IT departments regarding strategies for improving department performance.

Marie et al. (2013) applied a parallel DEA model of operational-profitability and operational-quality indicators to the banking sector in Dubai. They made comparisons between the Islamic and the commercial banks within both models. They found that there are no statistical differences between the Islamic and the commercial banks in the operational-profitability model.

Forecasting techniques are important tools in operational management for creating realistic expectations. In literature many different techniques in the area of statistics and artificial intelligence were proposed for achieving close estimations.

Clements et al. (2004) study was about estimating, evaluating, and selecting among non-linear forecasting models for economic and financial time series. They suggested that careful application of existing techniques, and new models and tests, can result in significant advances in understanding.

3. Overview of Data

Annual time series data are used for the period 2002 to 2011. The sample period is dependent on annual data availability. The data was gathered from the publications of the Banks Association of Turkey. The sample includes 3 state banks (Ziraat Bank, Halk Bank and Vakıflar Bank); 9 private banks (Akbank; Anadolubank; Sekerbank; Tekstil Bank; Turkish Bank; Turk Ekonomi Bank; Garanti Bank; Is Bank and Yapı Kredi Bank) and 5 foreign banks (Denizbank; Eurobank Tekfen; Finans Bank; HSBC Bank and ING Bank). Financial ratios have been grouped as Capital Ratios, Balance Sheet Ratios, Assets Quality, Liquidity, Profitability, Income-Expenditure Structure, Share in Sector, Share in Group, Branch Ratios and Activity Ratios as described by the Banks Association of Turkey. Table 1 shows the hierarchical structure of model for financial performance:

Table 1: Hierarchical Structure of Model for Financial Performance

GOAL	CRITERIA	SUB CRITERIA
Performance Evaluation of Turkish Banks	CAPITAL RATIOS, %	Shareholders' Equity / (Amount Subject to Credit Risk + Market Risk + Operational Risk)
		Shareholders' Equity / Total Assets
		(Shareholders' Equity-Permanent Assets) / Total Assets
		Shareholders' Equity / (Deposits + Non-Deposit Funds)
		On Balance-sheet FC Position / Shareholders' Equity
		Net on Balance-sheet Position / Total Shareholders' Equity
		N(on+off) Balance-sheet Position / Total Shareholders' Equity
	BALANCE SHEET RATIOS, %	TC Assets / Total Assets
		FC Assets / Total Assets
		TC Liabilities / Total Liabilities
		FC Liabilities / Total Liabilities
		FC Assets / FC Liabilities
		TC Deposits / Total Deposits
		TC Loans and Receivables / Total Loans and Receivables
		Total Deposits / Total Assets
		Funds Borrowed / Total Assets

Table 1: Hierarchical Structure of Model for Financial Performance (Continued)

GOAL	CRITERIA	SUB CRITERIA
mance Evalua tion of Turkis	ASSETS QUALITY, %	Financial Assets (Net) / Total Assets
		Total Loans and Receivables / Total Assets

		Total Loans and Receivables / Total Deposits
		Consumer Loans / Total Loans and Receivables
	LIQUIDITY, %	Liquid Assets / Total Assets
		Liquid Assets / Short-term Liabilities
		TC Liquid Assets / Total Assets
		Liquid Assets / (Deposits + Non-Deposit Funds)
		FC Liquid Assets / FC Liabilities
	PROFITABILITY, %	Net Profit (Losses) / Total Assets
		Net Profit (Losses) / Total Shareholders' Equity
		Income Before Taxes / Total Assets
		Net Profit (Losses) / Paid-in Capital
	INCOME-EXPENDITURE STRUCTURE, %	Net Interest Income After Specific Provisions / Total Assets
		Net Interest Income After Specific Provisions / Total Operating Income
		Non-Interest Income (Net) / Total Assets
		Non-Interest Income (Net) / Other Operating Expenses
		Interest Income / Interest Expense
		Total Income / Total Expense
		Interest Income / Total Assets
		Interest Income / Total Expenses
		Interest Expense / Total Expenses
	SHARE IN SECTOR, %	Total Assets
		Total Loans and Receivables
		Total Deposits
	SHARE IN GROUP, %	Total Assets
		Total Loans and Receivables
		Total Deposits
	BRANCH RATIOS, TRY MILLION	Total Assets / No. of Branches
		Total Deposits / No. of Branches
		TRY Deposits / No. of Branches
		FX Deposits / No. of Branches
		Total Loans and Receivables / No. of Branches
		Total Employees / No. of Branches (person)
		Net Income / No. of Branches
	ACTIVITY RATIOS	(Personnel Expenses + Reserve for Employee Termination Benefit) / Total Assets
		(Personnel Expenses + Reserve for Employee Termination Benefit) / Number of Personnel (Thousand TRY)
		Reserve for Employee Termination Benefit / Number of Personnel (Thousand TRY)
		Personnel Expenses / Other Operating Expenses
		Other Operating Expenses / Total Asset
		Total Operating Income / Total Assets

4. Multi Criteria Decision Making Techniques

AHP is an effective decision making method especially when subjectivity exists and it is very suitable to solve problems where the decision criteria can be organized in a hierarchical way into sub-criteria. The findings of previous studies about factors influencing performance of banks were first identified by literature review. Experts expressed or defined a ranking for the attributes in terms of importance/weights. Each experts is asked to fill

''checked mark'' in the 9-point scale evaluation table. The AHP allows group decision making. One of the main advantages of the AHP method is the simple structure. The questionnaire is answered by financial expert. Financial expert is asked to compare the criteria at a given level on a pair-wise basis to identify their relative precedence.

4.1. Analytical Hierarchy Process

AHP was developed in the 1970s by Thomas Saaty is a multi-criteria decision making (MCDM) methodology. It has been used extensively for analyzing complex decisions. The approach can be used to help decision-makers for prioritizing alternatives and determining the optimal alternative using pair-wise comparison judgments (Liberatore and, Nydick, 1997, s. 595 ; Yoo and Choi s. 137, 2006). Weighting the criteria by multiple experts avoids the bias decision making and provides impartiality (Dagdeviren, 2009).

The AHP is a selection process that consists of following steps (Saaty, 1990, 2008; Saaty and Vargas, 2001):

1. Define the problem and determine the criteria. Factors and related sub factors must be correlated (Lee, 2012).
2. Structure the decision hierarchy taking into account the goal of the decision.
3. Construct a set of all judgments in a square comparison matrix in which the set of elements is compared with itself (size nxn) by using the fundamental scale of pair-wise comparison shown in Table 4. Assign the reciprocal value in the corresponding position in the matrix. Total number of comparison is n.(n-1)/2 (Lee, 2012).

Table 4. The fundamental scale of pair-wise comparison for AHP

Intensity of Importance	Definition	Explanation
1	Equal importance	Two activities have equal contribute to the objective
3	Moderate importance	Experience and judgment slightly favor one activity over another.
5	Strong importance	Experience and judgment strongly favor one activity over another
7	Very strong on demonstrated importance	An activity is favored very strongly over another
9	Extreme importance	The evidence favoring one activity over another is of the highest possible order of affirmation
2,4,6,8	For compromise between the above values	Sometimes one needs to interpolate a compromise judgment numerically

4. Use overall or global priorities obtained from weighted values for weighting process. For synthesis of priorities obtain the principal right eigenvector and largest eigenvalue.

Matrix A=(a_{ij}) is said to be consistent if $a_{ij}.a_{jk}=a_{ik}$ and its principal eigenvalue (λ_{max}) is equal to n.

The general eigenvalue formulation is:

$$Aw = \begin{bmatrix} 1 & w_1/w_2 & . & w_1/w_n \\ w_2/w_1 & 1 & . & w_2/w_n \\ . & . & . & . \\ w_n/w_1 & w_n/w_2 & . & 1 \end{bmatrix} \begin{bmatrix} w_1 \\ . \\ . \\ w_n \end{bmatrix} = nw \quad (1)$$

$$a_{ij} = w_i / w_j, \qquad i, j = 1, 2, ...n \quad (2)$$

$$Aw = \lambda_{max} w \quad (3)$$

For measure consistency index (CI) adopt the value:

$$CI = (\lambda_{max} - n) / (n-1) \quad (4)$$

Accept the estimate of w if the consistency ratio (CR) of CI that random matrix is significant small. If CR value is too high, then it means that experts' answers are not consistent (Lee, 2012; Saaty, 1980) . When CR value is less than 0.10 consistency of the comparisons is appropriate (Millet and Saaty, 2000; Lee, 2012). The CR is obtained by comparing the CI with an average random consistency index (RI).

$$CR = \frac{CI}{RI} \quad (5)$$

The following gives the average RI:

Table 5. Average RI values

n	3	4	5	6	7	8	9	10
RI	0.52	0.89	1.11	1.25	1.35	1.40	1.45	1,49

4.2. Using Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) to rank the alternatives

Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) was first presented by Yoon (1980) and Hwang and Yoon (1981), for solving multiple criteria decision making (MCDM) problems based upon the concept that the chosen alternative should have the shortest Euclidian distance from the positive ideal solution (PIS) and the farthest from the negative ideal solution (NIS). For instance, PIS maximizes the benefit and minimizes the cost, whereas the NIS maximizes the cost and minimizes the benefit. It assumes that each criterion require to be maximized or minimized. TOPSIS is a simple and useful technique for ranking a number of possible alternatives according to closeness to the ideal solution. Expanded developments of TOPSIS were done by Chen and Hwang in 1992, Lai, Liu and Hwang (1994). This MCDM technique is widely used in many fields, including financial performance evaluation, supplier selection, tourism destination evaluation, location selection, company evaluation, selecting the most suitable machine, ranking the carrier alternatives (Behzadian, 2012). One of the advantages of TOPSIS is that pair-wise comparisons are avoided. TOPSIS is conducted as follows (Tsaur, 2011).

Step 1. Establish a decision matrix for the ranking. TOPSIS uses all outcomes (x_{ij}) in a decision matrix to develop a compromise rank. The viable alternatives of the decision process are A_1, A_2,..., A_n. The structure of the decision matrix denoted by $X = (x_{ij})_{n\times m}$ can be expressed as follows:

$$X = \begin{array}{c} \overset{m \quad Criteria}{\overbrace{}} \\ \begin{matrix} C_1 & C_2 & \cdots & C_j & \cdots & C_m \end{matrix} \\ \left[\begin{matrix} x_{11} & x_{12} & \cdots & x_{1j} & \cdots & x_{1m} \\ x_{21} & x_{22} & \cdots & x_{2j} & \cdots & x_{2m} \\ \vdots & \vdots & \cdots & \vdots & \cdots & \vdots \\ x_{i1} & x_{i2} & \cdots & x_{ij} & \cdots & x_{im} \\ \vdots & \vdots & \cdots & \vdots & \cdots & \\ x_{n1} & x_{n2} & \cdots & x_{nj} & \cdots & x_{nm} \end{matrix}\right] \begin{matrix} A_1 \\ A_2 \\ \vdots \\ A_i \\ \vdots \\ A_n \end{matrix} \end{array} \left.\vphantom{\begin{matrix} a \\ a \\ a \\ a \\ a \\ a \end{matrix}}\right\} n \quad Alternatives \quad (6)$$

x_{ij} is the outcome of i[th] alternative with respect to j[th] criteria. $W = (w_1, w_2, \ldots, w_j, \ldots, w_m)$ is the relative weight vector about the criteria, and w_j represents the weight of the j[th] attribute and $\sum_{j=1}^{m} w_j = 1$.

Step 2. Normalize the decision matrix using the following equation:

$$r_{ij} = \frac{w_{ij}}{\sqrt{\sum_{k=1}^{n} w_{ij}^2}} \quad \text{i=1,2,3,...,n} \quad \text{j=1,2,3,...,m} \quad (7)$$

Step 3. Weighted normalized decision matrix is calculated by multiplying the normalized decision matrix by its associated weights as:

$$v_{ij} = w_j r_{ij} \qquad \text{i=1,2,3,...,n} \quad \text{j=1,2,3,...,m} \quad (8)$$

Step 4. Identify the positive ideal solution (PIS) and negative ideal solution (NIS), respectively, as follows:

$$PIS = A^* = \left\{v_1^*, v_2^*, ..., v_m^*\right\}$$
$$= \left\{\left(\max_i v_{ij} \mid j \in \Omega_b\right), \left(\min_i v_{ij} \mid j \in \Omega_c\right)\right\} \quad (9)$$

$$NIS = A^- = \left\{v_1^-, v_2^-, ..., v_m^-\right\}$$
$$= \left\{\left(\min_i v_{ij} \mid j \in \Omega_b\right), \left(\max_i v_{ij} \mid j \in \Omega_c\right)\right\} \quad (10)$$

Ω_b is associated with benefit criteria, and Ω_c is associated with cost criteria.

Step 5. Determine the Euclidean distance (separation measures) of each alternative from the ideal and negative-ideal solution as below respectively:

$$d_i^* = \sqrt{\sum_{j=1}^{m}\left(v_{ij} - v_j^*\right)^2}\ ,\ \text{i=1,2,3,…,n} \quad (11)$$

$$d_i^- = \sqrt{\sum_{j=1}^{m}\left(v_{ij} - v_j^-\right)^2}\ ,\ \text{i=1,2,3,…,n} \quad (12)$$

Step 6 Calculate the relative closeness of the i[th] alternative to ideal solution using the following equation:

$$RC_i = \frac{d_i^-}{d_i^* + d_i^-}\ \text{i=1,2,3,…,n}\ \ RC_i \in [0,1] \quad (13)$$

Step 7. By comparing RC_i values, the ranking of alternatives are determined. The higher the closeness means the better the rank. Ranked the alternatives starting from the value that closest to 1 and in decreasing order.

5. Forecasting

In this study two different traditional time series methods including decomposition methods and smoothing methods were applied to the macro economic data for forecasting. The methods and regarding formulas are shown in this section. The notation of Orhunbilge (1999) is used to explain the time series methods.

5.1. Decomposition Methods

Decomposition methods are using for determining secular trend, seasonal variation, conjuncture (cyclical variation) and random fluctuation (irregular variation) components in time series. It this study annual data was used. Therefore 3 important trend function including linear, quadratic and growth were mentioned in this part of this study.

5.1.1. Least Squares Method for Determining Trend

Least square method is one of the popular methods for determining trend. X is the time variable (year, month, etc.) in $y_t = f(x)$ function. If the the sum of the time series variable (X) is identified as zero the estimation values of model parameters can be shown as the following formulas. The trend of y_t can be determined by least squares method. It is not very easy to decide which function we should use as a trend. By trying several functions and finding minimum sum of squares of residuals, the suitable trend functions can be found.

$$\sum_{t=1}^{n} e_t^2 = \sum_{t=1}^{n}\left(y_t - y_t'\right)^2 \Rightarrow \min \quad (14)$$

5.1.2. Linear Trend Function

The linear trend function is shown as below:

$$y = a + bx + e_t \quad (15)$$

When the least squares method is applied the linear trend function, the equations below are obtained.

$$\sum_{t=1}^{n} e_t^2 = \sum_{t=1}^{n}\left(y_t - y_t'\right)^2 = \sum_{t=1}^{n}\left(y_t - a - bx\right)^2 \quad (16)$$

For determining the minimum of this function the first level derivatives should be done regarding to a and b parameters.

$$\sum y_t = na + b\sum x \quad (17)$$

$$\sum xy_t = a\sum x + b\sum x^2 \quad (18)$$

By solving these equations the parameters a and b can be found as follows:

$$a = \frac{\sum y_t}{n} \quad (19)$$

$$b = \frac{\sum xy_t}{\sum x^2} \quad (20)$$

5.1.3. Quadratic Trend Function

If the observed data has a curved figure (in quadratic trend function the mean of the data is increasing first

than start decreasing or reverse) than quadratic trend function can be used.

$$y = a + bx + cx^2 + e_t$$

$$\sum_{t=1}^{n} e_t^2 = \sum_{t=1}^{n} \left(y_t - y_t'\right)^2 = \sum_{t=1}^{n} \left(y_t - a - bx - cx^2\right)^2 = 0 \quad (21)$$

First order derivatives of the equation according to a, b and c parameters should be solved for writing the quadratic trend function with using least squares method. The equations below are the normal equations. Three unknown can be found by solving these three equations.

$$\sum y_t = na + b\sum x + c\sum x^2 \quad (22)$$

$$\sum xy_t = a\sum x + b\sum x^2 + c\sum x^3 \quad (23)$$

$$\sum x^2 y_t = a\sum x^2 + b\sum x^3 + c\sum x^4 \quad (24)$$

$$b = \frac{\sum xy_t}{\sum x^2} \quad (25)$$

5.1.4. Growth Trend Function

If the change of the y variable is nearly constant in time, growth trend function can be used for this kind of data. The growth trend function is shown below.

$$y_t = ab^x + e_t \quad (26)$$

$$\sum_{t=1}^{n} e_t^2 = \sum_{t=1}^{n} \left(\log y_t - \log y_t'\right)^2 = \sum_{t=1}^{n} \left(\log y_t - \log a - x \log b\right)^2 = 0 \quad (27)$$

$$\sum \log y_t = n \log a + \log b \sum x \quad (28)$$

$$\sum x \log y_t = \log a \sum x + \log b \sum x^2 \quad (29)$$

$$\log a = \frac{\sum \log y_t}{n} \quad (30)$$

$$\log b = \frac{\sum x \log y_t}{\sum x^2} \quad (31)$$

$$\log y_t = \log a + x \log b \quad (32)$$

5.2. Smoothing Methods

Random or/and coincidental fluctuations in weekly, monthly, seasonal or annual time series data can be removed or softened by smoothing methods. Six smoothing methods including single moving averages, Brown's simple exponential smoothing method, linear moving averages, Brown's linear exponential smoothing methods with single parameter, Holt's linear exponential smoothing with two parameters and Brown's quadratic exponential smoothing methods are mentioned in this part of the study (Orhunbilge, 1999).

5.2.1. Single Moving Averages

Estimation can be done by using arithmetic mean of number of certain (k) prior period of data. Single moving average method gives the same importance level to the past data for estimating future values.

$$y_{t+1}' = \frac{(y_t + y_{t-1} + \ldots + y_{t-k+1})}{k} \quad (33)$$

$$y_{t+1}' = \frac{1}{k} \sum_{i=t-k+1}^{t} y_i \quad (34)$$

$$y_{t+1}' = \frac{y_t}{k} - \frac{y_{t-k}}{k} + y_t' \quad (35)$$

5.2.2. Brown's Simple Exponential Smoothing Method

It is a suitable method for time series that $y_1, y_2, \ldots, y_n$ has no significant trend or seasonal fluctuations. y_t' is the estimation value for the time t. y_{t-1} is the observation data for the time t-1. α is a smoothing constant. The constant α has the value between 0 and 1.

$$y_t' = \alpha y_{t-1} + (1-\alpha) y_{t-1}' \quad (36)$$

$$y_t' = y_{t-1} + \alpha(y_{t-1} - y_{t-1}') \quad (37)$$

$$y_t' = y_{t-1}' + \alpha e_t \quad (38)$$

5.2.3. Brown's Simple Exponential Smoothing Method

When moving averages method is applied the data which has a significant trend, estimations are always remains lower than actual values. To deal with this situation "Linear Moving Averages" method was

developed. The main idea of this method is the calculation of second moving average.

$$y'_t = \frac{y_t + y_{t-1} + y_{t-2} + \ldots + y_{t-k+1}}{k} \quad (39)$$

$$y''_t = \frac{y'_t + y'_{t-1} + y'_{t-2} + \ldots + y'_{t-k+1}}{k} \quad (40)$$

$$a_t = y'_t + (y' - y''_t) = 2y'_t - y''_t \quad (41)$$

$$b_t = \frac{2}{k-1}(y'_t - y''_t) \quad (42)$$

$$\hat{y}_{t+m} = a_t + b_t m \quad (43)$$

The coefficient "m" is the forecast period to be estimated.

5.2.4. Brown's Linear Exponential Smoothing Method with Single Parameter

Brown's Linear Exponential Smoothing Method with single parameter has some similarities with linear moving averages method. But the difference between first and second smoothing values is added into the first smoothing value.

$$y'_t = \alpha y_t + (1-\alpha) y'_{t-1} \quad (44)$$

$$y''_t = \alpha y'_t + (1-\alpha) y''_{t-1} \quad (45)$$

$$a_t = y'_t + (y'_t - y''_t) = 2y'_t - y''_t \quad (46)$$

$$b_t = \frac{\alpha}{1-\alpha}(y'_t - y''_t) \quad (47)$$

$$\hat{y}_{t+m} = a_t + b_t m \quad (48)$$

5.2.5. Holt's Linear Exponential Smoothing Method with Two Parameter

It seems similar to previous method (Brown's Linear Exponential Smoothing Method with Single Parameter). But in Holt's Linear Exponential Smoothing Method second smoothing is not used. Trend values are smoothed directly. This adds flexibility into the method. The parameters α and γ have the values between 0 and 1.

$$y'_t = \alpha y_t + (1-\alpha)(y'_{t-1} + b_{t-1}) \quad (49)$$

$$b_t = \gamma(y'_t - y'_{t-1}) + (1-\gamma) b_{t-1} \quad (50)$$

$$\hat{y}_{t+m} = y'_t - b_t m \quad (51)$$

The parameters α and γ are the smoothing constants. These parameters should be optimized for minimizing the sum of error squares.

5.2.6. Brown's Quadratic Exponential Smoothing Method

When the time series are curved shape (quadratic, third order or more) Brown's quadratic exponential smoothing technique is suitable for estimation. Third parameter is added to the model. The equations for quadratic exponential smoothing are below:

$$y'_t = \alpha y_t + (1-\alpha) y'_{t-1} \quad (52)$$

$$y''_t = \alpha y'_t + (1-\alpha) y''_{t-1} \quad (53)$$

$$y'''_t = \alpha y''_t + (1-\alpha) y'''_{t-1} \quad (54)$$

$$a_t = 3y'_t - 3y''_t + y'''_t \quad (55)$$

$$b_t = \frac{\alpha}{2(1-\alpha)^2} \left[(6-5\alpha) y'_t - (10-8\alpha) y''_t + (4-3\alpha) y'''_t\right] \quad (56)$$

$$c_t = \frac{\alpha^2}{(1-\alpha)^2}(y'_t - 2y''_t + y''') \quad (57)$$

Estimation equation can be shown as below:

$$\hat{y}_{t+m} = a_t + b_t m + \frac{1}{2} c_t m^2 \quad (58)$$

The selection of the α coefficient can be done as the selection in previous methods.

6. Combining Forecasting and Multi Criteria Decision Making Techniques to Determine the Rank of Alternatives

In analyzing the data, Analytical Hierarchy Process (AHP) and Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) methodologies

are used for the outranking of supplier alternatives. Fig. 2 shows the steps of the proposed method. To apply proposed method financial performance evaluation problem was solved. In this financial performance evaluation there are 10 main criteria, 57 sub-criteria and 17 alternatives. The hierarchical structure to select the best performing bank is shown in Table 3. An interview was performed with the financial expert in order to identify weight coefficients. Past experience and the back-ground of the financial expert are utilized in the determination of the criteria and 10 main, 57 sub-criteria to be used for bank evaluation are established. The outputs of the AHP are determined as the input of TOPSIS method. Performance evaluation plays a major role in planning and it is an essential analytical tool in banks' financial strategies. In this content, the primary purpose of this research is to evaluate the financial performances of Turkish Banks. Annual time series data are used for the period 2002 to 2011. The sample period is dependent on annual data availability. The data was gathered from the publications of the Banks Association of Turkey. The sample includes 3 state banks (Ziraat Bank, Halk Bank and Vakıflar Bank); 9 private banks (Akbank; Anadolubank; Sekerbank; Tekstil Bank; Turkish Bank; Turk Ekonomi Bank; Garanti Bank; Is Bank and Yapı Kredi Bank) and 5 foreign banks (Denizbank; Eurobank Tekfen; Finans Bank; HSBC Bank and ING Bank). Financial ratios have been grouped as Capital Ratios, Balance Sheet Ratios, Assets Quality, Liquidity, Profitability, Income-Expenditure Structure, Share in Sector, Share in Group, Branch Ratios and Activity Ratios as described by the Banks Association of Turkey.

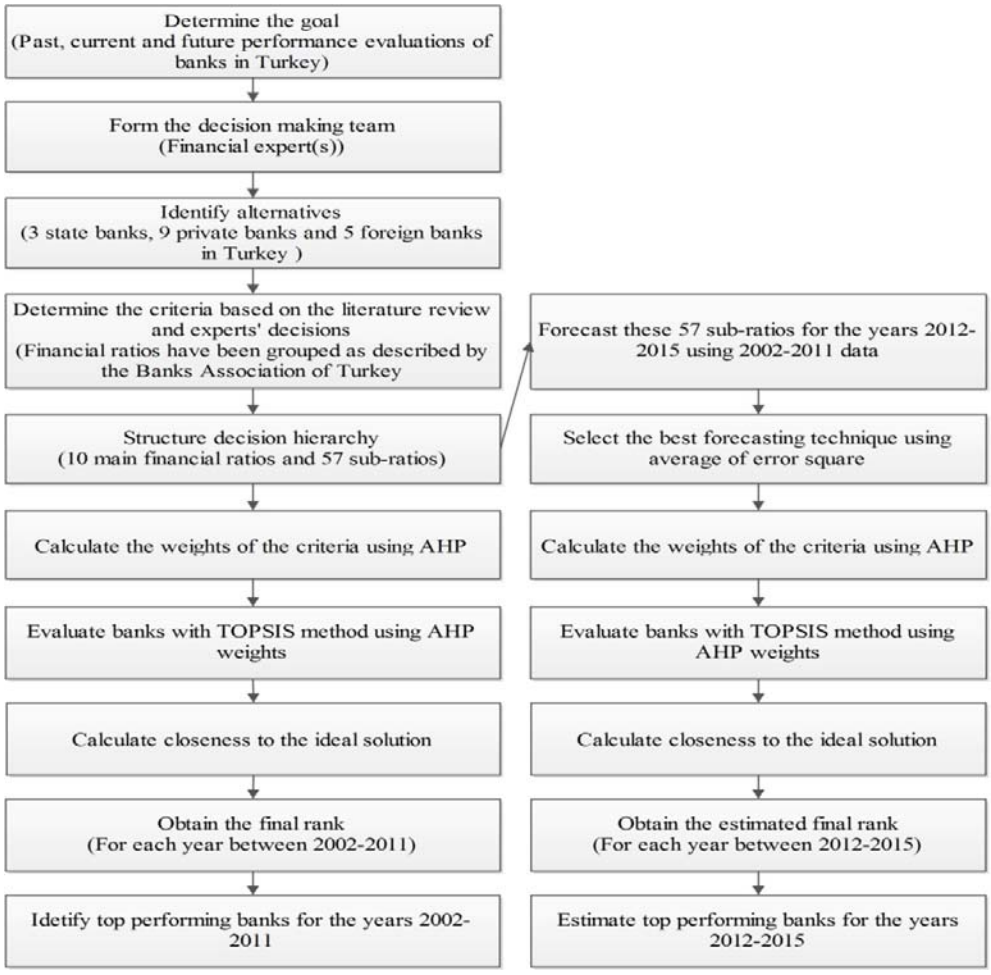


Figure 1. Steps of proposed method

As a result, 10 main criteria were used in evaluation and decision hierarchy is established accordingly. Decision hierarchy structured with the determined banks and criteria is provided in Table 3. There are four levels in the decision hierarchy structured for bank performance evaluation problem. The overall

goal of the decision process is ‘‘performance evaluation of selected banks in Turkey” in the first level of the hierarchy. The main financial ratios are on the second level, sub-ratios are on the third level and alternative banks are on the fourth level of the hierarchy. After forming the decision hierarchy for the problem, the weights of the criteria to be used in evaluation process are calculated by using AHP method. In this phase, the financial expert is given the task of forming individual pairwise comparison matrix by using the Saaty’s 1-9 scale.

Table 6. The pairwise comparison matrix main financial ratios

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10
C1	**1.00**	6.00	3.00	4.00	2.00	5.00	8.00	9.00	7.00	6.00
C2	0.17	**1.00**	0.25	0.33	0.20	0.50	4.00	5.00	3.00	2.00
C3	0.33	4.00	**1.00**	2.00	0.50	3.00	6.00	7.00	5.00	4.00
C4	0.25	3.00	0.50	**1.00**	0.50	2.00	6.00	7.00	5.00	4.00
C5	0.50	5.00	2.00	2.00	**1.00**	4.00	7.00	9.00	7.00	6.00
C6	0.20	2.00	0.33	0.50	0.25	**1.00**	5.00	6.00	4.00	3.00
C7	0.13	0.25	0.17	0.17	0.14	0.20	**1.00**	2.00	0.50	0.33
C8	0.11	0.20	0.14	0.14	0.11	0.17	0.50	**1.00**	0.33	0.25
C9	0.14	0.33	0.20	0.20	0.14	0.25	2.00	3.00	**1.00**	0.50
C10	0.17	0.50	0.25	0.25	0.17	0.33	3.00	4.00	2.00	**1.00**

Financial expert’s choice values (Table 6) are calculated to form the pairwise comparison matrix (Table 7). The results obtained from the calculations based on the pairwise comparison matrix provided in Table 6, are presented in Table 7.

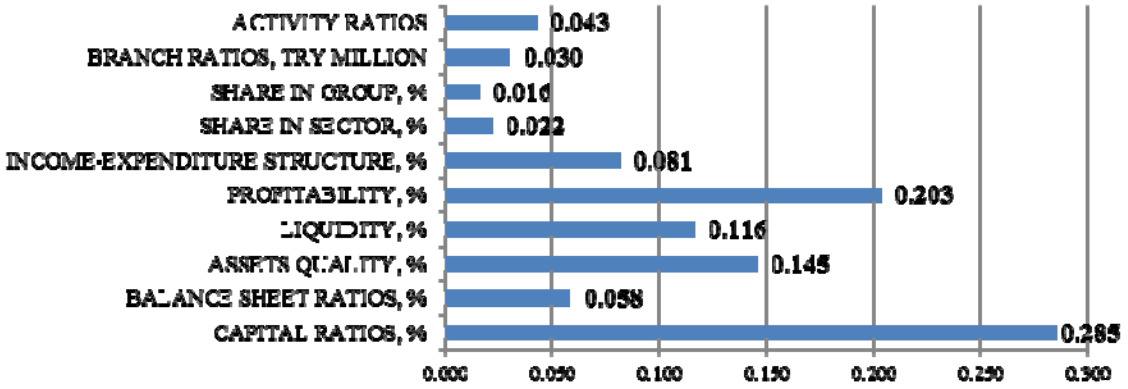


Figure 2. Resulting weights of main financial ratios obtained with AHP

Net Profit (Losses) / Total Assets (PROFITABILITY) (0,1057), Shareholders' Equity / Total Assets (CAPITAL RATIOS) (0,1020), Consumer Loans / Total Loans and Receivables (ASSETS QUALITY) (0,0763), Shareholders' Equity / (Amount Subject to Credit Risk + Market Risk + Operational Risk) (CAPITAL RATIOS) (0,0736) and Net Profit (Losses) / Total Shareholders' Equity (PROFITABILITY) (0,0583) are determined as the five most important financial ratios for the performance of the banks by AHP.

FX Deposits / No. of Branches (BRANCH RATIOS) (0,0010), FC Assets / FC Liabilities (BALANCE SHEET RATIOS) (0,0011), TRY Deposits / No. of Branches (BRANCH RATIOS) (0,0014), FC Liabilities / Total Liabilities (BALANCE SHEET RATIOS) (0,0014) and Non-Interest Income (Net) / Other Operating Expenses (INCOME-EXPENDITURE STRUCTURE) (0,0016) are determined as the five least important financial ratios for the performance of the banks by AHP.

Table7. Results of main criteria obtained by AHP

Criteria	**Weights**	**λmax, CI, RI**	**CR**

CAPITAL RATIOS, %	0.285		
BALANCE SHEET RATIOS, %	0.058		
ASSETS QUALITY, %	0.145		
LIQUIDITY, %	0.116	λmax = 10.59	
PROFITABILITY, %	0.203	CI = 0.0652	0.044
INCOME-EXPENDITURE STRUCTURE, %	0.081	RI = 1.49	
SHARE IN SECTOR, %	0.022		
SHARE IN GROUP, %	0.016		
BRANCH RATIOS, TRY MILLION	0.030		
ACTIVITY RATIOS	0.043		

Consistency ratios of the expert's pairwise comparison matrixes are calculated as 0,044 (Main Financial Ratios), 0,027 (CAPITAL RATIOS), 0,038 (BALANCE SHEET RATIOS), 0,045 (ASSETS QUALITY), 0,042 (LIQUIDITY), 0,064 (PROFITABILITY), 0,037 (INCOME-EXPENDITURE STRUCTURE), 0,008 (SHARE IN SECTOR), 0,008 (SHARE IN GROUP), 0,025 (BRANCH RATIOS) and 0,020 (ACTIVITY RATIOS). They all are less than 0.1. So the weights are shown to be consistent and they are used in the financial performance evaluation. The most important criterion is "Net Profit (Losses) / Total Assets" (0.1057) and the least important criterion is "FX Deposits / No. of Branches" (0.0010).

Table 8. Global weights obtained by AHP

Rank	FINANCIAL RATIOS	SUB RATIOS	Global Weights
1	PROFITABILITY, %	Net Profit (Losses) / Total Assets	**0.1057**
2	CAPITAL RATIOS, %	Shareholders' Equity / Total Assets	**0.1020**
3	ASSETS QUALITY, %	Consumer Loans / Total Loans and Reciv.	**0.0763**
4	CAPITAL RATIOS, %	Shareholders' Equity / (Amount Subject to Credit Risk + Market Risk + Operational Risk)	**0.0736**
5	PROFITABILITY, %	Net Profit (Losses) / Total Shareholders' Equity	**0.0583**
6	LIQUIDITY, %	Liquid Assets / Total Assets	**0.0494**
7	CAPITAL RATIOS, %	(Shareholders' Equity-Permanent Assets) / Total Assets	**0.0449**
8	ASSETS QUALITY, %	Total Loans and Receivables / Total Deposits	**0.0448**
9	PROFITABILITY, %	Net Profit (Losses) / Paid-in Capital	**0.0293**
10	CAPITAL RATIOS, %	Net on Balance-sheet Position / Total Shareholders' Equity	**0.0289**
11	LIQUIDITY, %	Liquid Assets / Short-term Liabilities	**0.0286**
12	INCOME-EXPENDITURE STRUCTURE, %	Interest Income / Total Assets	**0.0248**
13	LIQUIDITY, %	Liquid Assets / (Deposits + Non-Deposit Funds)	**0.0217**
14	CAPITAL RATIOS, %	Shareholders' Equity / (Deposits + Non-Deposit Funds)	**0.0180**
15	BALANCE SHEET RATIOS, %	TC Assets / Total Assets	**0.0176**
16	INCOME-EXPENDITURE STRUCTURE, %	Interest Income / Total Expenses	**0.0176**
17	ACTIVITY RATIOS	Total Operating Income / Total Assets	**0.0162**
18	ASSETS QUALITY, %	Financial Assets (Net) / Total Assets	**0.0160**
19	BALANCE SHEET RATIOS, %	Total Deposits / Total Assets	**0.0128**
20	INCOME-EXPENDITURE STRUCTURE, %	Total Income / Total Expense	**0.0123**
21	SHARE IN SECTOR, %	Total Deposits (SHARE IN SECTOR, %)	**0.0118**
22	LIQUIDITY, %	TC Liquid Assets / Total Assets	**0.0107**
23	ACTIVITY RATIOS	Personnel Expenses / Other Operating Expenses	**0.0106**
24	BRANCH RATIOS, TRY MILLION	Net Income / No. of Branches	**0.0106**
25	CAPITAL RATIOS, %	On Balance-sheet FC Position / Shareholders' Equity	**0.0103**
26	PROFITABILITY, %	Income Before Taxes / Total Assets	**0.0101**
27	BALANCE SHEET RATIOS, %	TC Deposits / Total Deposits	**0.0095**
28	INCOME-EXPENDITURE STRUCTURE, %	Interest Expense / Total Expenses	**0.0090**
29	SHARE IN GROUP, %	Total Deposits (SHARE IN GROUP, %)	**0.0086**
30	ASSETS QUALITY, %	Total Loans and Receivables / Total Assets	**0.0083**

Table 8. Global weights obtained by AHP (Continued)

Rank	FINANCIAL RATIOS	SUB RATIOS	Global Weights
31	BRANCH RATIOS, TRY MILLION	Total Deposits / No. of Branches	**0.0072**
32	CAPITAL RATIOS, %	N(on+off) Balance-sheet Position / Total Shareholders' Equity	**0.0070**
33	ACTIVITY RATIOS	(Personnel Expenses + Reserve for Employee Termination Benefit) / Total Assets	**0.0069**
34	SHARE IN SECTOR, %	Total Assets (SHARE IN SECTOR, %)	**0.0065**
35	BALANCE SHEET RATIOS, %	TC Liabilities / Total Liabilities	**0.0065**
36	INCOME-EXPENDITURE STRUCTURE, %	Interest Income / Interest Expense	**0.0063**
37	LIQUIDITY, %	FC Liquid Assets / FC Liabilities	**0.0057**
38	BRANCH RATIOS, TRY MILLION	Total Assets / No. of Branches	**0.0048**
39	SHARE IN GROUP, %	Total Assets (SHARE IN GROUP, %)	**0.0047**
40	INCOME-EXPENDITURE STRUCTURE, %	Net Interest Income After Specific Provisions / Total Assets	**0.0044**
41	ACTIVITY RATIOS	(Personnel Expenses + Reserve for Employee Termination Benefit) / Number of Personnel (Thousand TRY)	**0.0044**
42	BALANCE SHEET RATIOS, %	TC Loans and Receivables / Total Loans and Receivables	**0.0043**
43	SHARE IN SECTOR, %	Total Loans and Receivables (SHARE IN SECTOR, %)	**0.0036**
44	INCOME-EXPENDITURE STRUCTURE, %	Non-Interest Income (Net) / Total Assets	**0.0032**
45	BRANCH RATIOS, TRY MILLION	Total Loans and Receivables / No. of Branches	**0.0032**
46	BALANCE SHEET RATIOS, %	Funds Borrowed / Total Assets	**0.0030**
47	ACTIVITY RATIOS	Other Operating Expenses / Total Asset	**0.0028**
48	SHARE IN GROUP, %	Total Loans and Receivables (SHARE IN GROUP, %)	**0.0026**
49	INCOME-EXPENDITURE STRUCTURE, %	Net Interest Income After Specific Provisions / Total Operating Income	**0.0022**
50	BRANCH RATIOS, TRY MILLION	Total Employees / No. of Branches (person)	**0.0021**
51	BALANCE SHEET RATIOS, %	FC Assets / Total Assets	**0.0020**
52	ACTIVITY RATIOS	Reserve for Employee Termination Benefit / Number of Personnel (Thousand TRY)	**0.0019**
53	INCOME-EXPENDITURE STRUCTURE, %	Non-Interest Income (Net) / Other Operating Expenses	**0.0016**
54	BALANCE SHEET RATIOS, %	FC Liabilities / Total Liabilities	**0.0014**
55	BRANCH RATIOS, TRY MILLION	TRY Deposits / No. of Branches	**0.0014**
56	BALANCE SHEET RATIOS, %	FC Assets / FC Liabilities	**0.0011**
57	BRANCH RATIOS, TRY MILLION	FX Deposits / No. of Branches	**0.0010**

Table 9. Input values sample of the TOPSIS analysis for the year 2011

Weights	***0.0736***	***0.1020***	***…***	***0.0106***	***0.0028***	***0.0162***
RATIOS / BANKS	Shareholders' Equity / (Amount Subject to Credit Risk + Market Risk + Operational Risk)	Shareholders' Equity / Total Assets	…	Personnel Expenses / Other Operating Expenses	Other Operating Expenses / Total Asset	Total Operating Income / Total Assets
Ziraat Bank	15.61	8.20	…	50.06	1.63	3.86
Halk Bank	14.30	9.48	…	42.42	1.89	5.54
Vakıflar Bank	13.38	10.43	…	42.96	2.18	4.96
Akbank	16.98	13.14	…	39.45	1.82	4.56
Anadolubank	16.96	14.54	…	66.78	3.23	5.81
Sekerbank	13.24	10.15	…	41.73	3.80	6.09
Tekstil Bank	15.86	14.75	…	60.07	2.78	4.22
Turkish Bank	32.09	17.10	…	53.24	3.38	3.73
Turk Ekonomi	14.23	11.06	…	41.99	3.62	4.71
Garanti Bank	16.89	11.99	…	38.93	2.19	5.41
Is Bank	14.07	11.09	…	52.26	2.15	5.05
Yapı Kredi Bank	14.69	10.82	…	42.31	2.49	5.39
Denizbank	15.65	10.98	…	48.92	3.40	6.37
Eurobank Tekfen	16.94	12.77	…	50.41	2.98	4.26
Finans Bank	17.18	12.33	…	43.43	3.41	6.49
HSBC Bank	16.14	11.58	…	42.32	4.36	6.36
ING Bank	14.19	11.21	…	46.34	3.99	5.22

Finally, TOPSIS method is applied to rank the banks. The priority weights of banks with respect to criteria, calculated by AHP and shown in Table 8, can be used as input of TOPSIS (Table 9). The weighted normalized decision matrix can be seen from Table 10.

Table 10. Weighted evaluation for the bank evaluation for the year 2011

BANKS	RATIOS	Shareholders' Equity / (Amount Subject to Credit Risk + Market Risk + Operational Risk)	Shareholders' Equity / Total Assets	…	Personnel Expenses / Other Operating Expenses	Other Operating Expenses / Total Asset	Total Operating Income / Total Assets
Ziraat Bank		0.01650	0.01685	…	0.00270	0.00037	0.00290
Halk Bank		0.01511	0.01948	…	0.00229	0.00043	0.00416
Vakıflar Bank		0.01414	0.02142	…	0.00232	0.00049	0.00372
Akbank		0.01795	0.02700	…	0.00213	0.00041	0.00341
Anadolubank		0.01793	0.02987	…	0.00360	0.00073	0.00435
Sekerbank		0.01399	0.02086	…	0.00225	0.00086	0.00456
Tekstil Bank		0.01676	0.03031	…	0.00324	0.00063	0.00316
Turkish Bank		0.03391	0.03513	…	0.00287	0.00076	0.00279
Turk Ekonomi Bank		0.01504	0.02272	…	0.00226	0.00082	0.00353
Garanti Bank		0.01785	0.02462	…	0.00210	0.00049	0.00406
Is Bank		0.01487	0.02277	…	0.00282	0.00049	0.00378
Yapı Kredi Bank		0.01553	0.02224	…	0.00228	0.00056	0.00404
Denizbank		0.01654	0.02256	…	0.00264	0.00077	0.00477
Eurobank Tekfen		0.01791	0.02624	…	0.00272	0.00067	0.00319
Finans Bank		0.01816	0.02533	…	0.00234	0.00077	0.00487
HSBC Bank		0.01706	0.02380	…	0.00228	0.00098	0.00477
ING Bank		0.01500	0.02302	…	0.00250	0.00090	0.00391
Min or Max		+	+	…	-	-	+
A^*		0.03391	0.03513	…	0.00210	0.00037	0.00487
A^-		0.01399	0.01685	…	0.00360	0.00098	0.00279

By using TOPSIS method, the ranking of banks are calculated. Table 11 shows the evaluation results and final ranking of banks.

Table 11. TOPSIS results for the year 2011

Banks	d_i^*	d_i^-	RC_i
Ziraat Bank	0.041	0.041	**0.500**
Halk Bank	0.040	0.053	**0.568**
Vakıflar Bank	0.043	0.039	**0.477**
Akbank	0.036	0.044	**0.551**
Anadolubank	0.047	0.035	**0.430**
Sekerbank	0.055	0.026	**0.315**
Tekstil Bank	0.058	0.025	**0.297**
Turkish Bank	0.064	0.036	**0.361**
Turk Ekonomi Bank	0.056	0.025	**0.309**
Garanti Bank	0.033	0.050	**0.601**
Is Bank	0.041	0.041	**0.496**
Yapı Kredi Bank	0.043	0.041	**0.487**
Denizbank	0.037	0.055	**0.600**
Eurobank Tekfen	0.057	0.030	**0.347**
Finans Bank	0.038	0.051	**0.575**
HSBC Bank	0.047	0.036	**0.429**
ING Bank	0.060	0.025	**0.293**

Depends on the RCj values (Table 12), the ranking of the alternatives from top to bottom order are Garanti Bank, Denizbank, Finans Bank, Halk Bank, Akbank, Ziraat Bank, Is Bank, Yapı Kredi Bank, Vakıflar Bank, Anadolubank, HSBC Bank, Turkish Bank, Eurobank Tekfen, Sekerbank, Turk Ekonomi Bank, Tekstil Bank and ING Bank. Proposed model results show that Garanti Bank is the best performing bank for the year 2011 with RC value of 0.601.

Table 12. Performance ranking for the year 2011

RANK	*BANK*	*RCi**
1	*Garanti Bank*	*0.601*
2	*Denizbank*	*0.600*
3	*Finans Bank*	*0.575*
4	*Halk Bank*	*0.568*
5	*Akbank*	*0.551*
6	*Ziraat Bank*	*0.500*
7	*Is Bank*	*0.496*
8	*Yapı Kredi Bank*	*0.487*
9	*Vakıflar Bank*	*0.477*
10	*Anadolubank*	*0.430*
11	*HSBC Bank*	*0.429*

12	*Turkish Bank*	*0.361*
13	*Eurobank Tekfen*	*0.347*
14	*Sekerbank*	*0.315*
15	*Turk Ekonomi Bank*	*0.309*
16	*Tekstil Bank*	*0.297*
17	*ING Bank*	*0.293*

Depends on the RCj values (Appendix: Table 12-Table 14), the rankings of the alternatives for the years 2002-2011 are shown on Table 13.

Proposed model results show that Akbank is the best performing bank during the years 2007-2011 and 2009-2011 (Table 14).

Table 13. Performance ranking for the years 2002-2011

BANK	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Akbank	4	**1**	**1**	**3**	**3**	**2**	5	**1**	**1**	5
Anadolubank	13	17	9	13	13	9	**2**	6	8	10
Denizbank	15	9	11	9	6	11	12	8	11	**2**
Eurobank Tekfen	7	15	14	15	17	17	17	17	17	13
Finans Bank	8	6	10	10	**2**	8	11	4	**2**	**3**
Garanti Bank	16	14	12	7	9	**3**	4	**3**	**3**	**1**
Halk Bank	**2**	4	5	8	5	5	8	9	5	4
HSBC Bank	**3**	**2**	4	**2**	4	4	**1**	5	9	11
ING Bank	12	10	7	4	14	14	15	13	15	17
Is Bank	11	7	8	6	10	6	6	7	6	7
Sekerbank	17	11	6	11	11	10	13	12	13	14
Tekstil Bank	5	16	17	16	16	15	16	15	14	16
Turk Ekonomi Bank	14	12	16	14	15	16	14	14	12	15
Turkish Bank	6	5	13	12	8	13	7	16	16	12
Vakıflar Bank	10	8	**3**	5	7	7	10	11	10	9
Yapı Kredi Bank	**1**	13	15	17	12	12	9	10	7	8
Ziraat Bank	9	**3**	**2**	**1**	**1**	**1**	**3**	**2**	4	6

Table 14. Performance ranking for the years 2007-2011 (5 years) and 2009-2011 (3 years)

Top Performing Banks During 2007-2011			Top Performing Banks During 2009-2011		
Rank	**Bank**	**Average**	**Rank**	**Bank**	**Average**
1	Akbank	2.8	1	Akbank	2.33
2	Garanti Bank	2.8	2	Garanti Bank	2.33
3	Ziraat Bank	3.2	3	Finans Bank	3
4	Finans Bank	5.6	4	Ziraat Bank	4
5	HSBC Bank	6	5	Halk Bank	6
6	Halk Bank	6.2	6	Is Bank	6.67
7	Is Bank	6.4	7	Denizbank	7
8	Anadolubank	7	8	Anadolubank	8
9	Denizbank	8.8	9	HSBC Bank	8.33
10	Yapı Kredi Bank	9.2	10	Yapı Kredi Bank	8.33
11	Vakıflar Bank	9.4	11	Vakıflar Bank	10
12	Sekerbank	12.4	12	Sekerbank	13
13	Turkish Bank	12.8	13	Turk Ekonomi Bank	13.67
14	Turk Ekonomi Bank	14.2	14	Turkish Bank	14.67
15	ING Bank	14.8	15	ING Bank	15
16	Tekstil Bank	15.2	16	Tekstil Bank	15
17	Eurobank Tekfen	16.2	17	Eurobank Tekfen	15.67

7. Concluding Remarks

The operations of individual banks are roughly similar throughout the world; they acquire, use and manage funds to make a profit. In all countries, banks are financial intermediaries in the business of earning profits and the efficiency of banks can affect the stability of the financial market and thus the effectiveness of the whole monetary system. Turkish Banking Sector has changed drastically after the financial crisis. The impact of 2000 and 2001 crises on financial system especially on the Turkish Banking sector was extensive. As mentioned, social and economic reforms have been introduced in many areas after the crises that includes restructuring of the state banks, restructuring of private banks, enhancement of supervision and audit of banking system and new legal arrangements and resolution of non-performing loans. From the view of these transforming activities, performance evaluation plays a major role in planning and it is an essential analytical tool in banks' financial strategies. In this content, the primary purpose of this research is to evaluate the financial performances of Turkish Banks for the period 2002 to 2011.

This research proposes a financial performance evaluation model for banks that includes the consideration of financial ratios. This model is then applied to a case study for the financial performance evaluation of 3 state banks (Ziraat Bank, Halk Bank and Vakıflar Bank); 9 private banks (Akbank; Anadolubank; Sekerbank; Tekstil Bank; Turkish Bank; Turk Ekonomi Bank; Garanti Bank; Is Bank and Yapı Kredi Bank) and 5 foreign banks (Denizbank; Eurobank Tekfen; Finans Bank; HSBC Bank and ING Bank) in Turkey. Total performance of bank is divided into ten groups including Capital Ratios, Balance Sheet Ratios, Assets Quality, Liquidity, Profitability, Income-Expenditure Structure, Share in Sector, Share in Group, Branch Ratios and Activity Ratios as described by the Banks Association of Turkey. After AHP analysis most important ratios are found. Net Profit (Losses) / Total Assets (Profitability) (0,1057), Shareholders' Equity / Total Assets (Capital Ratios) (0,1020), Consumer Loans / Total Loans and Reciv. (Assets Quality) (0,0763), Shareholders' Equity / (Amount Subject to Credit Risk + Market Risk + Operational Risk) (Capital Ratios) (0,0736) and Net Profit (Losses) / Total Shareholders' Equity (Profitability) (0,0583) are determined as the five most important financial ratios for the performance of the banks by AHP. Finally, TOPSIS method is applied to rank the banks.

Our model shows that Akbank is the best performing bank during the years 2007-2011 and 2009-2011. On the other hand, critical changes happened for Garanti Bank throughout years; it performs better than the others and has the highest rank in 2011, whereas it has the just before last rank (16th) after the 2001 financial crisis.

Forecasting techniques are important tools in operational management for creating realistic expectations. In literature many different techniques in the area of statistics were proposed for achieving close estimations. This paper also shows evaluation of the financial performance of banks combining traditional forecasting techniques and multi criteria decision making methods. Forecasting models are applied the financial data of Turkish Banks during 2012-2015 based on 2002-2011 data. Results indicates that Garanti Bank continue being leader and Ziraat Bank and Denizbank will follow Garanti Bank during years 2012-2015.

References

[1] Abbott, M. Wu, S. & Wang, W. (2013). The productivity and performance of Australia's major banks since deregulation. Journal of Economics & Finance. Vol. 37, Issue 1, p122-135.

[2] Almazari, A. A. (2011). Financial Performance Evaluation of Some Selected Jordanian Commercial Banks. International Research Journal of Finance & Economics. Issue 68, p50-63.

[3] Al-Nimer, M. eta l. (2012). The Diffusion of Performance Evaluation Measures: An Empirical Study in Jordanian Banks. International Journal of Business & Management. Vol. 7 Issue 14, p76-87.

[4] Ayadi, O. F. Adebayo, A. O. & Omolehinwa, E. (1998). Bank performance measurement in a developing economy: an application of data envelopment analysis. Managerial Finance. Vol. 24, Issue 7, pp.5 – 16.

[5] Banking Regulation and Supervision Agency, http://www.bddk.org.tr

[6] Banks Association of Turkey, http://www.tbb.org.tr

[7] Bao, K. et al. (2012). Improved hierarchical fuzzy TOPSIS for road safety performance

evaluation. Knowledge-Based Systems. Volume 32, August 2012, p 84–90.

[8] Bellman, R. E. and Zadeh, L. A., (1970). Decision-making in a fuzzy environment management. Science, 17(4), 141–164

[9] Chou, Y. C., Sun, C.C., Yen, H. Y., 2012. Evaluating the criteria for human resource for science and technology (HRST) based on an integrated fuzzy AHP and fuzzy DEMATEL approach. Applied Soft Computing 12, 64–71

[10] Clements, M. P., Franses, P. H., Swanson, N. R., 2004. Forecasting economic and financial time-series with non-linear models. International Journal of Forecasting (20), 169 – 183

[11] Deng, H., 1999. Multi-criteria analysis with fuzzy pairwise comparison, International Journal of Approximate Reasoning 21, 215-231

[12] Grigoroudis, E. Tsitsiridi, E. & Zopounidis, C. (2013). Linking Customer Satisfaction, Employee Appraisal, And Business Performance: An Evaluation Methodology In The Banking Sector. Annals Of Operations Research. Vol 205, Issue 1, p5-p27

[13] Jajimoggala, S. Rao, V. V. S. K. Beela, S. (2011). Supplier Evaluation Using Fuzzy Analytical Network Process and Fussy TOPSIS. Jordan Journal of Mechanical & Industrial Engineering. Vol. 5, Issue 6, p543-551.

[14] Mamo Bekana, D. & Abitie, A. (2012). Evaluation Of Financial Performance Of Banking Enterprises; The Case Of Construction And Business Bank Of Ethiopia. Young Economists Journal / Revista Tinerilor Economisti. Vol. 9, Issue 18, p82-102.

[15] Manian, A. et al. (2011). Performance Evaluating of IT Department Using a Modified Fuzzy TOPSIS and BSC Methodology. Journal of Management Research. Vol. 3, Issue 2, p1-20.

[16] Marie, A. Al-Nasser, A. & brahim, M. (2013). Operational-Profitability-Quality Performance of Dubai's Banks. Journal of Management Research (09725814). Vol. 13 Issue 1, p25-34.

[17] Minh, N. K. Long, G. T. & Hung, N. V. (2013). Efficiency And Super-Efficiency Of Commercial Banks In Vietnam: Performances And Determinants. Asia-Pacific Journal of Operational Research. Vol. 30, Issue 1, p-1-19.

[18] Nili, M. Ardakani, S. T. & Shekarchizadeh, A. (2012). A New Method for Evaluating and Ranking Performance in Production Plants Based on BSC and MADM Techniques. Business & Management Review. Vol. 1, Issue 12, p72-80.

[19] Orhunbilge, N., 1999, Time Series Analysis, Forecasting and Price Index. Istanbul University, School of Business Press, Publication No: 277, 11–130. (In Turkish)

[20] Pal, M. & Choudhury, K. (2009). Exploring The Dimensionality Of Service Quality: An Application Of Topsis In The Indian Banking Industry. Asia-Pacific Journal of Operational Research. Vol. 26, Issue 1, p115-133.

[21] Pinter, U. Psunder, U. (2013). Evaluating construction project success with use of the M-TOPSIS method. Journal of Civil Engineering & Management. Vol. 19, Issue 1, p 16-23.

[22] Rouhani, S., Ghazanfari, M., Jafari, M., 2012. Evaluation model of business intelligence for enterprise systems using fuzzy TOPSIS. Expert Systems with Applications, 39, 3764–3771

[23] Saaty, T.L.,1980. The analytic hierarchy process. New York: McGraw-Hill.

[24] Saaty, T.L., (1990). How To Make Decision: The Analytic Hierarchy Process, European Journal of Operational Research,North_Holland, 48, 9-26.

[25] Saaty, T. L., Vargas Luis L., (2001). Models, Methods, Concepts& Applications of The Analytic Hierarchy Process. International Series in Operations Research & Management Science, Kluwer Academic Publishers.

[26] Saaty, T. L.,(2008). Decision Making With The Analytic Hierarchy Process. Int. J. Services Sciences, 1 (1), 83.

[27] Sanayei, A., Mousavi, S. F. and Yazdankhah, A., (2010). Group decision making process for supplier selection with VIKOR under fuzzy environment, Expert systems with applications, 37, 24-30

[28] Sayed, G. J. & Sayed, N. S. (2013). Comparative Analysis of Four Private Sector Banks as per CAMEL Rating. Business Perspectives & Research. Vol. 1, Issue 2, p31-46.

[29] Sooreh, L. K. et al. (2011). Defining and Measuring Entrepreneurial Universities: A Study in Iranian Context Using Importance-Performance Analysis and TOPSIS Technique. Global Business & Management Research.Vol. 3, Issue 2, p182-199.

[30] Stankevičienė, J. & Mencaitė, E. (2012). The evaluation of bank performance using a multicriteria decision making model: a case study on Lithuanian commercial banks. Technological & Economic Development of Economy. Vol. 18, Issue 1, p189-205.

[31] Sun, C.C., (2010). A performance evaluation model by integrating fuzzy AHP and fuzzy

TOPSIS methods, Expert Systems with Applications 37 (2010) 7745–7754

[32] Yılmaz A.A., Bank Efficiency Analysis in Turkish Banking System, WEU International Academic Conference Proceedings, 2013, pp.112-121

[33] Yu, V. F. & Hu, K. J. (2010). An integrated fuzzy multi-criteria approach for the performance evaluation of multiple manufacturing plants. Computers & Industrial Engineering. Volume 58, Issue 2, p 269–277.

[34] Zadeh, L. A. (1965). Fuzzy sets. Information Control, 8, 338–353.

[35] Zavadskas, E. K. et al. (2010). Contractor Selection For Construction Works by Applying Saw-G and Topsis Grey Techniques. Journal of Business Economics & Management. Vol. 11, Issue 1, p34-55.

APPENDIX

Table 1. Results of capital ratios obtained by AHP

Criteria	Weights	λmax, CI, RI	CR
Shareholders' Equity / (Amount Subject to Credit Risk + Market Risk + Operational	0.259		
Shareholders' Equity / Total Assets	0.358		
(Shareholders' Equity-Permanent Assets) / Total Assets	0.158	λmax = 7.22	
Shareholders' Equity / (Deposits + Non-Deposit Funds)	0.063	CI = 0.0363	0.027
On Balance-sheet FC Position / Shareholders' Equity	0.036	RI = 1.32	
Net on Balance-sheet Position / Total Shareholders' Equity	0.101		
N(on+off) Balance-sheet Position / Total Shareholders' Equity	0.024		

Table 2. Results of balance sheet ratios obtained by AHP

Criteria	Weights	λmax, CI, RI	CR
TC Assets / Total Assets	0,285		
FC Assets / Total Assets	0,058		
TC Liabilities / Total Liabilities	0,145		
FC Liabilities / Total Liabilities	0,116	λmax = 9,44	
FC Assets / FC Liabilities	0,203	CI = 0.055	0,038
TC Deposits / Total Deposits	0,081	RI = 1.45	
TC Loans and Receivables / Total Loans and Receivables	0,022		
Total Deposits / Total Assets	0,016		
Funds Borrowed / Total Assets	0,030		

Table 3. Results of assets quality ratios obtained by AHP

Criteria	Weights	λmax, CI, RI	CR
Financial Assets (Net) / Total Assets	0,110		
Total Loans and Receivables / Total Assets	0,057	λmax = 4,12	0,045
Total Loans and Receivables / Total Deposits	0,308	CI = 0.041	
Consumer Loans / Total Loans and Reciv.	0,525	RI = 0,9	

Table 4. Results of liquidity ratios obtained by AHP

Criteria	Weights	λmax, CI, RI	CR
Liquid Assets / Total Assets	0,425		
Liquid Assets / Short-term Liabilities	0,246	λmax = 5,19	0,042
TC Liquid Assets / Total Assets	0,093	CI = 0.047	
Liquid Assets / (Deposits + Non-Deposit Funds)	0,187	RI = 1,12	
FC Liquid Assets / FC Liabilities	0,049		

Table 5. Results of profitability ratios obtained by AHP

Criteria	Weights	λmax, CI, RI	CR
Net Profit (Losses) / Total Assets	0,520		
Net Profit (Losses) / Total Shareholders' Equity	0,287	λmax = 4,17	0,064
Income Before Taxes / Total Assets	0,050	CI = 0.057	
Net Profit (Losses) / Paid-in Capital	0,144	RI = 0,9	

Table 6. Results of income-expenditure structure ratios obtained by AHP

Criteria	Weights	λmax, CI, RI	CR
Net Interest Income After Specific Provisions / Total Assets	0,054		
Net Interest Income After Specific Provisions / Total Operating	0,027		
Non-Interest Income (Net) / Total Assets	0,039		
Non-Interest Income (Net) / Other Operating Expenses	0,019	λmax = 9,44	
Interest Income / Interest Expense	0,078	CI = 0.054	0,037
Total Income / Total Expense	0,151	RI = 1.45	
Interest Income / Total Assets	0,305		
Interest Income / Total Expenses	0,216		
Interest Expense / Total Expenses	0,111		

Table 7. Results of share in sector ratios obtained by AHP

Criteria	Weights	λmax, CI, RI	CR
Total Assets	0,297	λmax = 3,01	
Total Loans and Receivables	0,164	CI = 0.005	0,008
Total Deposits	0,539	RI = 0,58	

Table 8. Results of share in group ratios obtained by AHP

Criteria	Weights	λmax, CI, RI	CR
Total Assets	0,297	λmax = 3,01	
Total Loans and Receivables	0,164	CI = 0.005	0,008
Total Deposits	0,539	RI = 0,58	

Table 9. Results of branch ratios obtained by AHP

Criteria	Weights	λmax, CI, RI	CR
Total Assets / No. of Branches	0,159		
Total Deposits / No. of Branches	0,237		
TRY Deposits / No. of Branches	0,046	λmax = 7.20	
FX Deposits / No. of Branches	0,032	CI = 0.033	0,025
Total Loans and Receivables / No. of Branches	0,106	RI = 1.32	
Total Employees / No. of Branches (person)	0,070		
Net Income / No. of Branches	0,350		

Table 10. Results of activity ratios obtained by AHP

Criteria	Weights	λmax, CI, RI	CR
(Personnel Expenses + Reserve for Employee Termination Benefit) / Total Assets	0,160		
(Personnel Expenses + Reserve for Employee Termination Benefit) / Number of Personnel (Thousand TRY)	0,102		
Reserve for Employee Termination Benefit / Number of Personnel (Thousand TRY)	0,043	λmax = 6,12	0,020
Personnel Expenses / Other Operating Expenses	0,249	CI = 0.025	
Other Operating Expenses / Total Asset	0,065	RI = 1,24	
Total Operating Income / Total Assets	0,379		

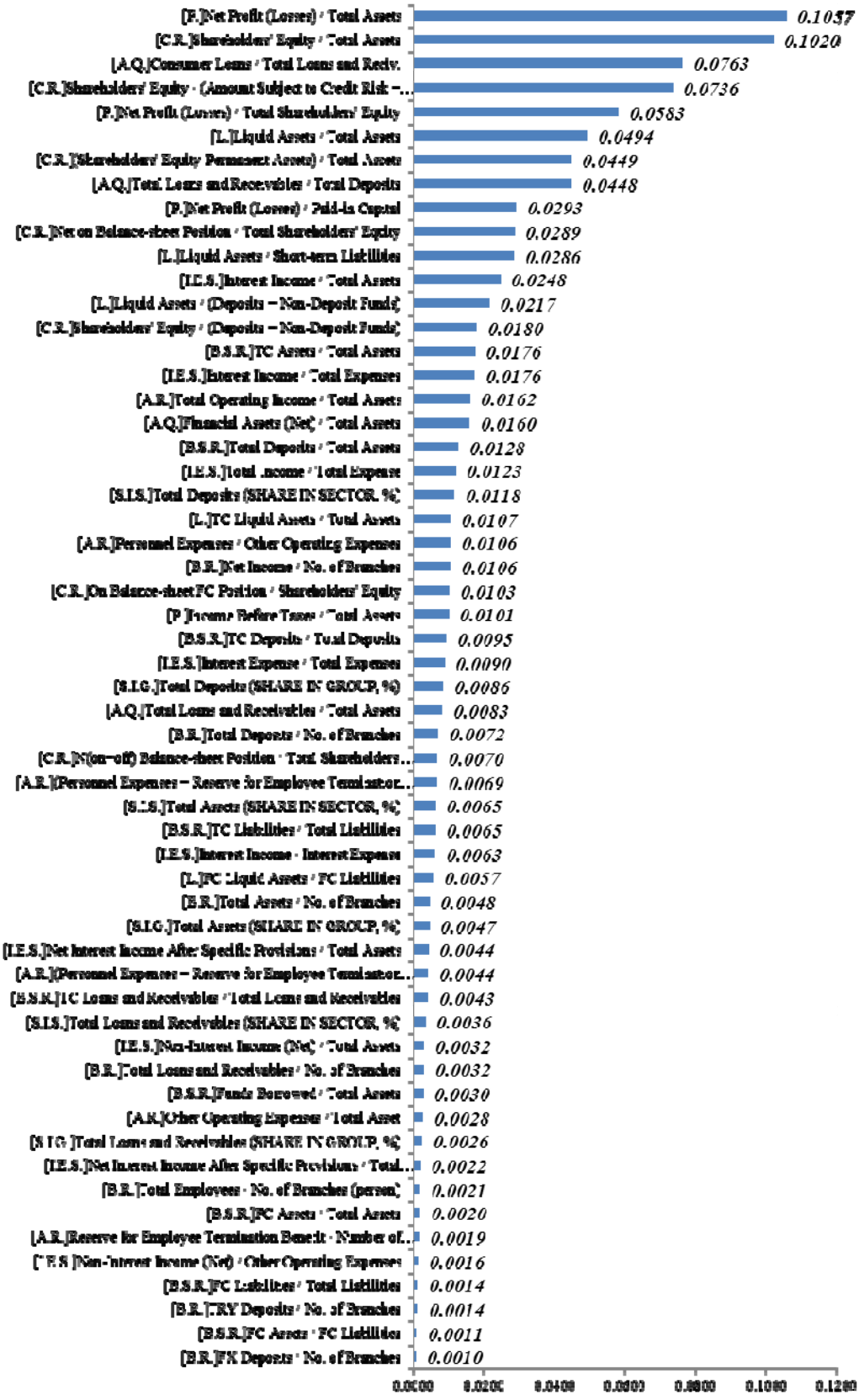


Figure 1. Weights of financial ratios

Table 11. Local and global weights of all criteria

FINANCIAL RATIOS	Local Weights	SUB RATIOS	Min	Max	Local Weights	Global Weights
CAPITAL RATIOS, %	0.2847	Shareholders' Equity / (Amount Subject to Credit Risk + Market Risk + Operational Risk)		x	0.2586	**0.0736**
		Shareholders' Equity / Total Assets		x	0.3583	**0.1020**
		(Shareholders' Equity-Permanent Assets) / Total Assets		x	0.1578	**0.0449**
		Shareholders' Equity / (Deposits + Non-Deposit Funds)		x	0.0633	**0.0180**
		On Balance-sheet FC Position / Shareholders' Equity		x	0.0361	**0.0103**
		Net on Balance-sheet Position / Total Shareholders'		x	0.1015	**0.0289**
		N(on+off) Balance-sheet Position / Total Shareholders'		x	0.0244	**0.0070**
BALANCE SHEET RATIOS, %	0.0583	TC Assets / Total Assets		x	0.3023	**0.0176**
		FC Assets / Total Assets		x	0.0351	**0.0020**
		TC Liabilities / Total Liabilities		x	0.1111	**0.0065**
		FC Liabilities / Total Liabilities		x	0.0244	**0.0014**
		FC Assets / FC Liabilities		x	0.0184	**0.0011**
		TC Deposits / Total Deposits		x	0.1634	**0.0095**
		TC Loans and Receivables / Total Loans and Receivables		x	0.0730	**0.0043**
		Total Deposits / Total Assets		x	0.2204	**0.0128**
		Funds Borrowed / Total Assets		x	0.0518	**0.0030**
ASSETS QUALITY, %	0.1454	Financial Assets (Net) / Total Assets		x	0.1101	**0.0160**
		Total Loans and Receivables / Total Assets		x	0.0572	**0.0083**
		Total Loans and Receivables / Total Deposits		x	0.3079	**0.0448**
		Consumer Loans / Total Loans and Reciv.		x	0.5248	**0.0763**
LIQUIDITY, %	0.1162	Liquid Assets / Total Assets		x	0.4249	**0.0494**
		Liquid Assets / Short-term Liabilities		x	0.2464	**0.0286**
		TC Liquid Assets / Total Assets		x	0.0925	**0.0107**
		Liquid Assets / (Deposits + Non-Deposit Funds)		x	0.1867	**0.0217**
		FC Liquid Assets / FC Liabilities		x	0.0495	**0.0057**
PROFITABILITY, %	0.2035	Net Profit (Losses) / Total Assets		x	0.5196	**0.1057**
		Net Profit (Losses) / Total Shareholders' Equity		x	0.2866	**0.0583**
		Income Before Taxes / Total Assets		x	0.0499	**0.0101**
		Net Profit (Losses) / Paid-in Capital		x	0.1439	**0.0293**
INCOME-EXPENDITURE STRUCTURE, %	0.0813	Net Interest Income After Specific Provisions / Total		x	0.0542	**0.0044**
		Net Interest Income After Specific Provisions / Total Operating Income		x	0.0267	**0.0022**
		Non-Interest Income (Net) / Total Assets		x	0.0393	**0.0032**
		Non-Interest Income (Net) / Other Operating Expenses		x	0.0194	**0.0016**
		Interest Income / Interest Expense		x	0.0778	**0.0063**
		Total Income / Total Expense		x	0.1507	**0.0123**
		Interest Income / Total Assets		x	0.3050	**0.0248**
		Interest Income / Total Expenses		x	0.2163	**0.0176**
		Interest Expense / Total Expenses	x		0.1106	**0.0090**
SHARE IN SECTOR, %	0.0219	Total Assets (SHARE IN SECTOR, %)		x	0.2973	**0.0065**
		Total Loans and Receivables (SHARE IN SECTOR, %)		x	0.1638	**0.0036**
		Total Deposits (SHARE IN SECTOR, %)		x	0.5390	**0.0118**
SHARE IN GROUP, %	0.0159	Total Assets (SHARE IN GROUP, %)		x	0.2973	**0.0047**
		Total Loans and Receivables (SHARE IN GROUP, %)		x	0.1638	**0.0026**
		Total Deposits (SHARE IN GROUP, %)		x	0.5390	**0.0086**
BRANCH RATIOS, TRY MILLION	0.0302	Total Assets / No. of Branches		x	0.1590	**0.0048**
		Total Deposits / No. of Branches		x	0.2375	**0.0072**
		TRY Deposits / No. of Branches		x	0.0462	**0.0014**
		FX Deposits / No. of Branches		x	0.0318	**0.0010**
		Total Loans and Receivables / No. of Branches		x	0.1056	**0.0032**
		Total Employees / No. of Branches (person)	x		0.0696	**0.0021**
		Net Income / No. of Branches		x	0.3504	**0.0106**

ACTIVITY RATIOS	**0.0427**	(Personnel Expenses + Reserve for Employee Termination Benefit) / Total Assets	x		0.1604	**0.0069**
		(Personnel Expenses + Reserve for Employee Termination Benefit) / Number of Personnel (Thousand TRY)	x		0.1024	**0.0044**
		Reserve for Employee Termination Benefit / Number of Personnel (Thousand TRY)	x		0.0434	**0.0019**
		Personnel Expenses / Other Operating Expenses	x		0.2488	**0.0106**
		Other Operating Expenses / Total Asset	x		0.0655	**0.0028**
		Total Operating Income / Total Assets		x	0.3794	**0.0162**

Table 12. Performance rankings for the years 2002 and 2003

Financial Performance of the banks for the year 2002			***Financial Performance of the banks for the year 2003***		
RANK	***BANK***	*RCi**	***RANK***	***BANK***	*RCi**
1	***Yapı Kredi Bank***	***0.531***	**1**	***Akbank***	***0.666***
2	***Halk Bank***	***0.510***	**2**	***HSBC Bank***	***0.578***
3	***HSBC Bank***	***0.505***	**3**	***Ziraat Bank***	***0.520***
4	***Akbank***	***0.480***	**4**	***Halk Bank***	***0.500***
5	***Tekstil Bank***	***0.474***	**5**	***Turkish Bank***	***0.440***
6	***Turkish Bank***	***0.431***	**6**	***Finans Bank***	***0.434***
7	***Eurobank Tekfen***	***0.424***	**7**	***Is Bank***	***0.387***
8	***Finans Bank***	***0.419***	**8**	***Vakıflar Bank***	***0.377***
9	***Ziraat Bank***	***0.383***	**9**	***Denizbank***	***0.362***
10	***Vakıflar Bank***	***0.372***	**10**	***ING Bank***	***0.346***
11	***Is Bank***	***0.368***	**11**	***Sekerbank***	***0.339***
12	***ING Bank***	***0.359***	**12**	***Turk Ekonomi Bank***	***0.335***
13	***Anadolubank***	***0.315***	**13**	***Yapı Kredi Bank***	***0.323***
14	***Turk Ekonomi Bank***	***0.313***	**14**	***Garanti Bank***	***0.314***
15	***Denizbank***	***0.298***	**15**	***Eurobank Tekfen***	***0.297***
16	***Garanti Bank***	***0.277***	**16**	***Tekstil Bank***	***0.247***
17	***Sekerbank***	***0.233***	**17**	***Anadolubank***	***0.240***

Table 13. Performance rankings for the years 2004 and 2005

Financial Performance of the banks for the year 2004			***Financial Performance of the banks for the year 2005***		
RANK	***BANK***	*RCi**	***RANK***	***BANK***	*RCi**
1	***Akbank***	***0.672***	**1**	***Ziraat Bank***	***0.801***
2	***Ziraat Bank***	***0.620***	**2**	***Akbank***	***0.787***
3	***Vakıflar Bank***	***0.608***	**3**	***HSBC Bank***	***0.786***
4	***HSBC Bank***	***0.565***	**4**	***ING Bank***	***0.783***
5	***Halk Bank***	***0.523***	**5**	***Vakıflar Bank***	***0.769***
6	***Sekerbank***	***0.495***	**6**	***Is Bank***	***0.762***
7	***ING Bank***	***0.482***	**7**	***Garanti Bank***	***0.748***
8	***Is Bank***	***0.481***	**8**	***Halk Bank***	***0.745***
9	***Anadolubank***	***0.471***	**9**	***Denizbank***	***0.742***
10	***Finans Bank***	***0.453***	**10**	***Finans Bank***	***0.731***
11	***Denizbank***	***0.444***	**11**	***Sekerbank***	***0.716***
12	***Garanti Bank***	***0.426***	**12**	***Turkish Bank***	***0.706***
13	***Turkish Bank***	***0.394***	**13**	***Anadolubank***	***0.705***
14	***Eurobank Tekfen***	***0.354***	**14**	***Turk Ekonomi Bank***	***0.685***
15	***Yapı Kredi Bank***	***0.338***	**15**	***Eurobank Tekfen***	***0.670***
16	***Turk Ekonomi Bank***	***0.318***	**16**	***Tekstil Bank***	***0.648***
17	***Tekstil Bank***	***0.268***	**17**	***Yapı Kredi Bank***	***0.196***

Table 14. Performance rankings for the years 2006 and 2007

Financial Performance of the banks for the year 2006			*Financial Performance of the banks for the year 2007*		
RANK	***BANK***	*RCi**	***RANK***	***BANK***	*RCi**
1	***Ziraat Bank***	***0.648***	**1**	***Ziraat Bank***	***0.691***
2	***Finans Bank***	***0.604***	**2**	***Akbank***	***0.654***
3	***Akbank***	***0.561***	**3**	***Garanti Bank***	***0.645***
4	***HSBC Bank***	***0.544***	**4**	***HSBC Bank***	***0.614***
5	***Halk Bank***	***0.487***	**5**	***Halk Bank***	***0.570***
6	***Denizbank***	***0.477***	**6**	***Is Bank***	***0.564***
7	***Vakıflar Bank***	***0.461***	**7**	***Vakıflar Bank***	***0.553***
8	***Turkish Bank***	***0.442***	**8**	***Finans Bank***	***0.533***
9	***Garanti Bank***	***0.433***	**9**	***Anadolubank***	***0.459***
10	***Is Bank***	***0.417***	**10**	***Sekerbank***	***0.442***
11	***Sekerbank***	***0.318***	**11**	***Denizbank***	***0.399***
12	***Yapı Kredi Bank***	***0.317***	**12**	***Yapı Kredi Bank***	***0.399***
13	***Anadolubank***	***0.315***	**13**	***Turkish Bank***	***0.396***
14	***ING Bank***	***0.311***	**14**	***ING Bank***	***0.381***
15	***Turk Ekonomi Bank***	***0.297***	**15**	***Tekstil Bank***	***0.351***
16	***Tekstil Bank***	***0.281***	**16**	***Turk Ekonomi Bank***	***0.321***
17	***Eurobank Tekfen***	***0.265***	**17**	***Eurobank Tekfen***	***0.300***

Table 15. Performance rankings for the years 2008 and 2009

Financial Performance of the banks for the year 2008			*Financial Performance of the banks for the year 2009*		
RANK	***BANK***	*RCi**	***RANK***	***BANK***	*RCi**
1	***HSBC Bank***	***0.566***	**1**	***Akbank***	***0.627***
2	***Anadolubank***	***0.565***	**2**	***Ziraat Bank***	***0.606***
3	***Ziraat Bank***	***0.562***	**3**	***Garanti Bank***	***0.600***
4	***Garanti Bank***	***0.544***	**4**	***Finans Bank***	***0.558***
5	***Akbank***	***0.541***	**5**	***HSBC Bank***	***0.539***
6	***Is Bank***	***0.503***	**6**	***Anadolubank***	***0.528***
7	***Turkish Bank***	***0.498***	**7**	***Is Bank***	***0.503***
8	***Halk Bank***	***0.466***	**8**	***Denizbank***	***0.499***
9	***Yapı Kredi Bank***	***0.461***	**9**	***Halk Bank***	***0.499***
10	***Vakıflar Bank***	***0.450***	**10**	***Yapı Kredi Bank***	***0.478***
11	***Finans Bank***	***0.428***	**11**	***Vakıflar Bank***	***0.477***
12	***Denizbank***	***0.416***	**12**	***Sekerbank***	***0.381***
13	***Sekerbank***	***0.402***	**13**	***ING Bank***	***0.380***
14	***Turk Ekonomi Bank***	***0.398***	**14**	***Turk Ekonomi Bank***	***0.368***
15	***ING Bank***	***0.343***	**15**	***Tekstil Bank***	***0.368***
16	***Tekstil Bank***	***0.334***	**16**	***Turkish Bank***	***0.357***
17	***Eurobank Tekfen***	***0.283***	**17**	***Eurobank Tekfen***	***0.277***

Table 16. Performance rankings for the years 2010 and 2011

Financial Performance of the banks for the year 2010			*Financial Performance of the banks for the year 2011*		
RANK	***BANK***	*RCi**	***RANK***	***BANK***	*RCi**
1	***Akbank***	***0.655***	**1**	***Garanti Bank***	***0.605***
2	***Finans Bank***	***0.630***	**2**	***Denizbank***	***0.599***
3	***Garanti Bank***	***0.630***	**3**	***Finans Bank***	***0.575***
4	***Ziraat Bank***	***0.626***	**4**	***Halk Bank***	***0.570***
5	***Halk Bank***	***0.568***	**5**	***Akbank***	***0.554***
6	***Is Bank***	***0.559***	**6**	***Ziraat Bank***	***0.499***
7	***Yapı Kredi Bank***	***0.544***	**7**	***Is Bank***	***0.497***

8	***Anadolubank***	***0.526***	**8**	***Yapı Kredi Bank***	***0.488***
9	***HSBC Bank***	***0.502***	**9**	***Vakıflar Bank***	***0.478***
10	***Vakıflar Bank***	***0.470***	**10**	***Anadolubank***	***0.428***
11	***Denizbank***	***0.441***	**11**	***HSBC Bank***	***0.427***
12	***Turk Ekonomi Bank***	***0.428***	**12**	***Turkish Bank***	***0.358***
13	***Sekerbank***	***0.373***	**13**	***Eurobank Tekfen***	***0.345***
14	***Tekstil Bank***	***0.368***	**14**	***Sekerbank***	***0.311***
15	***ING Bank***	***0.344***	**15**	***Turk Ekonomi Bank***	***0.305***
16	***Turkish Bank***	***0.317***	**16**	***Tekstil Bank***	***0.293***
17	***Eurobank Tekfen***	***0.263***	**17**	***ING Bank***	***0.288***

Table 17. Estimated financial performance rankings for the years 2012 and 2013

Estimated Performance of the banks for the year 2012			***Estimated Performance of the banks for the year 2013***		
RANK	***BANK***	*RCi**	***RANK***	***BANK***	*RCi**
1	***Garanti Bank***	***0.680***	**1**	***Garanti Bank***	***0.685***
2	***Ziraat Bank***	***0.637***	**2**	***Ziraat Bank***	***0.626***
3	***Akbank***	***0.574***	**3**	***Denizbank***	***0.580***
4	***Halk Bank***	***0.573***	**4**	***Is Bank***	***0.577***
5	***Is Bank***	***0.569***	**5**	***Halk Bank***	***0.574***
6	***Denizbank***	***0.568***	**6**	***Akbank***	***0.551***
7	***Finans Bank***	***0.558***	**7**	***Anadolubank***	***0.545***
8	***Anadolubank***	***0.538***	**8**	***Finans Bank***	***0.543***
9	***HSBC Bank***	***0.491***	**9**	***Yapı Kredi Bank***	***0.492***
10	***Yapı Kredi Bank***	***0.469***	**10**	***HSBC Bank***	***0.472***
11	***Vakıflar Bank***	***0.461***	**11**	***Vakıflar Bank***	***0.447***
12	***Sekerbank***	***0.428***	**12**	***Sekerbank***	***0.434***
13	***Turk Ekonomi Bank***	***0.385***	**13**	***Turk Ekonomi Bank***	***0.391***
14	***Turkish Bank***	***0.342***	**14**	***Turkish Bank***	***0.333***
15	***ING Bank***	***0.320***	**15**	***ING Bank***	***0.311***
16	***Tekstil Bank***	***0.309***	**16**	***Tekstil Bank***	***0.308***
17	***Eurobank Tekfen***	***0.278***	**17**	***Eurobank Tekfen***	***0.278***

Table 18. Estimated financial performance rankings for the years 2014 and 2015

Financial Performance of the banks for the year 2014			***Financial Performance of the banks for the year 2015***		
RANK	***BANK***	*RCi**	***RANK***	***BANK***	*RCi**
1	***Garanti Bank***	***0.685***	**1**	***Garanti Bank***	***0.684***
2	***Ziraat Bank***	***0.611***	**2**	***Denizbank***	***0.598***
3	***Denizbank***	***0.589***	**3**	***Ziraat Bank***	***0.598***
4	***Is Bank***	***0.583***	**4**	***Is Bank***	***0.593***
5	***Halk Bank***	***0.571***	**5**	***Halk Bank***	***0.570***
6	***Anadolubank***	***0.548***	**6**	***Anadolubank***	***0.551***
7	***Akbank***	***0.530***	**7**	***Yapı Kredi Bank***	***0.532***
8	***Finans Bank***	***0.528***	**8**	***Akbank***	***0.516***
9	***Yapı Kredi Bank***	***0.511***	**9**	***Finans Bank***	***0.515***
10	***HSBC Bank***	***0.456***	**10**	***Sekerbank***	***0.446***
11	***Sekerbank***	***0.439***	**11**	***HSBC Bank***	***0.445***
12	***Vakıflar Bank***	***0.436***	**12**	***Vakıflar Bank***	***0.432***
13	***Turk Ekonomi Bank***	***0.397***	**13**	***Turk Ekonomi Bank***	***0.405***
14	***Turkish Bank***	***0.326***	**14**	***Turkish Bank***	***0.322***
15	***Tekstil Bank***	***0.309***	**15**	***Tekstil Bank***	***0.313***
16	***ING Bank***	***0.304***	**16**	***ING Bank***	***0.302***
17	***Eurobank Tekfen***	***0.280***	**17**	***Eurobank Tekfen***	***0.288***

Table 19. Forecasting example for the "Shareholders' Equity / (Amount Subject to Credit Risk + Market Risk + Operational Risk)" parameter

Shareholders' Equity / (Amount Subject to Credit Risk + Market Risk + Operational Risk)	*Year*	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Forecasting Method
	Ziraat Bank	72.0	95.1	50.6	47.7	39.5	25.4	20.1	23.2	19.2	15.6	15.97	14.29	12.60	10.92	Linear Moving Averages
	Halk Bank	102.0	99.3	58.9	49.6	32.0	20.0	14.5	16.0	15.9	14.3	12.71	11.62	10.70	9.92	Power Trend Function
	Vakıflar Bank	14.9	14.9	17.3	25.4	19.7	15.4	14.3	15.4	14.4	13.4	14.37	13.98	13.60	13.21	Linear Trend Function
	Akbank	39.1	44.5	36.2	21.4	20.7	18.9	18.2	22.5	20.6	17.0	15.40	14.37	13.42	12.54	Logarithmic Trend Function
	Anadolubank	13.9	14.3	15.0	14.1	15.2	14.3	18.5	20.0	18.8	17.0	16.94	16.98	17.01	17.04	S Trend Function
	Şekerbank	10.4	16.5	15.8	20.2	16.7	16.8	14.7	16.3	14.0	13.2	15.35	15.37	15.39	15.41	Growth Trend Function
	Tekstil Bank	13.3	12.2	12.7	12.0	14.2	13.2	17.9	20.8	19.4	15.9	19.51	20.30	21.09	21.88	Linear Trend Function
	Turkish Bank	61.3	67.4	40.9	30.9	50.2	31.9	34.5	28.8	24.7	32.1	25.89	24.56	23.23	21.90	Linear Moving Averages
	Türk Ekonomi Bank	15.4	14.9	14.3	12.3	14.3	14.9	17.7	17.7	14.4	14.2	15.66	15.78	15.90	16.01	Linear Trend Function
	Garanti Bank	12.7	16.6	16.8	15.1	14.1	15.4	16.1	21.2	19.6	16.9	19.29	19.80	20.32	20.83	Linear Trend Function
	İş Bankası	25.3	28.4	29.0	25.0	23.9	20.5	15.2	18.3	17.5	14.1	13.87	12.85	11.90	11.03	Compound Trend Function
	Yapı ve Kredi Bank	15.1	18.6	18.3	7.2	12.3	13.7	15.7	17.8	16.1	14.7	15.12	14.86	14.12	14.05	Single Moving Averages
	Denizbank	19.0	18.2	18.9	14.1	15.5	13.2	17.2	19.0	16.4	15.6	15.50	15.31	15.12	14.93	Exponential Trend Function
	Eurobank Tekfen	30.5	26.7	26.6	22.6	16.9	21.8	17.9	26.0	20.3	16.9	17.11	16.32	15.56	14.85	Compound Trend Function
	Finans Bank	8.6	12.7	14.1	13.5	16.8	13.0	16.0	18.0	16.7	17.2	16.76	16.35	15.74	14.93	Quadratic Trend Function
	HSBC Bank	31.7	32.6	19.9	13.2	11.8	13.7	15.4	17.3	16.5	16.1	14.55	14.44	14.35	14.27	S Trend Function
	ING Bank	22.6	16.3	16.7	17.2	12.7	12.8	13.8	15.6	14.6	14.2	13.12	12.91	12.73	12.55	Power Trend Function

Globalization, Regime-Switching, and EU Stock Markets: the Impact of the Sovereign Debt Crises

Nuno Ferreira[#1], Rui Menezes[#2], Sónia Bentes[*3]

[#]*Department of Quantitative Methods, IBS-ISCTE Business School, ISCTE*
Avenida das Forças Armadas, Lisboa, Portugal
[1]nuno.ferreira@iscte.pt
[2]rui.menezes@iscte.pt
[*]*ISCAL*
Avenida Miguel Bombarda, 20, Lisboa, Portugal
[3]smbentes@iscal.ipl.pt

Abstract **- The most recent models learn over time, making the necessary adjustments to a new level of peaks or troughs, which enables the more accurate prediction of turning points. The Smooth Regression Model may be regarded as having a linear and a nonlinear component and may over time determine whether there is only a linear or nonlinear component or, in some cases, both.**

The present study focuses on the impact effect analysis of the European markets contamination by sovereign debt (particularly in Portugal, Spain, France and Ireland). The smooth transition regression approach applied in this study has proved to be a viable alternative for the analysis of the historical behavioural adjustment between interest rates and stock market indices. We found evidence in the crisis regime, i.e., large negative returns, especially in the case of Portugal, where we obtained the greatest nonlinear threshold adjustment between interest rates and stock market returns.

Keywords **-** *Stock markets, Interest rates, Smooth transition regression models, Nonlinearity, Debt sovereign crisis*

1. Introduction

There is no doubt that globalisation and its effects are among the most serious and disputed problems of our day. Fluctuations in financial markets are usually characterised by sudden switching, which causes increasing and decreasing trends over time (known as "bubble formation" and "bubble collapse"). It is also possible to observe hundreds of days where bubbles appear and tend to persist for only a very short time.

Previous work has centered analysis on the challenge of quantifying the behaviour of the probability distributions of large fluctuations of relevant variables, such as returns, volumes, and the number of transactions. More recently, several studies have focused their analyses on measuring and testing the robustness of power law distributions (characterising those large fluctuations in stock market activity). In contrast to these studies, we focus on the temporal trend switching of movement interactions between stock market returns and interest rates.

The financial crises in emerging markets during the 90s revealed some empirical regularities in business cycles. In the case of emerging economies, periods of financial distress are characterised by large current account reversals and sudden stops in capital inflows [Calvo et al. (2004)].

According to Neumeyer and Perri (2005), the soaring sovereign country risk, reflected in hikes in international interest rates, is induced by the economy and deep contractions in output, leading to collapses in equity prices. In several cases, the magnitude of the crises led countries to default on their outstanding debt (Argentina 2001, Russia 1998, Ecuador 1999 and Indonesia 1998).

The European sovereign debt crisis brought the focus of several economic analyses in recent months to the interdependence between financial markets during crises. For international economic organisms, such as the IMF, sovereign default was the most serious risk facing the global economy. The latest examples of economies under pressure are Greece, Ireland and Portugal. Further studies report that the financial systems of Spain and France have been infected by the Greek sovereign debt crisis.

The statistical significance of the interaction between the default and emerging markets crises has been highlighted by Reinhart (2002). In addition to the occurrence of default, sovereign country risk,

which is reflected in the interest rate imposed by international credit markets, is closely related to the sharp movements in current accounts, the collapse in private consumption and the currency crisis. This phenomenon has been labelled by Calvo as a "sudden stop". Sovereign debt ratings not only have a significant impact on sovereign bond yield spreads but also serve as good predictors of default. Consequently, it is not surprising that during periods of financial distress, lower ratings are observed, and countries face greater difficulty borrowing from international credit markets, as they must pay higher interest rates for limited funds.

The dynamics of the emerging markets crises with the characteristic sudden stops of capital inflows are inconsistent with smooth movements in current accounts and the level of foreign debt. This inconsistency remains with the neutrality of the business cycle against the external interest rate shocks predicted by conventional models of business cycles when analysed in a small open economy. One important reason for this inconsistency is the role assigned to international creditors. An assumption of conventional business cycle models is the perfection of the international credit markets. In other words, a small open economy is able to borrow funds at a fixed risk-free rate up to a point limited only through the extent of its wealth.

Therefore, the true novelty is presented in a model considering the typical macroeconomic fluctuations with the unpredicted and sudden movements of current accounts, trade flows and interest rates. A usual starting point of much of the literature on emerging markets crises has been the introduction of a type of financial market imperfection that distinguishes emerging economies from industrial countries.

Several experimental studies have shown that stock markets exhibit periods of clear turbulence and display extreme values more often than one would expect if the series were distributed normally (fat tail property). In the financial case, we observe the association between the state transition processes in the bull-bear market alternations. We focus our analysis mainly on studying the effect of interest rates on stock markets to consider the impact on sovereign debt that this tendency has recently transmitted to the European markets (Portugal, Spain, France and Ireland). For this purpose was used a smooth transition regression (STR) model applied to several macroeconomic variables, in order to identify a specific pattern that linked nominal interest rates and stock market returns between 1993 and mid-2012.

2. Methodology

2.2 STR Model

The smooth transition regression model was first developed by Chan and Tong (1986) and later improved in the works of Granger and Teräsvirta (1993); Teräsvirta (1994) and Teräsvirta (1998). The most popular approach taken in the majority of subsequent empirical studies has been summarised in Teräsvirta (1994) and constitutes the main line of the methodology applied in this paper. The standard STR model with a logistic transition function for a univariate time series y_t is given by

$$y_t = \phi' z_t + \theta' z_t G(\gamma, c, s_t) + u_t \quad (1)$$

where z_t is the vector of independent (explanatory) variables including lags of y_t. In our case, z_t is the vector of the interest rate variables, their lagged values, and the lagged values of the stock returns. The slope parameter is γ, and c is a vector of location parameters. The transition function $G(\gamma, c, s_t)$ constitutes a continuous function that is bounded between 0 and 1.

The transition variable s_t may be a lagged endogenous variable, such as $s_t = y_{t-d}$, for a certain integer d > 0. It may also be an exogenous variable or a function of both lagged exogenous and endogenous variables ($z_t = z(\bar{x})$). Most of the applications consider $z_t = t$ as a linear time trend. The transition variable is crucial for the model because it assumes a reference point for the behavioural changes. This variable may come from the theory, or it may be chosen from the set of dependent variables ($\bar{z_t}$). If the theory does not suggest any relevant variable, we should take every variable from $\bar{z_t}$ and repeat the modelling process for each one. In this way, choosing the right s_t is determined by a linearity test. The variable chosen should be the one that rejects linearity and yields the minimum p-value in this test compared to the other transition variables that also reject linearity. In this paper, we investigate both logistic models ((k=1) or LSTR1 and (k=2) or LSTR2).

The null hypothesis of linearity is H_0: $\beta_1 = \beta_2 = \beta_3 = 0$. In this step, we should test the null hypothesis of linearity against the alternative of STR-type nonlinearity. After rejecting the linearity, we select the appropriate transition variable s_t and the

form of the transition function $G(\gamma, c, s_t)$. To assess linearity, *F*-statistics are used with 3m and T-4m-1 degrees of freedom, where *m* is the number of variables in s_t. If the null hypothesis of linearity is rejected, the model may be usefully specified as a nonlinear alternative, for instance LSTR.

This modelling sequence of a nonlinear time series is described in depth by Teräsvirta (1994) and is known as the "Teräsvirta procedure". For the most recent survey on the modelling procedure and cycle, see van Dijk *et al.* (2002). All estimation procedures were run in JMulti freeware.

2.3 Dataset

In this paper, all variables have been collected and expressed in terms of market returns after a logarithmisation procedure. For instance, the stock market return (R_i) is defined as $R_i = \log(P_t / P_{t-1})$, where P_t denotes price on day *t*. To obtain a robust Smooth Transition Autoregression (LSTR) model, a large time series of data is required. Therefore, for each selected market (Portugal, Spain, France and Ireland), we considered the weekly returns on the corresponding stock price indices between January 1993 and August 2011.

To capture the interest rate behaviour, two different variables were selected: a short-term with risk (interbank 3-month interest rate) and a long-term without risk (10-year bond yield government interest rate). To test the linearity assumption to validate the nonlinear approach, we began to formulate an Autoregressive Model that included R_i as an exogenous variable. For explanatory variables, the Industrial Production Index (IPI_t), Consumer Price Index (CPI_t), Dividend Yield (DY_t) and Price Earnings Ratio (PER_t) of each stock market were collected.

Because nonlinear behaviour was confirmed, especially with regard to the interest rate variables and the lagged stock market returns series, we chose to focus our analysis on exploring the nonlinear adjustment threshold between stock market returns and interest rate variables. In the estimated results, we will present values only for these variables.

All data have been collected and are available from the Datastream database.

3. Empirical results

The empirical portion begins with the best linear model for the data (autoregressive model). The lag structure was determined using AIC information criterion. Once the appropriate linear model was defined, we conducted linearity tests against the alternative hypotheses of nonlinearity (STR-type). Table 1 presents these results, which clearly indicate the nonlinearity of the variables ($3M_t$ and $Y10_t$) in Ireland. Only the $Y10_t$ variable also maintains nonlinearity in Portugal. The variable $3M_t$ follows a linear trend in three of the four analysed countries. The variable "trend" is also linear in France and Ireland. For Portugal and Spain, we reject the linearity hypothesis. This finding may indicate the model misspecification of the linear model in that there are parameter changes present that may be captured by LSTR models [see Brüggemann and Riedel (2011), for further details].

Because the main goal of the paper centres on the analysis between adjustments of the available variables, we chose to report the interest rate and stock market returns while considering these variables. The remaining economic variables were not reported. We included one-lagged values of all independent variables and dependent variables in the model.

Table 1. Results of the linearity tests

P-value of linearity test

S_t	Market	F-statistic	H_{04}	H_{03}	H_{02}	Model
Ri_{t-1}	PT	2,77E-07	5,91E-02	4,51E-03	5,18E-06	LSTR1
Ri_{t-2}	PT	1,83E-01	5,67E-04	7,66E-01	4,76E-02	LSTR1
$3M_t$	PT	6,62E-01	8,72E-01	6,15E-01	2,32E-01	LINEAR
$Y10_t$	PT	6,54E-09	1,01E-02	2,98E-07	1,02E-03	LSTR2
trend	PT	6,43E-03	1,01E-01	1,02E-01	1,81E-02	LSTR1
Ri_{t-1}	SP	1,90E-06	6,51E-02	1,70E-03	1,17E-04	LSTR1
Ri_{t-2}	SP	3,81E-02	1,15E-02	5,99E-01	1,85E-02	LSTR1
$3M_t$	SP	1,59E-01	7,69E-01	2,11E-01	5,81E-02	LINEAR
$Y10_t$	SP	9,99E-01	9,87E-01	8,49E-01	9,72E-02	LINEAR
trend	SP	1,80E-02	1,32E-02	6,54E-01	5,39E-02	LSTR1
Ri_{t-1}	FR	2,46E-07	3,14E-04	5,29E-03	9,88E-04	LSTR1
Ri_{t-2}	FR	1,44E-03	6,09E-01	8,77E-02	2,94E-02	LINEAR
$3M_t$	FR	1,18E-01	5,24E-01	1,66E-01	2,71E-02	LINEAR
$Y10_t$	FR	5,65E-02	5,24E-01	1,66E-01	2,71E-02	LINEAR
trend	FR	4,83E-01	3,56E-01	7,75E-01	2,56E-01	LINEAR
Ri_{t-1}	IR	2,20E-08	6,35E-02	1,56E-07	7,71E-03	LSTR2
Ri_{t-2}	IR	-	5,35E-05	7,71E-02	2,57E-03	LINEAR
$3M_t$	IR	2,30E-03	4,34E-02	5,59E-01	1,37E-03	LSTR1
$Y10_t$	IR	8,06E-05	1,09E-05	1,63E-01	3,10E-01	LSTR1
trend	IR	3,02E-01	7,64E-01	3,39E-01	1,06E-01	LINEAR

Notes: PT - Portugal; SP - Spain; FR - France; IR - Ireland
$H_{04}: \beta_3 = 0$
$H_{03}: \beta_2 = 0 \mid \beta_3 = 0$
$H_{02}: \beta_1 = 0 \mid \beta_2 = \beta_3 = 0$

Therefore, only the Pi_{t-1} was compared in the four countries using a LSTR1 and LSTR2 model. The choice of model was also confirmed, with the highest

p-values in the different countries under study found for the next step in the specification of the STR model, the distinction between logistic and exponential functions. Teräsvirta (1994) suggests testing the following null hypothesis, defined in the note of Table 1.

From the results above, we concluded that in several cases, the linear model fails to model stock returns adequately from macroeconomic variables. This finding led to the next step, which consisted of choosing the appropriate STR model type (k=1 or k=2). For example, a LSTR1 model (k=1) describes processes whose dynamic properties differ between periods of expansion and periods of recession, with a smooth transition occurring between the two periods. The LSTR2 model (k=2) is similar at both large and small values of s_t and different at moderate values [see Teräsvirta (1994) for further references in the STR modelling procedure and application studies].

Table 2. Estimates for STR model

Variable	S_t	Estimate											
		PT			SP			FR			IR		
		estimate	SD	p-value	estimate	SD	p-value	estimate	SD	p-value	estimate	SD	p-value
Linear Part													
CONST	Ri_{t-1}	-0,042	0,008	0,000	-0,046	0,015	0,002	-2,258	2,698	0,403	0,001	0,001	0,443
CONST	$Y10_t$	0,001	0,000	0,016							-0,011	0,007	0,107
Ri_{t-1}	Ri_{t-1}	-0,623	0,118	0,000	-0,687	0,163	0,000	-16,254	18,441	0,378	0,004	0,040	0,919
Ri_{t-1}	$Y10_t$	0,091	0,000	0,243							0,124	0,109	0,258
Ri_{t-2}	Ri_{t-1}	-0,149	0,098	0,131	0,058	0,115	0,613	1,695	4,767	0,722	0,026	0,034	0,443
Ri_{t-2}	$Y10_t$	0,022	0,000	0,706							0,129	0,109	0,237
$Y10_t$	Ri_{t-1}	-0,002	0,001	0,274	0,001	0,004	0,805	-0,283	0,320	0,376	0,000	0,000	0,601
$Y10_t$	$Y10_t$	0,000	0,001	0,992							-0,002	0,001	0,170
$3M_t$	Ri_{t-1}	0,137	0,051	0,007	0,291	0,074	0,000	5,397	6,349	0,396	-0,023	0,022	0,296
$3M_t$	$Y10_t$	-0,003	0,009	0,788							0,286	0,144	0,048
Nonlinear Part													
CONST	Ri_{t-1}	0,043	0,008	0,000	0,046	0,015	0,002	2,269	2,705	0,402	-0,095	0,035	0,008
CONST	$Y10_t$	-0,008	0,005	0,121							0,020	0,011	0,068
Ri_{t-1}	Ri_{t-1}	-0,719	0,126	0,000	0,708	0,167	0,000	16,061	18,382	0,383	-0,224	0,180	0,003
Ri_{t-1}	$Y10_t$	0,674	0,000	0,031							-0,547	0,169	0,184
Ri_{t-2}	Ri_{t-1}	-0,582	0,108	0,164	-0,088	0,121	0,466	-1,785	4,796	0,710	-0,261	0,343	0,000
Ri_{t-2}	$Y10_t$	0,151	0,000	0,016							-1,235	0,187	0,164
$Y10_t$	Ri_{t-1}	0,000	0,002	0,234	-0,002	0,004	0,679	0.28440	0,320	0,374	0,000	0,012	0,000
$Y10_t$	$Y10_t$	0,002	0,002	0,783							0,045	0,001	0,956
$3M_t$	Ri_{t-1}	0,094	0,054	0,005	-0,311	0,076	0,000	-5,433	6,353	0,393	-0,548	0,348	0,002
$3M_t$	$Y10_t$	-0,153	0,105	0,373							1,088	0,227	0,016
Gamma	Ri_{t-1}	10,129	6,693	0,131	16,273	18,136	0,370	0,798	0,288	0,006	0,437	0,196	0,026
Gamma	$Y10_t$	0,561	0,000	0,704							4,567	3,536	0,197
C1	Ri_{t-1}	-0,033	0,003	0,000	-0,057	0,005	0,000	-0,218	0,068	0,001	-0,106	0,007	0,000
C1	$Y10_t$	-7,289	0,000	0,000							-0,151	0,257	0,556
C2	Ri_{t-1}										0,163	0,050	0,001
C2	$Y10_t$	4,604	0,000	0,171									

The model specification procedure (Table 1) suggests a single-logistic transition function model when Pi_{t-1} is the transition variable for Portugal, Spain and Ireland. This single transition function infers the existence of two different regimes in these stock markets. Only two cases generate a double transition function: Y10 (Portugal) and Pi_{t-1} (Ireland). The combination of the 3M with Pi_{t-1} in the linear part reveals the significance of the coefficients (Table 2) for Portugal and Spain, whereas the same combination in the nonlinear part was significant for all markets.

An interesting result in Table 2 is the opposite effect that the interest rate variables have in the linear model versus the effects of the same variables during depreciation regimes (registered in Portugal, Spain and Ireland). Therefore, in the crisis regime, i.e., when there are large negative returns, variable interest rates typically have a large negative impact, which exacerbates the bear market. This situation may partially explain why these three countries were forced to ask for financial assistance from the IMF and the EU.

The estimates of the threshold parameters are important in that they provide information about interest rate levels (in terms of returns, as the data were expressed with reference to returns); in this regard, the nonlinear part of the model becomes relevant. A point of interest is related to the precision of the threshold estimates, which, to judge from the standard errors, are low. In the Portuguese case, where these parameters were higher, this finding may

indicate a more substantial nonlinear behavioural adjustment between interest rate and stock market returns. Nonlinearities are associated with the asymmetric effects of threshold adjustment between interest rates and stock market indices.

For Spain, we observed a high standard error for the γ However, this evidence is not always a signal of weak nonlinearity: the accurate estimation of the γ parameter is not always feasible, as it requires many observations in the immediate neighbourhood of the threshold parameter *c* [Teräsvirta, 1998].

From the estimated results for Portugal, two facts may be highlighted. The two regimes correspond roughly to positive and negative values of interest rate growth. The linear and nonlinear components are distinct in terms of the explanatory variables included. All of the variables are presented in both models; however, the signal inverts between them. The standard deviation is higher for the nonlinear component, indicating that the confidence intervals are larger.

The same conclusions may be derived from the Spanish and French markets with the note that the standard error in the Pi_{t-1} variable does not increase in the nonlinear component. The results for the Irish model present the same inversion of signals. However, the $Y10_t$ variable is not significant in the nonlinear component.

The LSTR2 models for Portugal and Ireland (with Pi_{t-1} and $Y10_t$ as transition variables respectively) both show the signal inversions mentioned before. Furthermore, the $Y10_t$ does not appear in the linear component of the Ireland model. The same transition variable is not included in the Portuguese equation, indicating that it has no influence on the model. The estimated coefficients of Portugal tend to be more statistically significant than the other markets in both models (linear and nonlinear).

For all markets, the γ value is slow but always positive, suggesting that the speed of transition between regimes is moderate. The direction of transition is positive for all markets. However for Portugal, Spain and France, the parameter values of β_1 are negative. None of the transitions appears to occur abruptly, as the values for estimated γ parameter for all markets are small. This finding is the same as that obtained by Leybourne *et al.* (1997). However, it contradicts the results of Patel and Sarkar (1998), stating that prices tend to fall more rapidly and steeply in emerging markets. The threshold parameter c_1 for all cases is significant (mostly with a negative value). This finding suggests distinct market behaviour between large negative returns and smaller falls, and positive returns.

After the nonlinear model estimation, diagnostic tests were performed to evaluate the STR models (Tables 3-6). In particular, we performed misspecification tests for skewness and kurtosis as well as for the ARCH effect of Engle. We also conducted LM tests for autocorrelation, parameter constancy and additive nonlinearity [as suggested by Eitrheim and Teräsvirta (1996)]. The test results indicated no signs of either ARCH or cyclical heteroskedasticity at a significance level of 0.05, nor did they reveal any signs of serial dependence in the estimated residuals.

No Error Autocorrelation: H_0: no

Market:	PT		SP	FR	IR	
Model:	LSTR1	LSTR2	LSTR1	LSTR1	LSTR2	LSTR1
S_t:	Ri_{t-1}	$Y10_t$	Ri_{t-1}	Ri_{t-1}	Ri_{t-1}	$Y10_t$
Lag	**F-value**	**F-value**	**F-value**	**F-value**	**F-value**	**F-value**
1	5,130 [a]	6,894	12,385	0,768	3,445	12,941
2	6,646	3,832 [a]	12,256	0,855	3,348 [a]	18,061
4	12,632	11,621	12,925	7,058	3,481	9,822
6	8,672	7,999	8,623	4,680	2,817 [a]	6,714
8	6,751	6,225	6,546	3,595	2,280 [a]	6,224

[a] Significant at the 5% level.

Table 3. Autocorrelation error

Table 4. Remaining nonlinearity

Parameter Constancy: H_0: yes

T.F.	H:	F-Value			
		PT	SP	FR	IR
Ri_{t-1}	H_1	5,879	3,763	2,532 [a]	1,681
Ri_{t-1}	H_2	4,016	2,342	1,422	2,567
Ri_{t-1}	H_3	1,197	1,883 [a]	1,252	2,068
$Y10_t$	H_1	1,865			2,961 [a]
$Y10_t$	H_2	1,429			1,665
$Y10_t$	H_3	1,039			1,736 [a]

[a] Significant at the 5% level.

No Remaining Nonlinearity: H_0: no

Market:	S_t:	F-Values			
		F	F2	F3	F4
PT	Ri_{t-1}	1,58E-04	2,77E-03	3,00E-02	2,61E-02
PT	$Y10_t$	5,95E+03	1,90E-01	4,34E-02	1,88E-03
SP	Ri_{t-1}	5,81E-03	7,54E-01	2,27E-04	3,78E-01
FR	Ri_{t-1}	6,78E-02	1,80E-01	5,68E-02	3,39E-01
IR	Ri_{t-1}	3,48E-05	5,37E-03	1,53E-02	4,93E-03
IR	$Y10_t$	2,05E-05	3,44E-06	9,08E-02	3,33E-01

Table 5. ARCH-LM test

S_t:	Statistics:	PT	SP	FR	IR
Ri_{t-1}	Test :	155,293	67,995	127,849	164,610
$Y10_t$	Test:	153,053			211,286
Ri_{t-1}	F:	23,278	9,166	18,512	24,973
$Y10_t$	F:	22,876			34,121

Table 6. Parameter constancy

We failed to find evidence for parameter nonconstancy (Table 6) or evidence for remaining nonlinearity for the full sample. Diagnostic check findings are altered when the transition variable used is the evidence of remaining nonlinearity in several countries. The exception for this case is France, where the Pi_{t-1} does not reflect any evidence of remaining nonlinearity.

For a better understanding of the nonlinear behavioural adjustment, in Figure 1 we present graphs of the transition function in terms of observed values of Δu_t. Although there is little similarity in the estimated transitions function, there is greater focus when the lagged *Pi* variable is employed as the transition function (see the cases of Portugal, Spain and France). The logistic function for these markets is centred very close to zero with a steep slope, indicating that the regimes detected by the nonlinear model are related to depreciations, with $G(s_t) = 1$, versus appreciations, $G(s_t) = 0$. Our findings revealed asymmetric responses of growth to positive and negative Δu_t, with one linear model applied in periods of depreciation and a different one applied in periods of appreciation. Ehrmann and Fratzscher (2004) also present evidence that the stock market response to monetary policy is highly asymmetric.

From the results we may observe that in cases of asymmetric behaviour, this asymmetry is not around zero returns, as is widely advocated in much of the literature. In line with the results of Reyes *et al.* (2010), the regime switches are associated with very negative past returns.

It is well known that equity markets react differently to the same news depending on the state of the economy. Bad news always have a positive impact during expansions, and the opposite have a negative impact during recessions. Several studies have found that the financial and banking crises are often related and share common trends. However, in many contexts, especially in recent history, the banking crisis precedes the financial crisis. Furthermore, the most obvious marker of a potential financial crisis to come in developed countries is a downturn in the equity markets. Stock price movements are more volatile and susceptible than other indicators to several factors.

4. Conclusion

From our empirical analysis, it is possible to conclude that STR nonlinearities are present in the data, as the linear model fails to model stock market returns. Other highlighted evidence is related to the very strong connections between interest rates and stock markets.

The smooth transition regression approach applied in this study proved to be a viable alternative to the analysis of historical behavioural adjustment between interest rates and stock market indices. This remark is in line with Brüggemann and Riedel (2011), as countries and financial markets react differently to external crises. Combining bonds and stocks from different emerging economies may provide benefits for investment portfolios. [see Kenourgios and Padhi (2012)].

We found evidence in the crisis regime, i.e., large negative returns – interest rate variables typically have a large negative impact, exacerbating the bear market. In the case of Portugal in particular, we obtained the biggest nonlinear threshold adjustment between interest rates and stock market returns. Nonlinearities were associated with the asymmetric effects of threshold adjustment between these two variables. For this market, the linear and nonlinear components were shown to be distinct in terms of the explanatory variables included. Nevertheless, the signal is inverted between the two components.

Finally, the estimated models highlight the importance of modelling the cyclical behaviour of stock market returns to identify the real significance of the influence of interest rates on returns. Nonlinear threshold adjustment between bond markets and stock markets has implications for an investment strategy based on only one of these markets. It appears that any potential benefits from international diversification are greater for bond investors than for stock investors. Aslanidis and Christiansen (2012) have explored the similar effects of large short rates on the present value of future stock and bond returns, thereby implying a positive stock-bond correlation. In this context, investors flee stocks and rush into bonds [flight to safety]. This movement implies negative

stock-bond correlations. The authors conclude that this flight in times of high levels of uncertainty explains why the stock-bond correlations become negative.

Further detailed analysis should be made to clearly identify the alarm signals to prevent an imminent market crisis.

References

[1] Aslanidis, N., Christiansen, C., 2012. Smooth transition patterns in the realized stock-bond correlation. *J. Empirical Finance*, 19, 454-464.

[2] Brüggemann, R. Riedel, J., 2011. Nonlinear interest rate reaction fuctions for the UK. *Econ. Model.*, 28, 1174-1185.

[3] Calvo, G.A., Izquierdo, A., Mejía, L.-F., 2004. *On the empirics of sudden stops: the relevance of balance-sheet effects*. NBER Working Paper 10520.

[4] van Dijk, D., Terasvirta, T., Franses, P.H., 2002. Smooth Transition Autoregressive Models – A Survey of Recent Developments. *Econometrics Rev*., 21, 1-47.

[5] Chan, K.S. Tong, H., 1986. On estimating thresholds in autoregressive models. *J. Time Ser. Anal.*, 7, 179-90.

[6] Ehrmann, M., Fratzscher, M., 2004. *Equal size, equal role? Interest rate interdependence between the Euro area and the United States*. ECB Working Paper 342.

[7] Eitrheim, Ø, Teräsvirta, T., 1996. Testing the adequacy of smooth transition autoregressive models. *J. Econometrics*, 74, 59-75.

[8] Granger, C., Teräsvirta, T., 1993. *Modelling Nonlinear Economic Relationships*. Oxford University Press.

[9] Kenourgios, D., Padhi, S., 2012. Emerging markets and financial crises: Regional, global or isolated shocks? *J. Multinatl. Financ*., 22, 24-38.

[10] Leybourne, S.J., Sapsford, D.R., Greenway, D., 1997. Modelling Growth (and liberalisation) using Smooth Transitions. *Anal. Eco. Inquiry*, 35, 798-814.

[11] Neumeyer P.A., Perri, F., 2005. Business cycles in emerging economies: the role of interest rates. *J. Monetary Econ*., 52, 345-380.

[12] Patel, S. Sarkar, A., 1998. *Stock market crises in developed and emerging markets*. Research Paper 8909, Federal Reserve Bank of New York.

[13] Reinhart, C., 2002. *Sovereign debt ratings before and after financial crises*. MPRA Paper 7410. University Library of Munich.

[14] Reyes, C., Alellie, S. Jeremy, J., 2010. *The Impact of the global financial crisis on poverty in the Philippines*. PIDS Discussion Paper 04. Philippine Institute for Development Studies.

[15] Teräsvirta, T., 1998. *Modeling economic relationships with smooth transition regressions*, in: Ullah, A. and Giles, D. (Eds.), Handbook of Applied Economic Statistics, Dekker, New York, pp. 507-552.

[16] Teräsvirta, T., 1994. Specification, estimation, and evalution of smooth transition autoregressive models, *J. Am. Stat. Assoc*., 89, 208-218.

The Seveso Directives and Their Application to Enterprise Risk Management

Manuel da Cruz [#], Sonia R. Bentes [*]

[#] *ISCAD – Instituto Superior de Ciências da Administração – Universidade Lusófona, Lisbon, Portugal*

mmcruz@iscal.ipl.pt

[*] *ISCAL – Instituto Superior de Contabilidade e Administação de Lisboa and BRU/UNIDE – Instituto Universitário de Lisboa (ISCTE-IUL), Lisbon, Portugal*

smbentes@iscal.ipl.pt

***Abstract* – Enterprise Risk Management is a relatively new concept which has emerged as a new paradigm for managing the portfolio of risks that face organizations. In this paper we explain what enterprise risk management is, how it differs from traditional risk management, what new skills are involved in this process and what advantages and opportunities this approach offers compared to prior techniques. Additionally, a relation with the Seveso Directives as a tool to manage risk is also provided. We conclude that Seveso Directives are an effective mechanism to achieve ERM objectives. Yet, this will only be accomplished by using Seveso activity as an improvement process rather than a compliance focused activity. Indeed, if applied with an eye beyond pure compliance, Seveso reports can deliver significant business opportunity.**

Keywords *– Enterprise Risk Management, Management Control Systems, Seveso Directives, uncertainty, COSO*

1. Introduction

The ultimate goal of a company is to create value, utility and wealth, through the rational and effective use "of various inputs (such as, people, goods and capital) that combined together, allow the production of goods and services" (García, 1998). Thus, one should expect that the value generated by a company should be greater than the sum of the partial values induced by each production factor.

However, the economic and technological evolution has brought new dimensions to business risk, many of them not yet fully recognized in organizations. Indeed, several different types of risks can be considered when analyzing business activity, such as, for example, credit risk, production risk, financial risk, environmental risk, *inter alia*.

Since risk and uncertainty are closely related but slightly different concepts a clarification about its meaning is necessary. According to Knight (1921) whereas risk is randomness in which events have measurable probabilities, such is not the case of uncertainty where the probability of occurrence of each possible event is completely unknown.

The occurrence of a number of natural disasters, especially over the last few decades, with adverse consequences for human beings, uncovered the need for an effective Enterprise Risk Management (ERM). In this context a disaster is understood as a serious disruption of the regular activity of a community and/or company that results in losses of human lives, injuries, illnesses, *inter alia*.

For a long time, companies have used insurances to hedge against disasters that could appear. Even if insurance continues to be a popular way to transfer risks, such as, the occurrence of fire, natural disasters, etc, management recognize nowadays that this is only a part of the risk a company needs to hedge against.

In fact, management is usually committed to identify, assess and prevent risks and, above all, to reduce (or even eliminate) potential losses, since:

- Risks that may affect a company's activity are diffuse, disseminate and heterogeneous, often affecting different areas at the level of departments and functions. Monitoring them requires technical skills in various disciplines as well as their inclusion in the strategic planning of a company;
- Risk assessment techniques are imperfect;
- Stakeholders tend to be naturally optimistic about the company's ability to perceive and control risks.

In this context, risk management can be broadly defined as the identification, assessment, and prioritization of risks followed by coordinated and economical application of resources to minimize, monitor, and control the probability and/or impact of unfortunate events or to maximize the realization of opportunities. According to Arruda (2004) it is a set of techniques and tools that are used in order to avoid potential losses.

Traditionally, managing risks used to include analyzing, monitoring and transferring risks to another part. The reasons for this are two-fold: (i) first, it is important to anticipate and minimize risks; (ii) it is necessary to maximize the cost/benefit associated to a given investment.

As a result of the increasing number of competitors in the market and the action of Governments and Non-Governmental Organizations (NGO's), entrepreneurs begin to implement more prudent risk control policies. Hence, risk management is nowadays understood as an active part of the decision-making and strategic planning process since it helps reducing potential losses, therefore.

Given (i) the importance ERM has assumed today and (ii) the adoption in EU of regulatory legislation aimed at preventing and mitigating accidents in which risk assessment plays a crucial role we analyze in this paper how the Seveso Directives have contributed to implement an effective ERM system.

The remainder of this paper will proceed as follows. In Section 2 we discuss the Seveso Directives. Section 3 focuses on ERM. Section 4 debates the relation between the Seveso Directives and ERM and finally, Section 5 concludes.

2. The Seveso Directives

2.1 Seveso I Directive

A series of major accidents on refinery and chemical plants across Europe from 1960 to 1970 led to growing concern over the safe operation in industrial sites, especially those which could represent major hazard potential to local populations.

In July 1976, an explosion in a chemical plant manufacturing pesticides and herbicides at Seveso, Italy, contaminated more than 10 square miles of land and vegetation and demanded the immediate evacuation of more than 600 people from their homes. In the overall, about 2.000 people had to receive medical assistance. This was caused by a dense vapour cloud containing tetrachlorodibenzoparadioxin (TCDD), which was released from a reactor used for the production of trichlorophenol. Commonly known as dioxin, this was a poisonous and carcinogenic by-product of an uncontrolled exothermic reaction.

As a consequence of this severe accident the Council Directive 82/501/EEC (known as the Seveso I Directive) on major-accident hazards of certain activities was adopted in 1982 in order to prevent and control such accidents. This legislation required, amongst other things:

- The production of a safety report detailing how major accidents are prevented and controlled.
- An assessment of the possible major accidents, their likely consequences and approximate frequencies.
- The development of on-site emergency plans.
- The production of an off-site emergency plan by the local authorities responsible for such matters.

In 3 December 1984, an explosion in Union Carbide a pesticide factory at Bhopal, India, followed by fire caused the leakage of methyl isocyanate gas (MIC), forming a toxic cloud that caused the death of more than 2.500 people, having been affected a total of 100.000 people. Although located outside Europe this accident – whose environmental consequences are still yet to be fully determined – assumed such proportions that prompted the amendment of Seveso I Directive.

Meanwhile an explosion in a chemical plant in Basel, Switzerland, in 1986, where fire-fighting water was contaminated with mercury organophospate pesticides and other chemicals, caused massive pollution of the Rhine and the death of half a million fish.

Motivated by these events two amendments to the Seveso I Directive were produced, namely: Directive 87/216/EEC and Directive 88/610/EEC. Both amendments aimed at broadening the scope of the Directive, in particular to include the storage of dangerous substances.

2.2 Seveso II Directive

On 9 December 1996 Seveso I Directive was finally subjected to a fundamental review by the European Commission. A number of problem areas were identified giving rise to the production of a new Directive (96/82/EC) replacing the earlier Seveso I Directive. Known as Seveso II Directive, the legislation came into force across Member States in 1999. The Directive in addition to the European Union is also adopted by Norway, Iceland and Switzerland and countries intending to join the EU. Seveso II Directive is based on the experiences accumulated during the implementation of Seveso I, in particular lessons learnt from accidents. It includes

a revision and extension of the scope; the introduction of new requirements relating to safety management systems; emergency planning and land-use planning and a reinforcement of the provisions on inspections to be carried out by Member States. The aim of this Directive is two-fold. First, it aims at the prevention of major hazards involving dangerous substances. Secondly, the Directive aims at the limitation of consequences of accidents that still may occur, for man and environment.

According to Kozine and Hagen (2008) there are a number of ways the new Directive differs from the old:

- The scope of Seveso II has been broadened and simplified, referring to the presence of dangerous substances at establishments in excess of threshold quantities, while Seveso I referred either to substances in connection with certain industrial activities or to separate storage of substances. It covers both industrial activities as well as the storage of dangerous chemicals. The Directive can be viewed as providing for three levels of proportionate controls, where larger quantities mean more controls. In this sense a company who holds a quantity of dangerous substance less than the lower threshold levels given in the Directive is not covered by this legislation. On the other hand, companies that hold a larger quantity of dangerous substance, which is above the lower threshold contained in the Directive, will be covered by lower tier requirements. Finally, companies that hold quantities of dangerous substances above the upper threshold contained in the Directive will be covered by all requirements contained within the Directive.
- The measures to be undertaken by Operators of Establishments to prevent and limit the consequences of major-accidents have been redefined and now include the setting up of a "Major-Accident Prevention Policy". The intention is to emphasize the importance of setting up of safety management systems as important elements to promote high levels of protection.
- Increased emphasis on measures to minimize environmental impacts of major-accidents including emergency preparedness and land-use planning, identification of possible domino effects and information to public.
- To obtain uniform levels of protection throughout the European Union, the Member States are required to ensure that the Competent Authorities assess the Safety reports and in particular are required to organize a system of ongoing inspections.
- The purpose of the Directive is the prevention of major accidents and to harmonize the efforts in this field within the EU.
- Seveso II is related to the new EU legislation on the protection of safety and health of workers.

The Directive contains general and specific obligation on both Operators and Member States Authorities falling into the categories of the two aims of the Directive, *i.e.*, control measures aimed at the prevention of major accidents and control measures aimed at the limitation of consequences of major accidents. One obligation of Operators of establishments of utmost importance is the production of a Safety Report, demonstrating that (Kozine and Hagen, 2008):

- A major accident prevention policy and a safety management system for implementing it are in effect.
- Major accident hazards have been identified and necessary measures have been taken to prevent such accidents and limit their consequences for man and environment.
- Adequate safety and reliability have been incorporated into the design, construction, operation and maintenance linked to major accident hazards.
- Internal emergency plans have been drawn up and information has been supplied to the Authorities enabling an emergency plan to be drawn up.

Notwithstanding its advance when compared to the older Directive, important areas were excluded from the scope of Seveso II including nuclear safety, the transport of dangerous substances and intermediate temporary storage outside establishments and the transport of dangerous substances by pipelines.

In the light of more recent industrial accidents (Toulouse, Baia Mare, *inter alia*) the Seveso II Directive was extended by Directive 2003/105/EC to cover risks arising from storage and processing

activities in mining, from pyrotechnic and explosive substances and from storage of ammonium nitrate and ammonium nitrate based fertilizers.

2.3 Seveso III Directive

The Seveso III Directive 2012/18/EU was adopted on 4th July 2012 and entered into force on 13th August 2012. The main changes when compared to Seveso II Directive are:

- Technical updates to take account for changes in EU chemicals classification. This is because the European system for the Classification, Packaging and Labeling (CPL) of Dangerous Substances is being replaced by the Globally Harmonized System (GHS). This prompted the need to adapt the Seveso II Directive, since its scope is based on the former chemicals classification.
- Better access for citizens to information about risks from activities of nearby companies. The aim is to improve the level of information available to the public.
- More effective rules on participation by the public concerned in land-use planning projects in the vicinity of Seveso establishments.
- Stricter standards for inspections of installations to ensure more effective implementation of safety rules.
- Access to justice for citizens who have not been granted appropriate access to information or participation.

However, the degree of change brought about by this new legislation is much less significant than that brought about by the transition from the original Seveso Directive to the Seveso II legislation.

3. Enterprise Risk Management

Managing risk is a fundamental concern of today's dynamic global environment. This is because risk is inherent to any business activity and may directly arise from:

- A new product launched in the market;
- Changes in products or in manufacturing processes;
- Modification or installation of new manufacturing equipments;
- Alternative forms of financing new projects;
- etc.

However technological and economic developments have brought new dimensions to business risks, sometimes producing effects that are difficult to control. In this context, we can mention:

- The increasing dimension of facilities;
- The use of new techniques, raw materials and products;
- The increasing specialization of production aggravating the consequences of production stops along the production chain;
- etc.

Traditionally managers were not too much concerned about the Enterprise Risk Management. However, this new term has emerged in a systematic manner since the late 1940s and early 1950s due to two main causes (Dickinson, 2001):

- First, in the sequence of a series of company failures, corporate scandals and frauds the scope of corporate governance has broadened to include all risks that a company takes. As a result Directors are now increasingly required to report on their internal risk control systems.
- Second, shareholder value models are playing a major role in strategic planning. Thus, while early strategic planning models paid insufficient attention to risk, modern strategic planning are based more on shareholder value concepts drawn from financial models.

3.1 Defining Enterprise Risk Management

To define Enterprise Risk Management it is first necessary to clarify the meaning of enterprise risk. According to Dickinson (2001) enterprise risk can be viewed as the extent to which the outcomes from the corporate strategy of a company may differ from those specified in its corporate objectives. In other words, it is the extent to which the outcomes fail to meet these objectives. In this process, the strategy adopted to achieve the corporate objectives has to be in accordance with the risk profile of a company. This risk profile is usually divided into three broad categories: (i) aggressive risk investors/companies; (ii) moderate risk investors/companies and (iii) low risk profile investors/companies. While the first and the third categories privileges high and low risk investments, respectively, the second one refers to a medium degree of risk. In this assessment it is important to bare in mind that the grater the risk associated to an investment, the greater the returns

required. This constitutes the so-called risk/return tradeoff.

There are however a set of causes that can originate deviations from the original corporate objectives. Some external causes are inherent to those in the marketplace in which a company competes, such as, new entrants into the market, changing consumer tastes or new product developments, *inter alia*. Others, occur in a much more macro level and implicate, for example, modifications in the economy, changes in the stock market conditions and all changes related to political, legal, technological, and demographic environments. The common factor among all of these causes is that they are all beyond the control of management. Another set of causes, internal to the company, that should be considered encompass human error, fraud, disruption of production, etc.

To assess the impact of these factors and measure enterprise risk several techniques like scenario analysis or shareholder value models, are available. The former is mainly a process of analyzing possible future events by considering alternative possible outcomes. Therefore, this method does not try to show one exact picture of the future. Instead, it presents consciously several alternative future developments. Consequently, a scope of possible future outcomes is observable. On the other hand, shareholders value models postulates that the corporate objectives of a company should be coincident of those from the shareholders. Nonetheless, shareholder risk can only be determined indirectly, since it depends on how stock markets value the expected risk of future expected incomes (Dickinson, 2001).

Given this, several definitions for Enterprise Risk Management have been advanced in literature. According to Meulbroek (2002), ERM is a management process that requires a firm's management to identify and assess the collective risks that affect firm value and apply an enterprise wide strategy to manage those risks in order to establish an effective risk management strategy. It is widely recognized that the primary goal of risk management is to maximize shareholder value (Sobel and Reding, 2004; Lajili and Zeghal, 2005; Breasley *et al.*, 2008; Pagach and Warr, 2011; Hoyt and Liebenberg, 2011). Firstly, this is achieved by improving capital efficiency through the provision of an objective basis for allocating corporate resources. This is accomplished by reducing expenditures on immaterial risks and exploiting natural hedges. Secondly, ERM can support decision-making by exposing areas of high risk and suggesting risk-based advances. Thirdly, ERM will help improve investor confidence by establishing a process which by its activities can stabilize financial results.

In this line, CAS[1] (2003, p. 8) defines ERM as:

"The discipline, by which an organization in an industry assesses, controls, exploits finances and monitors risks from all sources for the purpose of increasing the organization's short-and-long term value to its shareholders."

The CAS (2003) then proceeds to enumerate the types of risk subject to ERM as hazard, financial, operational and strategic. Hazard risks are those risks that have traditionally been addressed by insurers, including fire, theft, windstorm, liability, business interruption, pollution, health and pensions. Financial risks cover potential losses due to changes in financial markets, including interest rates, foreign exchange rates, commodity prices, liquidity risks and credit risk. Operational risks comprise costumer satisfaction, product development, product failure, trademark protection, corporate leadership, information technology, management fraud and information risk. Strategic risks comprehend such factors as completion, customer preferences, technological innovation and regulatory or political impediments.

Another popular definition of ERM used in the literature is the one provided by COSO[2] (2004) that describes this concept as follows:

"Enterprise risk management is a process, effected by an entity's board of directors, management and other personnel, applied in strategy setting and across the enterprise, designed to identify potential events that may affect the entity, and manage risk to be within its risk appetite, to provide reasonable assurance regarding the achievement of entity objectives."

In COSO (2004) perspective, an organization's ERM system should be oriented toward achieving the following objectives: (i) Strategy: high level goals aligned with and supporting the organization's mission. (ii) Operations: effective and efficient use of the organization's resources. (iii) Reporting: reliability of the organization's reporting system. (iv) Compliance: organizational compliance with applicable laws and regulations.

[1] CAS stands for Casualty Actuarial Society.
[2] COSO stands for Committee of Sponsoring Organizations of the Treadway Commission.

It is worthy to note that COSO (2004) acknowledges that the adequate ERM system is contingent, that is, will likely vary from firm to firm. This perspective is in consonance with literature that examines the more generic notion of management control systems (e.g., Chenhall, 2003; Luft and Shields, 2003; Gerdin and Greve, 2008).

In the light of the above, a common thread to ERM is that the overall risks of companies are managed in aggregate, rather than in a separate form. This denotes an evolution from the initial view of ERM, traceable from the late 1940s and early 1950s, where risks were evaluated from a "silo" perspective. In this context, risks were transferred through insurance or other financial products, such as, Derivatives. As documented above ERM is now treated as a holistic all-encompassing view including other kind of risks, such as, operational risk, reputational risk and strategic risk and not only hazard risk. This is because managing each risk class in a separate silo creates inefficiencies due to lack of coordination between the various risk departments. Consequently, the level of decision making under ERM is also shifted, from the insurance risk manager, who would generally seek to control risk, to CEO, or Board of Directors, who would be willing to embrace profitable risk opportunities.

3.2 Components and Steps of Enterprise Risk Management

Having clarified the meaning and extent of ERM it is now necessary to shed some light on how ERM should be carried out. Following COSO (2004), ERM comprises:

- *Aligning risk appetite and strategy* where the entity's risk appetite in evaluating strategic alternatives, setting related objectives and developing mechanisms to manage related risk is accounted for by management.
- *Enhancing risk response decisions* by providing the rigor to identify and select among alternative risk responses, such as, risk avoidance, reduction, sharing and acceptance.
- *Reducing operational surprises* and losses through enhanced capabilities to identify potential events and establish responses.
- *Identifying and managing multiple cross-enterprise risks*. This approach facilitates effective response to the interrelated impacts and integrated responses to multiple risks.
- *Seizing opportunities*. By considering a full range of potential events, management is positioned to identify and proactively realize opportunities.
- *Improving deployment of capital*. By providing robust risk information this method allows management to effectively assess overall capital needs and enhance capital allocation.

ERM is represented as a three dimensional matrix of eight elements deemed essential for achieve strategic, operational, reporting and compliance goals. These objectives are represented by vertical columns, the eight components by horizontal rows and an entity's units by the third dimension. As stated in COSO (20004, p. 5): "This matrix illustrates the ability to focus on the entirety of an entity's enterprise risk management, or by objectives category, component, entity unit, or any subset thereof". The eight components are:

- *Internal environment*;
- *Objective setting*;
- *Event identification*;
- *Risk assessment*;
- *Risk response*;
- *Control activities*;
- *Information and communication*;
- *Monitoring*.

Firstly the *internal environment* (i) determines how risk is perceived and addressed by the organization, defining its approach to risk management. *Objective setting* (ii) is the process by which the entity's goals are defined and communicated across the organization. *Event identification* (iii) comprises the recognition of internal and external events (both risks and opportunities). *Risk assessment* (iv) is the analysis and evaluation of potential risks, considering their frequency of occurrence and their impact. *Risk response* (v) covers the identification of proper actions for responding to risks, and aligning them with the organization's risk appetite. *Control activities* (vi) are the policies and procedures for ensuring that risk responses are effectively carried out. *Information and communication* (vii) denotes the mechanisms for ensuring effective communication and flows of information across the organization. Finally, *monitoring* (viii) refers to the ongoing management activities for verifying the effectiveness of the process put in place.

However, ERM is not strictly a serial process,[3] where one component affects only the next but is instead a multidirectional iterative process in which there is interdependency among all components. Moreover, it also encompasses internal control forming a more robust tool for management. Therefore, the effectiveness of an entity's Enterprise Risk Management is a judgment resulting from an assessment of whether the eight components are present and functioning effectively. For this to happen there can be no material weakness and risk needs to have been taken into account. However, these components will not function identically in every entity. Hence, small and mid-size entities may have a less formal and structured application.

The increasing complexity associated to ERM triggered the emergence of new co-ordinating management role – that is the Chief Risk Officer (CRO) who is in charge of all activities related to risk.

While Enterprise Risk Management provides important benefits, limitations exist. One has to do with human failures such as simple errors or mistakes arising from faulty decision making. Another, as discussed by Power (2007, pp. 76-82), refers to COSO simplistic view of organizations, which imposes a mechanical and cybernetic form of control that is defined in a top-down manner abstracted from organizational processes. Finally, firms, especially, the non-financial ones, may tend to introduce ERM merely as a compliance device, or as a self-contained internal control activity, but without assimilating it more closely to business activity.

4. Enterprise Risk Management and the Seveso Directives

As a tool for managing risks Seveso Directives constitutes an instrument to achieve ERM objectives. Thus, effective risk management developed in the context of the Seveso process has the potential to re-orientate a whole organization around performance. There are a number of examples where Seveso process can be applied as a part of ERM, especially in the areas of (DNV Consulting):

- Increasing organizational value;
- Ensuring the asset and capitalize on opportunities in the marketplace;
- Optimizing capital expenditure strategies;
- Improving forward planning and decision making;
- Evaluating project opportunity assessment against risk and return;
- Developing risk mitigation strategies for safety and business critical tasks.

The link between Enterprise Risk Management and safety/environmental risk is strong. By taking an overall approach of "integrated risk" where all risks are analyzed across the organization, Operators will get a better picture of the improvement options available and their associated risks.

The overall objective of managing business risk is to provide an assessment of the company's risk threshold in return for substantial improvements to business results. This is done through a structured and documented process that keeps key business objectives in focus and allows organizations to build a risk portfolio that yields improved business performance and project returns. This process of identifying hazards, evaluating event likelihood and consequence, and developing ERM management strategies is fundamental to the Seveso II process. The management of ERM through the Seveso directives provides a (DNV Consulting):

- Focus on the most vital aspects for successful operation of the organization by developing a thorough understanding of critical business objectives and strategies.
- Planned and structured method, involving both senior management and operational personnel as needed.
- Provides a common communication framework within which all those involved in operating, maintaining and managing the asset can gain a common understanding of the drivers and their associated management controls.

5. Conclusions

Risks are pervasive to all kind of organizations and will increase if not effectively managed.

In recent years, a paradigm shift has occurred regarding the way organizations view risk management. Instead of looking at it from a silo-based perspective, the trend is to take a holistic view.

[3] This approach commonly relies on the following one-directional steps (Ackerman, 2001): (i) identify the question(s); (ii) identify risks; (iii) risk measurements; (iv) formulate strategies to limit risk; (v) implement strategies; (vi) monitor results and repeat … In the same line, another consulting firm (ARI, 2001) considers the following steps: (i) identify risk on an enterprise basis; (ii) measure it; (iii) formulate strategies and tactics to limit leverage it; (iv) execute those strategies and tactics; and, (v) monitor process.

This new perspective, known as ERM, seeks to link risk management with business strategy and objective-setting, entering the domains of control, accountability and decision making.

In addition, legislation has been adopted in the EU – the so-called Seveso Directives – in order to regulate major accidents hazards. Given its importance in assessing and controlling risk we analyzed in this paper how these Directives have contributed to implement an appropriate ERM system in organizations.

We concluded that Seveso Directives are an effective tool to achieve ERM objectives. However, this will only be accomplished by using Seveso activity as an improvement process rather than a compliance focused activity. We expect, therefore, that in the future companies tend to regard Seveso reports as an opportunity to explore wide risk management issues.

References

[1] Ackerman, S. (2001), The enterprise in enterprise risk management, *Casuality Actuarial Society Enterprise Risk Management Seminar*.

[2] ARI Risk Management Consultants (2001), *Enterprise risk management: The intersection of risk and strategy*, http://www.riskadviser.net/Cases/case.htm.

[3] Arruda, L. (2004), *A Gestão de Riscos*. Curso de Técnicos Analistas de Riscos, Módulo IV: Análise de Riscos Industriais, Associação Portuguesa de Seguradores, Lisboa.

[4] Breasley, M.S., R. Clune and D.R Hermanso (2008), The impact of enterprise risk management on the internal audit function, *Journal of Forensic Accounting* IX (1), pp. 1-20.

[5] Casualty Actuarial Society – Enterprise Risk Management Committee (2003), *Overview of Enterprise Risk Management*, <http://www.casact.org/reserach/erm/overview.pdf>.

[6] Chenhall, R.H. (2003), Management control systems design within its organizational context: findings from contingency-based research and directions for future, Accounting Organizations and Society 28 (2-3), pp. 127-168.

[7] Committee of sponsoring Oraganizations (COSO) of the Treadway Comission (2004), *Enterprise Risk Management – Integrated Framework*.

[8] Dickinson, G. (2001), Enterprise risk management: Its origins and conceptual foundation, *The Geneva Papers on Risk Insurance* 26 (3), July, pp. 360-366.

[9] Directive 82/501/ECC of 5 August 1982.

[10] Directive 87/216/EEC of 19 March 1987.

[11] Directive 88/610/ECC of 24 November 1988.

[12] Directive 96/82/EC of 9 December 1996.

[13] Directive 2003/105/EC of 9 December 1996.

[14] Directive 2012/18/EU of 4 July 2012.

[15] DNV Consulting, Improving the link between Seveso Directives and business performance, *Unpublished Manuscript*.

[16] García, F. M. (1998), *Gerencia de Riesgos y Seguros en la Empresa*. Editorial Mapfre, Madrid.

[17] Gerdin, J. and J. Greeve (2008), The appropriateness of statistical methods for testing contingency hypothesis in management accounting research, *Accounting Organizations and Society* 33 (7-8), pp. 683-1010.

[18] Hoyt, R.E. and A.P. Liebenberg (2011), The value of Enterprise risk Management, *The Journal of Risk and Insurance* 78 (4), pp. 795-822.

[19] Knight, F. (1921), Risk, Uncertainty, and Profit, in Hart, Schaffner e Marx (Boston (Ed.): *Houghton Mifflin Company*, Cambridge: The Riverside Press.

[20] Kozine, N.J. D. and H. Hagen (2008), The Seveso II Directive and danish activities supporting its application in some eastern european countries, *R&RATA* 4 (1), December, 86-89.

[21] Lajili, K. and D. Zéghal (2005), A content analysis of risk management disclosures in Canadian annual reports, *Canadian Journal of Administrative Sciences* 22 (2), pp. 125-142.

[22] Luft, J. and M.D. Shields (2003), Mapping management accounting: graphics and guidelines for theory-consistent empirical research, Accounting Organizations and Society 28 (2-3), pp. 169-249.

[23] Meulbroek, L. (2002), A senior manager's guide to integrated risk management, *Journal of Applied Corporate Finance* 18 (4), pp. 56-70.

[24] Pagach, D. and R. Warr (2011), The characteristics of firms that hire chief risk officers, *The Journal of Risk and Insurance* 78 (1), pp. 185-211.

[25] Power, M. (2007), *Organized Uncertainty Designing a World of Risk Managemen*t, Oxford university Press.

[26] Sobel, P.J. and K.F. Reding (2004), Aligning corporate governance with enterprise risk management, *Management Accounting Quarterly* 5 (2), pp. 1-9.

Determinants of Economic Growth in G20 Countries: A Panel Data Approach

Nihat Taş[#1], Emrah Önder[#2], Ali Hepşen[*3]

[#] Department of Quantitative Methods, School of Business, Istanbul University, Istanbul, Turkey
[1]*nihattas@istanbul.edu.tr*
[2]*emrah@istanbul.edu.tr*

[*] Department of Finance, School of Business, Istanbul University, Istanbul, Turkey
[3]*alihepsen@yahoo.com*

Abstract **– During last 10 years some G20 countries had economic instability. They have short and long term challenges such as unemployment, population ageing, globalization etc. In this study it is aimed to analyze macroeconomic indicators of G20 countries' economic growth using panel data approach. Static linear panel data models were used for determining the effects of independent macro-economic variables on gross domestic product (GDP) of G20 countries including Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, Mexico, Russia, Saudi Arabia, South Africa, Republic of Korea, Turkey, the United Kingdom and the United States of America. While dependent variable of analyze is gross domestic product (volume), the independent variables are current account balance, general government gross debt, general government revenue, general government total expenditure, gross national savings, inflation (average consumer prices), population, total investment, unemployment rate, volume of exports of goods and services, volume of imports of goods and services. The analysis proposed is based on a panel data (cross sectional time series data) approach. The dataset of this research involves 18 (unemployment rate variable of India was not available on our data set, therefore India was excluded from analysis) of G20 members (cross sectional units). The effects of 11 macroeconomic indicators on gross domestic product volume were examined by using panel data series. The findings of this paper would help G20 countries and investors for creating more effective macroeconomic strategies. For the government side, future rises, falls, and turning points of the macro indicators puts into perspective the effects of government policy created to deal with them. For the investors' side, future values might increase the possibility of diligent investor in the financial market.**

Keywords - *G20 Counties, Macro Economic Parameters, Panel Data Analysis, Gross Domestic Product, Economic Growth*

1. Introduction

The Group of Twenty (G20) is the premier forum for international cooperation on the most important issues of the global economic and financial agenda. The objectives of the G20 refer to: (1) Policy coordination between its members in order to achieve global economic stability, sustainable growth; (2) Promoting financial regulations that reduce risks and prevent future financial crises; (3) Modernizing international financial architecture. The G20 brings together finance ministers and central bank governors from 19 countries: Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, the Republic of Korea, Mexico, Russia, Saudi Arabia, South Africa, Turkey, the United Kingdom, the United States of America plus the European Union, which is represented by the President of the European Council and by Head of the European Central Bank.

The G20 was formally established in September 1999 when finance ministers and central bank governors of seven major industrial countries (Canada, France, Germany, Italy, Japan, the United Kingdom and the United States) met in Washington, D.C. in the aftermath of the financial crisis of 1997-1998, which revealed the vulnerability of the international financial system in context of economic globalization and showed that key developing countries were insufficiently involved in discussions and decisions concerning global economic issues. Finance ministers and central

bank governors started to hold annual meetings after the inaugural meeting on December 15-16, 1999, in Berlin.

The first meeting of the G20 Leaders took place in Washington, D.C., on November 14-15, 2008, where the Leaders agreed to an action plan to stabilize the global economy and prevent future crises. As a result the premier forum acquired its current name and significance. At the Leaders' level, Mexico was the second episode, following the Republic of Korea, that an emerging country held the Presidency of the Group. At their first meeting in Washington, the G20 Leaders achieved general agreement amongst the G20 on how to cooperate in key areas so as to strengthen economic growth, deal with the financial crisis and agreed upon three key objectives: (1) restoring global economic growth; (2) strengthening the international financial system; (3) reforming international financial institutions.

G20 members represent almost: (1) 90% of global GDP; (2) 80% of international global-trade; (3) 2/3 of the world's population lives in G20 member countries; (4) 84% of all fossil fuel emissions are produced by G20 countries.

In this study it is aimed to analyze macroeconomic indicators of G20 countries' economic growth using panel data approach. Static linear panel data models were used for determining the effects of independent macro-economic variables on gross domestic product (GDP) of G20 countries.

2. Overview of the Data

Our model comprises twelve variables: while dependent variable of analyze is gross domestic product (GDP); the independent variables are current account balance, general government gross debt, general government revenue, general government total expenditure, gross national savings, inflation (average consumer prices), population, total investment, unemployment rate, volume of exports of goods and services, volume of imports of goods and services. Gross Domestic Product represents the economic health of a country. It presents a sum of a country's production which consists of all purchases of goods and services produced by a country and services used by individuals, firms, foreigners and the governing bodies. GDP consists of consumer spending, investment expenditure, government spending and net exports hence it portrays an all-inclusive picture of an economy because of which it provides an insight to investors which highlights the trend of the economy by comparing GDP levels as an index. GDP is not only used as an indicator for most governments and economic decision-makers for planning and policy formulation; but also it helps the investors to manage their portfolios by providing them with guidance about the state of the economy. On the other hand, it is good measure for an economy and with improvement in research and quality of data, statisticians and governments are trying to find out measures to strengthen GDP and make it a comprehensive indicator of national income.

International standards regarding the compilation of balance of payments statistics are described in the fifth edition of the Balance of Payments Manual prepared by the International Monetary Fund (IMF) in order to provide guidance to member countries. In a general sense, the balance of payments is a statistical statement that systematically records all the economic transactions between residents of a country (Central Government, monetary authority, banks, other sector) and nonresidents for a specific time period. The balance of payments statistics are classified under two major groups: "Current Account" and "Capital and Financial Account". In summary, the current account covers all transactions that involve real sources (including volume of exports and imports of goods and services,) and current transfers; the capital and financial accounts show how these transactions are financed (by means of capital transfer or investment in financial instruments). As mentioned in the European Economic series, current account deficits and surpluses are not necessarily macroeconomic imbalances in the sense of developments which are adversely affecting, or have the potential to affect the proper functioning of economies, of the monetary union, or on a wider scale. Deficits and surpluses are a natural consequence of economic interactions between countries. They show to which extent a country relies on borrowing from the rest of the world or how much of its resources it lends abroad. In this way, external borrowing and lending allows countries to trade consumption over time: a country with a current account surplus transfers consumption from today to tomorrow by investing abroad. In turn, a country with a current account deficit can increase its consumption or investment today but must transfer future income abroad to redeem its external debt. Deficits and

surpluses can thus simply be the result of an appropriate allocation of savings, taking into account different investment opportunities across countries. Differences in economic prospects lead to differences in saving behavior, with brighter expectations reducing the tendency of economic agents to save and hence contributing to the accumulation of deficits. In particular, countries with a rapidly ageing population may find it opportune to save today (i.e. run surpluses) to smooth consumption over time. On the other hand, current account deficits and surpluses are part of the adjustment process in a monetary union. They absorb asymmetric shocks in the absence of independent monetary policy and nominal exchange rate adjustment. This paper also attempts to analyze the correlation that exists between GDP and inflation. It is widely believed that there is a relationship between the two. The problem is that there are disagreements as to what that relationship is or how it operates. As a result, when governments make decisions based on these pieces of information, the outcome often cannot be guaranteed. Exploration of the relationship between GDP and inflation is best begun by developing an understanding of each term individually. As mentioned above, GDP is an acronym for gross domestic product, which is the value of a nation's goods and services during a specified period. This figure is generally regarded as an important indicator of an economy's health. Inflation refers the rate at which the general level of prices for goods and services is rising, and, subsequently, purchasing power is falling.

In determining the economic position of a country is through a comparison of general government gross debt, revenue, total expenditure, national savings and total investments to the gross domestic product of the country. For instance, a low government gross debt to GDP percentage is usually an indication of economic health, while a high debt to GDP percentage can indicate financial trouble for a country.

3. The Panel Data Analysis

"Panel Data" is set of data obtained by observation of the characteristics of a variety of units (cross-sectional variables) over time (Ahn and Moon, 2001). Panel data set have both cross-sectional and time-series dimensions. The size of the time series is formed by monitoring the same cross-section units during a given period (Wooldridge, 2009).

When each subject (cross sectional unit) has the same number of observations, this type of panel is called a balanced panel data set. If some subjects have different number of observations, this situation is known as the unbalanced data case (Wooldridge, 2009).

Panel data sets that thousands of cross sectional units observed through the time are used in many micro-economic researches (Hill et al., 2008). Panel data provide more informative data, more variability, more degrees of freedom, less collinearity among the variables and more efficiency (Baltagi, 2010).

Panel data analysis can be considered as a combination of regression and time series analysis (Frees, 2004). This analysis is based on repetitive variance models because the observations of the units are repetitive through time dimension (Pazarlıoğlu, 2001).

The main superiority of panel data due to working with the one dimensional cross-sectional series or repeated cross sectional series that same units are not observed through the time is to loosen the standard assumptions (Maddala and Lahiri, 2009).

By studying the repeated cross section of observations Panel data can better detect and measure effects that cannot be observed in pure cross section or pure time series data (Gujarati and Porter, 2009).

Analyzing the observations of cross section and time series provide more flexibility compared to when used them separately by increasing the quantity and quality of data. In panel data analysis, the cross-sectional units are considered to be heterogeneous and controlled for the variation (heterogeneity). Pure time series or cross section studies which are not controlling this heterogeneity may run the risk of obtaining biased results. Panel data are able to control variables which are subject or time invariant (Baltagi, 2010).

Because panel data has time based dynamics with the observations of cross sectional data repeated through time, the effect of unmeasured variables can be controlled (Hsiao, 2003). With the use of cross-sectional observations over time, panel data analysis provides more clarification character, less collinearity and more degrees of freedom and efficiency than only cross sectional analysis or time series analysis (Tarı, 2010).

In static panel data models, the covariance estimators (pooled panel data), fixed effects and random effects estimators are widely used. When the cross-sectional units are homogenous, pooled ordinary least squares panel model is used. In the presence of unit-specific or time-specific effects, in the case of assuming these effects to be fixed parameters to be estimated, model is called as the fixed effects. The term "fixed effects" expresses nonrandom quantities are accounted for the heterogeneity. If the subject specific effects are assumed random and not correlated with the regressors (independent variables), the model becomes random effects. These effects are included to the random effects model as a component of the error term (Baltagi, 2010).

The panel models that do not have any lagged values of the dependent or/and independent variables in the model as a regressor are called "static models".

Fixed effects model and random effects model can be shown as follow:

Fixes Effects Model:

$$y_{it} = \alpha_i + \sum_{k=1}^{K} \beta_k x_{kit} + u_{it}, \qquad (1)$$

$$i = 1,...,N, \qquad t = 1,...,T$$

Random Effects Model

$$y_{it} = \sum_{k=1}^{K} \beta_k x_{kit} + (\alpha_i + u_{it}), \qquad (2)$$

$$i = 1,...,N, \qquad t = 1,...,T$$

Index i differentiates the subjects and ranges from 1 to N. N is the number of subjects. Each subject is observed T times and the index t differentiates the observation times through 1 to T. K is the number of the explanatory (independent) variables.

4. Analyzing Macro Economic Indicators Using Panel Data

4.1. Variables and Descriptive Statistics

In this study, used database consists of the panel data set of 18 countries (N) for the 2002-2012 term (T). Dataset is a balanced panel and has NxTxk = 18x11x12 = 2376 observations. Each variable has NxT = 18x11 = 198 observations.

Dependent variable is ngdp (Gross domestic product, *billion dollars) and there are 11 independent variables. Average value of ngdp for 18 countries is 2248 billion dollars. Independent variables and measuring units are listed in Table 1.

Table 1: Independent Variables and Measuring Units

Code	Variable	Units
bca_ngdpd	**Current account balance**	**Percent of GDP**
lp	Population (*10,000,000)	Persons
lur	Unemployment rate	Percent of total labor force
pcpipch	Inflation, average consumer prices	Percent change
tx_rpch	Volume of exports of goods and services	Percent change
tm_rpch	Volume of imports of goods and services	Percent change
ggxwdg_gr	Growth rate in general government gross debt	Rate
ggr_gr	Growth rate in general government revenue	Rate
ggx_gr	Growth rate in general government total expenditure	Rate
ngsd_ngd	Gross national savings	Percent of GDP
nid_ngdp	Total investment	Percent of GDP

Descriptive statistics for the variables used in the analysis are shown below in Table 2. Descriptive statistics values are ordinary and there are not exceptional values in the dataset.

Table 2: Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
ngdp	198	2247.547	3077.303	97.403	15653.37
nid_ngdp	198	.2280678	.0666081	.10778	.48584
ngsd_ngdp	198	.2407581	.0950934	.11134	.53474
pcpipch	198	.0465638	.0496962	-.01344	.45134
tm_rpch	198	.0738092	.1196233	-.54587	.52255
tx_rpch	198	.0476785	.0789862	-.24196	.27765
lur	196	.0830784	.050227	.02978	.30409
lp	198	16.47114	29.0687	1.9771	135.3821
bca_ngdpd	198	.0129634	.0631424	-.09962	.28538
ggxwdg_gr	198	1.090097	.222862	.7317608	3.563901
ggr_gr	198	1.104398	.1254302	.490437	1.623843
ggx_gr	198	1.100209	.08843	.9401937	1.519621

Table 3 below displays the correlation coefficiencies between the variables. Highest correlations among the independent variables are coefficient between nid_ngdp and ngsd_ngdp which is 0.78; between nid_ngdpd and lp which is 0.74 and between ngsd_ngdp and bca_ngdp which is 0.70.

Table 3: Correlation Coefficients between the Variables

	ngdp	nid_ngdp	ngsd_n~p	pcpipch	tm_rpch	tx_rpch	lur	lp
ngdp	1.0000							
nid_ngdp	-0.0398	1.0000						
ngsd_ngdp	-0.1310	0.7785	1.0000					
pcpipch	-0.2860	-0.1209	-0.0651	1.0000				
tm_rpch	-0.1310	0.2098	0.2403	0.0965	1.0000			
tx_rpch	0.0304	0.2911	0.2571	0.0939	0.5484	1.0000		
lur	-0.2428	-0.4046	-0.3250	0.2803	-0.0277	-0.1446	1.0000	
lp	0.3018	0.7439	0.6243	-0.0811	0.1238	0.3155	-0.2359	1.0000
bca_ngdpd	-0.1713	0.0942	0.6964	0.0388	0.1454	0.0719	-0.0562	0.1344
ggxwdg_gr	0.0203	0.0307	-0.0401	0.2908	-0.3356	0.0522	0.1121	0.1261
ggr_gr	-0.2394	0.1985	0.3395	0.4460	0.5490	0.3652	0.1211	0.1810
ggx_gr	-0.2568	0.2607	0.3012	0.5777	0.1184	0.0601	0.1736	0.2370

Table 4: (continued)

	bca_ng~d	ggxwdg~r	ggr_gr	ggx_gr
bca_ngdpd	1.0000			
ggxwdg_gr	-0.1063	1.0000		
ggr_gr	0.3225	-0.0110	1.0000	
ggx_gr	0.1972	0.3283	0.5840	1.0000

Figure 1 shows the panel line graph for the dependent variable ngdp.

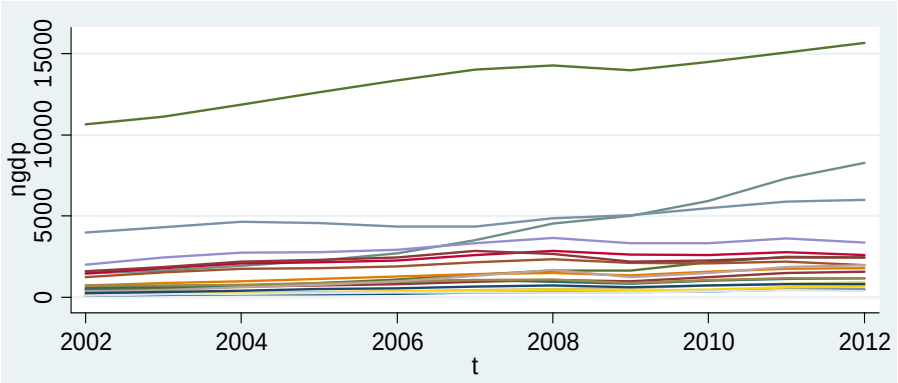


Figure 1: Panel Line Graph for the Dependent Variable ngdp.

4.2. Static Linear Panel Data Models

To determine the relationship between the ngdp and the independent variables, the fixed effects model and the random effects model which are the most common static linear panel data analysis models are used. ngdp is modeled as a function of 11 factors. The fixed effects model is

$$ngdp_{it} = \alpha_i + \beta_1 bca\_ngdpd_{it} + \beta_2 lp_{it} + \beta_3 lur_{it} + \beta_4 pcpipch_{it} + \beta_5 tx\_rpch_{it} + \beta_6 tm\_rpch_{it} + \beta_7 ggxwdg\_gr_{it} + \beta_8 ggr\_gr_{it} + \beta_9 ggx\_gr_{it} + \beta_{10} ngsd\_ngd_{it} + \beta_{11} nid\_ngdp_{it} + u_{it} \quad (3)$$

and the random effects model is

$$ngdp_{it} = \beta_1 bca\_ngdpd_{it} + \beta_2 lp_{it} + \beta_3 lur_{it} + \beta_4 pcpipch_{it} + \beta_5 tx\_rpch_{it} + \beta_6 tm\_rpch_{it} + \beta_7 ggxwdg\_gr_{it} + \beta_8 ggr\_gr_{it} + \beta_9 ggx\_gr_{it} + \beta_{10} ngsd\_ngd_{it} + \beta_{11} nid\_ngdp_{it} + (\alpha_i + u_{it}) \quad (4)$$

i stands for the country number, t stands for the year, u_{it} is the error term for the fixed effects model and $(\alpha_i + u_{it})$ is the composite error term for the random effects model. If the country effects are uncorrelated with the regressors, they are known as random effects. In the random effects model, because there is no correlation between the country specific effects and the regressors, country specific effects are parameterized as additional random disturbances. If the country effects are correlated with the regressors, then they are known as fixed effects. If there is no country specific effect in the model, then the model becomes as the pooled ordinary least squares regression which is

$$ngdp_{it} = \mu + \beta_1 bca\_ngdpd_{it} + \beta_2 lp_{it} + \beta_3 lur_{it} + \beta_4 pcpipch_{it} + \beta_5 tx\_rpch_{it} + \beta_6 tm\_rpch_{it} + \beta_7 ggxwdg\_gr_{it} + \beta_8 ggr\_gr_{it} + \beta_9 ggx\_gr_{it} + \beta_{10} ngsd\_ngd_{it} + \beta_{11} nid\_ngdp_{it} + u_{it} \quad (5)$$

Firstly, the null hypothesis that constant terms are equal across countries is tested to determine if the pooled ols regression will produce inconsistent estimates. Pooling test examines whether the intercepts take on a common value α and also known as the test for heterogeneity. Hypothesis is tested with F test

Table 5: Testing for the Country Specific Effects

$H_0 : \alpha_1 = \alpha_2 = ... = \alpha_N = 0$
$F(17; 167) = 318.63 \quad prob > F = 0.0000$

and the p value is 0.0000. Null hypothesis is rejected. This provides strong evidence for the case for retaining country specific effects in the model specification. So, the pooled ordinary least squares model is inconsistent. The Pooled ols model (OLS_ALL), the fixed effects model (FE_ALL) and the random effects model (RE_ALL) results are shown respectively in the Table 6.

Table 6: Pooled OLS, Fixed Effects and Random Effects Models

Variable	OLS_ALL	FE_ALL	RE_ALL
bca_ngdpd	-20795.508	-1273.3258	10244.125
	40536.146	8281.4613	12731.097
	0.6086	0.8780	0.4210
lp	86.6794	1047.0582	161.524
	9.0726365	60.570788	35.401347
	0.0000	0.0000	0.0000
lur	-19105.686	-7344.7459	7631.6385
	3937.8631	3077.0753	4409.526
	0.0000	0.0181	0.0835
pcpipch	-11643.572	804.78161	954.79785
	4633.4907	1027.2994	1586.31
	0.0128	0.4345	0.5472
tx_rpch	-288.05526	-627.2042	-2468.7299
	2860.1311	568.21817	858.77948
	0.9199	0.2713	0.0040
tm_rpch	-258.61622	210.82021	8.9230555
	2144.3833	415.00306	641.09106
	0.9041	0.6121	0.9889
ggxwdg_gr	246.20577	194.70315	440.1285
	957.27342	195.14302	300.43694
	0.7973	0.3198	0.1429
ggr_gr	-369.91052	567.05566	1094.4565
	2213.26	437.08882	672.70532
	0.8674	0.1963	0.1037
ggx_gr	-1470.7494	-1125.6047	-2542.3342
	3177.0526	674.98903	1033.498
	0.6440	0.0973	0.0139
ngsd_ngdp	10012.573	-1888.8218	-11345.537
	40128.229	8118.2812	12495.492
	0.8032	0.8163	0.3639
nid_ngdp	-45072.857	-6527.8979	23325.73
	40157.543	8658.1863	12989.709
	0.2632	0.4519	0.0725
_cons	12860.605	-12186.613	-2590.0982
	2928.3727	1062.7447	1725.3333
	0.0000	0.0000	0.1333

Because there is country specific effects, pooled ols model shown in the first column is inappropriate. Most of the regressors are not significant. The model reviewed by using different combinations of the regressors because there are some high correlations between the explanatory variables shown in Table 3. Finally 4 of all independent variables are significant and by using these regressors which are lur, lp, bca_ngdpd and nid_ngdp, the fixed (FE) and the random effects (RE) models are estimated and the results are shown in the first two coloumns of the Table 7 below.

Table 7: Static Linear Panel Data Models

Variable	FE	RE	FE_RB	FE_PCSE	FE_DK
lur	-7763.6146	6660.6738	-7763.6146	-12882.199	-7763.6146
	2790.0497	4186.0231	3654.8707	3212.5937	2389.7306
	0.0060	0.1116	0.0486	0.0001	0.0047
lp	1064.4479	137.73187	1064.4479	44.541245	1064.4479
	57.338028	31.8472	144.65103	10.596397	94.631885
	0.0000	0.0000	0.0000	0.0000	0.0000
bca_ngdpd	-2493.4479	-869.34636	-2493.4479	-3293.0229	-2493.4479
	1322.6402	2117.0613	2345.6457	1703.7132	1095.4531
	0.0611	0.6813	0.3026	0.0533	0.0361
nid_ngdp	-9320.9708	9957.238	-9320.9708	-7272.8518	-9320.9708
	2405.3268	3336.5945	5340.5012	3740.521	4666.9423
	0.0002	0.0028	0.0990	0.0519	0.0621
_cons	-12618.191	-2838.3459	-12618.191	4252.7806	-12618.191
	829.86401	1373.2236	2022.8941	1044.4052	754.83991
	0.0000	0.0387	0.0000	0.0000	0.0000

For the new model that contains 4 regressors, the null hypothesis that the variances of the country specific effects are equal to zero is tested by the Lagrange Multiplier test and the null hypothesis that the standard deviations of the country specific effects are equal to zero is also tested by the Likelihood Ratio test. Results are given in the Table 8.

Table 8: The Lagrange Multiplier and the Likelihood Ratio Test Results

Lagrange Multiplier Test	**Likelihood Ratio Test**
$H_0 : \sigma^2_{\alpha_i} = 0$ (Pooled ols regression is appropriate.)	$H_0 : \sigma_{\alpha_i} = 0$ (Pooled ols regression is appropriate.)
$LM \ \ \chi^2_1 = 619.58 \qquad prob > \chi^2 = 0.0000$	$\chi^2_1 = 483.62 \qquad prob > \chi^2 = 0.0000$

Each test *p* values are 0.0000 and null hypotheses are rejected. There is strong evidence for the case for retaining country specific effects in the model.

The random effects model specifies the country specific effects as a random draw that is uncorrelated with the regressors and the overall error term. The random effects estimator uses the assumption that the country specific effects are uncorrelated with the regressors and the extra orthogonality conditions are valid. This assumption is tested by using Hausman test and the results are given in Table 9.

Table 9: Hausman Specification Test Results

Variable	**Fixed Effects (b)**	**Random Effects (B)**	**Difference (b-B)**
lur	-7763.615	6660.674	-14424.29
lp	1064.448	137.732	926.72
bca_ngdpd	-2493.448	-869.346	-1624.10
nid_ngdp	-9320.971	9957.238	-19278.21

H_0 : Differences in coefficients are not systematic. (the RE estimator is consistent)

$$\chi^2_4 = (b-B)' \left[(V_b - V_B)^{-1} \right] (b-B) = 376.65$$

$$prob > \chi^2 = 0.0000$$

The Hausman test's null hypothesis is rejected. Country specific effects are correlated with the regressors. Because the random effects estimator is inconsistent, the fixed effects model is the appropriate one.

Before using the the fixed effects model, diagnostic tests for the model assumptions must be performed. The most important assumptions of the fixed effects estimator are homoscedasticity, no serial correlation and no contemporaneous correlation. Testing for homoscedasticity is performed by using modified Wald test for the null hypothesis of homoscedasticity against the heteroscedastic alternative. Testing for serial correlation is performed by using Baltagi-Wu locally best invariant test, modified Bhargava et.al. Durbin Watson test and Wooldridge's serial correlation test respectively. For testing the absence of the contemporenaous correlation assumption, Breusch-Pagan Lagrange Multiplier test, Pesaran CD test, Friedman's R test and Frees' Q test are performed. Test results are given below in Table 10.

Because the Modified Wald test p value is 0.0000, the null hypothesis is rejected and the model has heteroscedasticity. For serial correlation, Wooldridge' serial correlation F test statistic is 294.61 and the p value is 0.0000. Model has serial correlation problem. Additionally both Baltagi-Wu LBI. and modified Bhargava et. al. DW serial correlation test statistics which are 0.8328 and 0.4128 respectively indicate that the model has serial correlation problem. All tests performed for the contemporenaous correlation point that there is cross sectional correlation in the model.

The last three columns of the Table 7 shows the fixed effects model with the Huber-White standard errors that is robust to heteroscedasticity and serial correlation (FE_RB); the fixed effects model with panel corrected standard errors that is robust to heteroscedasticity and the cross sectional (contemporaneous) correlation (FE_PCSE); the fixed effects model with the Driskoll-Kraay standard errors that is robust to the heteroscedasticity, serial correlation and to the cross sectional correlation (FE_DK).

Table 10: Results of the Diagnostic Tests

Test	Hypothesis	Test Statistic	Probability
Homoscedasticity			
Modified Wald	$H_0 : \sigma_i^2 = \sigma^2$	$\chi^2_{18} = 1663.07$	$p > \chi^2_{18} = 0.0000$
Serial Correlation			
Baltagi-Wu LBI.	$H_0 : \rho = 0$	$LBI = 0.8328$	
Modif. Bhargavaet.al. DW	$H_0 : \rho = 0$	$DW = 0.4128$	
Wooldridge's Serial Correlation	H_0 :No first order serial correlation	$F_{1;17} = 294.61$	$p > F_{1;17} = 0.0000$
Contemporaneous Correlation			
Breusch-Pagan LM	H_0 :No contemporaneous correlation	$\chi^2_{153} = 526.44$	$p > \chi^2_{153} = 0.0000$
Pesaran CD	H_0 :No contemporaneous correlation	$CD = 6.81$	$p > CD = 0.0000$
Friedman's R	H_0 :No contemporaneous correlation	$R = 33.07$	$p > R = 0.0111$
Frees' Q	H_0 :No contemporaneous correlation	$Q_{test} = 4.254$	
	Critical Values from Frees' Q distribution:		
		$\alpha = 0.10$	: 0.2828
		$\alpha = 0.05$	: 0.3826
		$\alpha = 0.01$	: 0.5811

FE, FE_RB and the FE_DK models have the same coefficient estimates with the different standard errors. The FE_PCSE model has different coefficient estimates from the other three models. Finally, because of the violations of the assumptions and the nature of the model estimators, the last two models can be used to interpret the relationship between the dependent variable and the regressors (independent

variables) with 5.33% and 6.21% significance levels respectively. If the unemployment rate increases 1%, the gross domestic product decreases about -128.82 (-77.64 for FE_DK) billion dollars because the coefficient of lur is -12882.20 (-7763.61 for FE_DK). The coefficient of lp is 44.54 (1064.45 for FE_DK) and indicates that if the population increases 10 million, the dependent variable gross domestic product (ngdp) increases about 45 billion (1.06 trillion for FE_DK) dollars. The estimated coefficient of the bca_ngdpd is -3293.02 (-2493.45 for FE_DK) and it can be interpreted as if the current account balance (percent of GDP) increases 1%, the gross domestic product decreases about -32.93 (-24.93 for FE_DK) billion dollars. Finally, the estimated coefficient of nid_ngdp is -7272.85 (-9320.97 for FE_DK). It can be said that 1% increase in total investment (percent of GDP) decreases the gross domestic product -72.73 (-93.21 for FE_DK) billion dollars.

5. Concluding Remarks

GDP is the value of total production of goods and services in a country over a specified period. When government officials plan for the future, they consider the various macroeconomic indicators affecting to it. In this paper the authors used panel data approach to analyze the individual effect of some of the key macroeconomic indicators (current account balance, general government gross debt, general government revenue, general government total expenditure, gross national savings, inflation (average consumer prices), population, total investment, unemployment rate, volume of exports of goods and services, volume of imports of goods and services) on economic growth (GDP) of 18 G20 countries over during the 2002–2012 period.

Empirical results show that level of population positively affects economic growth. That is, 10 million increase in population leads to rise in GDP 45 billion (1.1 trillion for the FE_DK model) dollars. Whereas the level of unemployment rate, current account balance and total investment negatively affect economic growth. One percent increase in the unemployment rate decreases GDP by 128.8 (or 77.6) billion dollars, one percent increase in the current account balance decreases GDP by 32.93 (or 24.93) billion dollars and one percent increase in the total investment decreases GDP by 72.73 (or 93.21) billion dollars.

The results provide useful insights for governments and investors for creating more effective macroeconomic strategies. For the government side, future rises, falls, and turning points of the macro indicators puts into perspective the effects of government policy created to deal with them. For the investors' side, future values might increase the possibility of diligent investor in the financial market.

Acknowledgments

This study was supported financially by Istanbul University (BAP-Project no: 36374). It is my obligation to acknowledge financial support from Istanbul University – BAP Department.

References

[1] Ahn, S. C., Moon, H. R. (2001). Large-N and Large-T Properties of Panel Data Estimators and the Hausman Test", USC CLEO Research Paper, No. C01-20

[2] Baltagi, B. H. (2010). Econometric Analysis of Panel Data, Fourth Edition, John Wiley&Sons Ltd, 2010

[3] Beine, M., Docquier, F., Oden-Defoort, C. (2011). A Panel Data Analysis of the Brain Gain. World Development (39), 4, 523–532

[4] Bortolotti, B., Fantini, M., Siniscalco, D. (2003). Privatisation around the world: evidence from panel data. Journal of Public Economics, 88, 305 – 332

[5] Current Account Surpluses in the EU, European Economic Series, September 2012.

[6] Frees, E. W., (2004). Longitudinal and Panel Data, Analysis and Applications in the Social Sciences, New York, Cambridge University Press

[7] Gujarati, D. N., Porter, D. C., (2009). Basic Econometrics, Fifth Edition, McGraw Hill, New York

[8] Haas, R. de, Lelyveld, I. van, (2006). Foreign banks and credit stability in Central and Eastern Europe. A panel data analysis. Journal of Banking & Finance 30, 1927–1952

[9] Hill, R. C., Griffiths, W. E., Lim, G. C. (2008). Principles of Econometrics, 3rd press, John Wiley & Sons

[10] Hsiao, C. (2003). Analysis of Panel Data, 2nd press, New York, Cambridge University Press, 2003

[11] Maddala, G.S., Lahiri, K. (2009). Introduction to Econometrics, 4th press., West Sussex, John Wiley & Sons

[12] Lee, C. C., Chang, C. P., (2007). Energy consumption and GDP revisited: A panel analysis of developed and developing countries. Energy Economics, 29, 1206 – 1223

[13] Lee, C. C., Chang, C. P., (2008). Tourism development and economic growth: A closer look at panels. Tourism Management 29 (2008) 180 – 192

[14] Pazarlıoğlu, M.V. (2001). 1980-1990 Döneminde Türkiye'de İç Göç Üzerine Ekonometrik Model Çalışması", V. Ulusal Ekonometri ve İstatistik Sempozyumu, Çukurova Üniversitesi, Adana (In Turkish)

[15] Sukiassyan, G. (2007). Inequality and growth: What does the transition economy data say? Journal of Comparative Economics, 35, 35–56

[16] Tari, R. (2010). Ekonometri, Extended 6th press, Umuttepe Kitabevi, Kocaeli, (In Turkish)

[17] Tsoukas, S., (2011). Firm survival and financial development: Evidence from a panel of emerging Asian economies. Journal of Banking & Finance, 35, 1736–1752

[18] Wooldridge, J. M. (2009). Introductory Econometrics, 4th press, Canada, South Western

[19] What is the G20; http://www.g20.org/ docs/about/about_G20.html, 26/08/2013

Effect of Internal-marketing-mix on Customer-pyramid-oriented banking service performance. An Indian Experience

Selvarasu Appasamy Mutharasu [#1], Krishnaswamy Natarajan [#2], José António Filipe [*]
[#]Annamalai University, India
[1]aselvarasu@gmail.com
[2]krishnaadhy@yahoo.com
[*]Instituto Universitário de Lisboa (ISCTE-IUL), BRU – IUL
Lisbon, Portugal
jose.filipe@iscte.pt

Abstract **- The study proposes marketing support facility provided by all three categories of bank employees each as a commitment to service performance. IM has proved its results in human resource management implications and it is proposed to yield in the marketing as well as business development function in banking service performance in form of added values in an organization.**

Keywords *- Internal Marketing, Internal customer service, customer pyramid orientation, banking service performance.*

1. Introduction

Internal Marketing (IM) is a specialized marketing communication approach to add value to employee as an internal customer towards delighting external customers that results overall business performance. Internal Marketing (Berry, 1976 & 1981) campaign fulfils the need of internal customers' satisfaction. IM Mix delineates components like reward/compensation, internal communication, supervisor/senior leadership, intangible benefits and intermediary (Liao, Jun-Fang, 2009) that facilitate internal customers [employees] to understand and focus on business performance through servicing profitable customers. The revolutionized internal marketing approach is used to categorize customers in the internal structure based on value added to business performance in the form of corporate, brand and internal customer service value. In the banking services, there is differentiation likely in organizations' efforts to encourage customers depending on their ratings of either grade as 'the good', 'the bad', 'the ugly', 'the best' and 'the rest' or colours as 'green' and 'red'. The market segment of banking services focused on retail banking, wholesale customer and investment banking. The customer pyramid is a tool (see Zeithaml, Valarie A.; Rust, Roland T.; Lemon, Katherine N, (2001) used for labelling external customers into four different tiers like Platinum, Gold, Iron and Lead depending on their profitability and their sensitivity to pricing as well as other offers from the bank's point of view.

It is important to find new and innovative ways to deliver internal marketing campaigns if they are to have maximum impact with sales and support teams. The research proposal aims to understand the inter-linkages in the form of marketing support for external customer centric between Tier I-internal customer, Tier II-internal customer and Tier III-internal customer using internal marketing mix components that drive the corporate value, brand value and internal customer service values as a measure of business performance. Linkages in the form of service supporters and service performers have been assessed in the form of marketing service support as a measure of shared values.

Although IM mix and its effect on banking service performance with internal customer pyramid orientation have been an active research area, and although we review it in the following section, it is fair to say that most of the works deal with employees' support service focused on setting on job satisfaction, organizational commitment, etc. and hence they have shared roles and responsibilities for business development of banking service performance. Through this work we aim to close the gap by proposing a novel conceptual model of assessing internal customers' shared service support, brand partnership and corporate ownership in a hierarchical level of banking service performance.

2. Literature Review

Internal Marketing is an associated marketing process derived from the original marketing mix concepts that serves almost all interdisciplinary

functions of an organization by employees both in front office as service performer and in back office as service supporter to external customers (Varey, 1995). Employees act as an internal customer gets a share in the customer service value by partnering with another employee in the service delivery process. The marketing approach has been viewed as competitive strategy & advantage that provides resistance to change and innovation in service performance. The implementation of marketing strategies and participation of employees in the inter-functional co-ordination in achieving organizational competencies is facilitated by internal marketing (Pervaiz K Ahmed, Mohammed Rafiq and Norizan M Saad 2003). The strategic alignments of cross-functional activities relate integration, coherence and focus on marketing or business development.

Internal marketing permeates the upside-down pyramid orientation that shifts internal customer tiers from an external customer to a clerk; a clerk to a supervisor; a supervisor to a manager; a manager to senior VP; and a senior VP to the CEO. It is the external customer who commences the business through internal customer and finally it reaches the CEO in the pyramid approach (Jacka J. Mike, 1994). The customer value pyramid approach is a transformation from satisfaction–based to a commitment-based internal marketing (Lowenstein, 1997). It is this niche marketing concept that provides customer loyalty by creating customer value. The loyalty pyramid is to reduce risk and not to maximize utility by encouraging repeated purchasing (Bell, 1998).

Superior customer value leads to customer loyalty. Loyalty and profits are strongly linked to value created for customers (Reichcheld and Sasser, 1990). The change in 5% more of customer retention or reduction of defect rate leads to 40-50% increase in value profits. The value is categorized for shareholders, customers and stakeholder in the form of customer value-in-exchange, customer value-build-up and customer value dynamics model based on internal customer service (Khalifa, 2004) resulting in customer value increase with utmost satisfaction and effective behavioural change.

Internal customer service (ICS) encompasses employee engagement, self ratings of employees for each product, employee's contribution, senior management commitment & measuring of performance for improvement of customer service which results in need for establishment of reporting standards of customer service (Seibert and Lingle, 2007). It is about people equity factor that is whether the understanding of people is aligned with the strategy and their role in achieving business objectives. Superior business performance is identified with strong relationship of internal service and top leaders' constant emphasis on quality and values. Internal marketing extends as internal relationship marketing to ensure establishing relationship among employees by way of knowledge renewal. The four phases such as energizing, code breaking, authorizing and diffusing are depicting internal marketing cycle in the knowledge renewal process through hierarchical, inter-functional and network exchanges (Ballantyne, 2000a, and b). Internal customer service is approached at times of financial service collection using three Cs namely customer, competence, courtesy with orientation in hiring, training, customer relation, quality assurance, supervisory and leadership. The collection process in financial services is made successful while adopting transformational principle of connecting 'truth', 'teach', and 'transmit' and 'talk' (Hubbell, 2007).

Internal marketing initiative is used to build corporate branding using four constitutes namely internal customers, training and education, quality standards and reward system (Papasolomou and Vrontis, 2006). The initiative on a constant basis exhibit organizational reality through people, service and customer centric based organizational culture. Banking service staffs embody the service brand in the customer's eyes since in many cases the service staffs is the only point of contact for the consumers (Gronroos, 1994). Corporate identity value is strengthened by expanding the traditional 'four Ps' with additional six Ps such as Philosophy, Personality, People, Performance, Perception and Positioning (Balmer, 1998).

There are classical approaches established by consulting firms like 'ivija 3600' (2008) and 'Interagency Advisory Group (IAG) Committee on Performance Management and Recognition (1993)' facilitate employees to evaluate their performances especially on the focus of organizational and employee's contribution to individual group/team work. Ivija prescribed the feedback evaluation approach by self, manager, report, colleague, and customer to get an average score on employee's competency comprising of factors such as strategic perspective, leadership, teamwork, decision making, flexibility, creativity and innovation. Similarly, IAG proposed evaluation of individual, employee's

contribution to team, group performance and no individual performance. The measure of employee's contribution is related to the study of IM, the IAG approach is presented. It is proposed that organization emphasizes on team's performance but still individual evaluation and recognition system work well. The organizational culture, the environment relate to the evaluation along the focus continuum from individual-focused approach towards a team-focused approach. The criteria include individual contribution to work group, to the group process, to the improvement of group process skills. The construct comprises of rating on the 'involvement in the group activity', 'assisting the group in accomplishment of objectives, 'contribution to improved communications', fostering or maintaining positive relationship', 'support of team work or team building', and 'improvement of group process skills'. The study is creating such an evaluation approach to measure the support service in building team but still focused on the individual and measures internal marketing components and strategic perspectives.

3. Conceptual Model and Work Plan

IM as internal associate marketing is operationally defined as the process of increasing internal customer service values, brand partnership and corporate ownership among internal customers at different tiers as service performers and service supporters due to influences of internal marketing mix in retailing, wholesale and investment opportunities to external customers. Internal customer mix [input], internal customer-pyramid orientation [process] and internal customer service value, brand value partnership and corporate value ownership act interdependently in banking service performance [output] by enhancing retailing, wholesale and invest business avenues for external customers.

Conceptual model of Internal Marketing (IM) process is proposed keeping in view of the composite service needs among internal customers as a commitment to external customers. The internal customers vary in their roles and responsibility in addition to internal marketing and therefore, they are treated as Tier I, Tier II and Tier III. It is identified with the core banking system in banking services depending on the position of internal customers, the composition of services and its volume of transactions as high-end customers namely Titanium, Platinum, Gold and Silver in the case of retailing, small-medium-large in the wholesale/corporate and short-mid-long term in investments. The composition is in the structural form of cluster dealt by internal customers and at the same time, the internal marketing mix is also offered with variation in the composition of IM mix. The growth opportunities for internal customers depend on the shared internal customer services and business performances. The intention of internal customers are made clear in the form of IM mix components like rewards /compensation (three alternative packages), internal communication (three alternative forms), supervisor/leadership (three set of guidelines), intangible benefits (three alternative list of privileges) and intermediary (three distinct roles). The perception of internal marketing mix and the needed support from one another internal customer's commitment towards banking service performance is assumed to vary positively in the conceptual model. The propped relationship of IM mixes are, IM mix I for Tier-I internal customer, IM mix II for Tier-II internal customer and IM mix III for Tier-III internal customers; the focus of Tier –I internal customer towards Customer service value, Tier-II internal customer for brand value partnership and Tier-III internal customer for corporate value ownership; the functional support committed by all three Tiers of internal customers interdependently for high-end customers in retailing, corporate customers in wholesale and long term customers in investments. The overall perspective of the model is the interrelationship of internal customers and their committed focus on internal customer value depending on the composition of internal marketing mix. The model is attempted to study the indirect effect of the internal marketing mix on the internal customer service value, brand value and corporate value rather than the direct effect of job satisfaction, organizational commitment, service quality etc.

The following are hypotheses proposed to be studied to test the proof of conceptual model. There are about fifteen hypotheses formulated to find partial relationship between IM mix, customer pyramid orientation and banking service performance. The conceptual model is presented in Figure 1 with an indication of hypotheses with its relationship and direction.

H_1: Internal marketing mix I positively influences Tier I internal customers to extend service support to retail, wholesale and investment banking services

H_2: Internal marketing mix II positively influences Tier II internal customers to extend service support to retail, wholesale and investment banking services

H_3: Internal marketing mix III positively influences Tier III internal customers to extend service support to retail, wholesale and investment banking services

H_4: Internal marketing mix positively influences internal customers to extend service support to retail, wholesale and investment banking services

H_5: Internal marketing mix positively influences internal customer's service value, brand value and corporate value as banking service performance

H_6: Internal customer support service positively influences internal customers' service value, brand value and corporate value as banking service performance

H_7: Tier I internal customer support service positively influences internal customers service value as banking service performance

H_8: Tier II internal customer support service positively influences internal customers' brand value as banking service performance

H_9: Tier III internal customer support service positively influences internal customers' corporate value as banking service performance

H_{10}: Internal customers' service value positively influences the internal customers' perception on brand value as banking service performance

H_{11}: Internal customers' perception on brand value positively influences the internal customers' perception on corporate value as banking service performance

H_{12}: Internal customer's commitment of support service is positively influence by wholesale banking service performance

H_{13}: Internal customer's commitment of support service is positively influenced by investment banking service performance

H_{14}: Internal customer's commitment of support service is positively influenced by retail banking service performance

H_{15}: Internal customer's commitment of support service and internal customer's service, brand and corporate value of banking service performance is positively influenced by internal marketing mix

4. Methodology

4.1 Work Model and Plan

The methodologies of research include both qualitative and quantitative approaches in data collection as it involves three levels of employees in banking services. The first level employees who are in contact with external customers are operationally called as Tier I-internal customer and the second level of supporting staff is referred as Tier II-internal customer and the third top level employees are coined as Tier III-internal customer. The study focuses on the interaction effect of the all three tiers of internal customer with a specific orientation to customer-pyramid that depict four tiers of customers. Servicescape, Photo Elicitation Technique (PET) and Zaltman Metaphor Elicitation Technique (ZMET) are used to assess the internal business situation, brand value and customer value in banking service premises qualitatively. Servicescape is the tool proposed to study totality of the ambience and physical environment in which a banking service occurs PET involves using photographs or film as part of the interview by asking internal customers to discuss the meaning of photographs, films or videos. In this case the images can be taken by the researcher with the idea of using them to elicit information, they can belong to the branch staff group photographs or movies, or they can be gathered from other sources including archives, newspaper and television morgues, or corporate collections. Typically the interviewee's comments or analysis of the visual material is itself recorded, either on audio tape or video, etc. The Zaltman metaphor elicitation technique (ZMET) is a patented market research tool (1995). ZMET is a technique that elicits both conscious and especially unconscious thoughts by exploring people's non-literal or metaphoric expressions. It is proposed to as Bank staff to collect a set of pictures that represent their thoughts and feelings about their support each others in varied levels. Survey and interview method is proposed to be employed for second and third tier of bank employees. All variables in the study are assessed quantitatively in both survey and interview methods.

The Deposit schemes are:

- Savings Bank Account
- CUB-Excel
- CUB-Young India
- CUB-Janata Savings
- Current Deposits
- CUB-Classic Plus
- Monthly Savings Deposits
- CUB-VIP
- CUB-Apoorva
- Fixed Deposits
- CUB-Srichakra
- CUB-Flexi Fix
- CUB-Smart
- CUB-Tax Saver Gold
- CUB-Tax Saver Silver

CUB Loan schemes include:

- CUB-Consumer loan
- CUB-Easy ride
- CUB-Yoha Vahana
- CUB-Sulabh
- CUB-Dharani Loan
- CUB-Swamy Griha
- CUB-Vidhyavani
- CUB-Bazaar
- CUB-Easy business
- CUB-Dharani special
- CUB-Sona

Figure 1 Conceptual Model of Internal Marketing Process

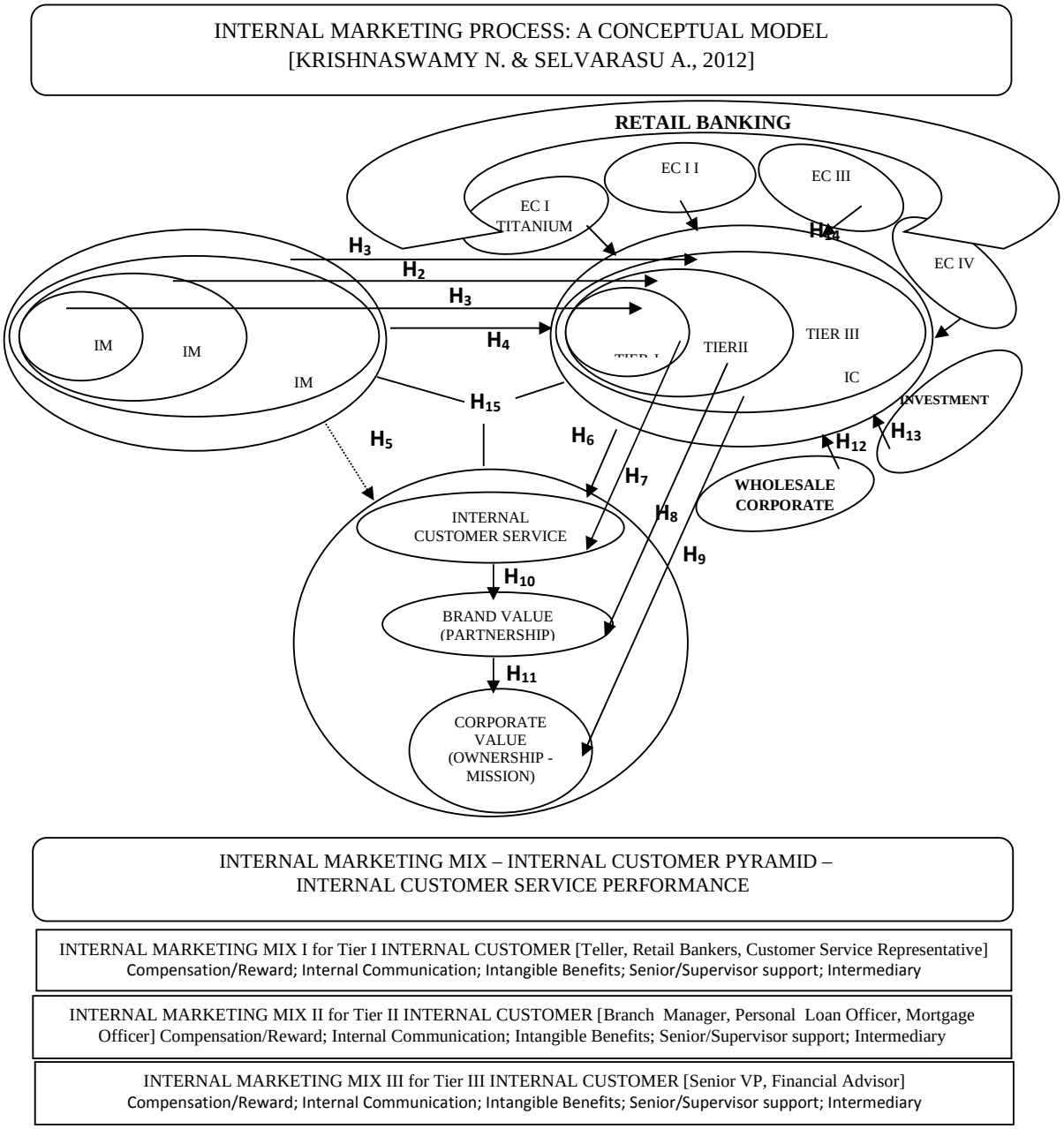
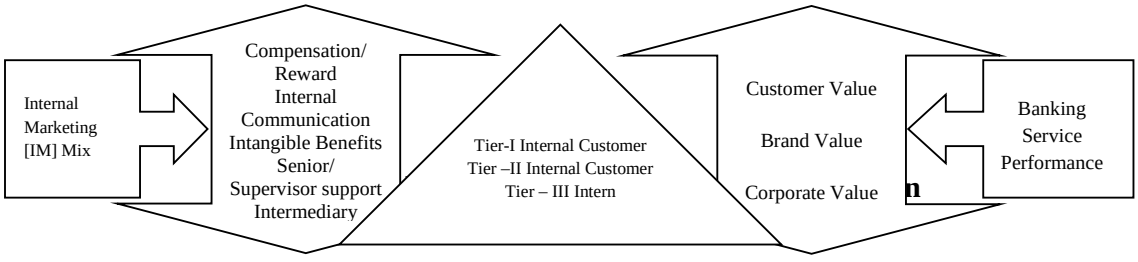


Figure 2 Input – Process – Output Model of Internal Marketing



Task Name	Quarter 1			Quarter 2			Quarter 3			Quarter 4		
Definition phase	M -1	M -2	M -3	M -4	M -5	M -6	M -7	M -8	M -9	M -10	M -11	M -12
Kick off meeting												
Establish feasibility												
Finalization of work plan												
1st pre-test meeting for internal marketing perception measuring scale items												
1st Interim report and models												
Stage 1 (Measuring Tool selection)												
Short listing of employees												
Short listing of measuring tool for IM perception												
Short listing of measuring tool for Customer-pyramid orientation												
Short listing of measuring tool for Banking service performance [Internal Customer service - Brand Value - Corporate [Governance]Value]												
Stage 2 (Qualitative assessment of Branch outlook)												
Short listing of branches and on its outlook [signage] photograph												
Short listing of banking services and its portrayal Photograph												
Participation and selection of photographs by employees - Tier I [Teller/Retail Banker]												
Participation and selection of photographs by employees - Tier II [Branch Manager, Officer (Personal Loan/Mortgage)												
Participation and selection of photographs by employees - Tier III [Senior Officers/ Financial advisor]												
Final report stage 1												
Stage 3 - hosting of survey instrument/ questionnaire on surveymonkey.com												
Mediation and facilitation in administering and filling up of questionnaires by employees - Area 1												
Mediation and facilitation in administering and filling up of questionnaires by employees - Area 2												
Mediation and facilitation in administering and filling up of questionnaires by employees - Area 3												
Mediation and facilitation in administering and filling up of questionnaires by employees - Area 4												
Final report stage 2												
Stage 4 - Compilation of Data and report writing on stage 2												
Editing and coding of data - Area 1												
Editing and coding of data - Area 2												
Editing and coding of data - Area 3												
Editing and coding of data - Area 4												
Final report stage 3												
Stage 5 Final Research Project Management												

Stage	Colour Code	Duration	Dependency
0	Green	2Months	
1	Blue	3Months	Stage 0
2	Purple	3Months	Stage 1
3	Red	3Months	Stage 2
4	Yellow	4Months	Stage 3
5	Light Blue	1Month	Stage 4

The area of study is in southern part of India that is a traditional and ancient Bank namely City Union Bank Limited (CUB) which has more than 300 branches across India. CUB is established since 1904

and its banking products and services spread from deposit schemes to mobile banking.

In addition to wealth management schemes, internet banking, SMS banking and mobile banking services have also been offered by CUB with its corporate office in Kumbakonam, Tamil Nadu. Employees of CUB have to be selected with stratified random sampling that meets 99% level of confidence and 25% co-efficient of variation around 500 samples in three clusters with random sampling distribution of Tier I, Tier II and Tier III for every tier of customers. The key question about the awareness about 'the utility of internal marketing process to support each others to commit towards servicing account holders in CUB' is proposed to ascertain the desired sample size with an accuracy of 0.6 intervals. Using advanced statistics of multi-variate analysis namely logistic regression and structural equation modelling (SEM) are proposed to identify the linkages among variables of internal marketing mix and business performance. Logistic regression is used to study the prediction of banking service performance due to internal marketing mix based on categorical expression of internal customers orientation either to support services or performer of service. SEM is proposed to test the confirmatory and exploratory causal relations in theory testing and development of IM mixes and its causal relations in banking service performance.

4.2 Internal Marketing Mix Components

Earning rewards /compensation is partly within employees' control by allowing them to create interest and anticipation as well as giving opportunity to interactive learning and accreditation. Generally doing what's expected of them, and even being the best at what they do does not guarantee of advancement. It is important to increase employees' value to the organization. Empirical findings confirmed that internal marketing, organizational commitment and organizational citizenship behaviours instil positive direct effect on banks' market orientation. In addition, organizational commitment should have positive direct effect on organizational citizenship behaviours. Internal communication includes top-down management driven, bottom-up employee driven and lateral management or employee driven. Employee publications [paper or electronic], employee intranet, email, memos/letters, inserts/enclosures, large group meetings, small group meetings, bulletin board, social media, grapevine, video, powerpoint slides, vodcasts/podcasts, webinars, face-to-face and displays/exhibits. Supervisor/senior leadership specifies understanding the organization to prepare for a promotion, increasing job responsibility, getting innovative assignments, setting promotional goals and communicating employee's desire. Intangible benefits are 'treating with respect', 'treating well', 'enhancing interpersonal relationship', 'allowing comfortable working environment', 'developing talents and potential' and 'work interestingly'. Intermediary denotes variables namely 'work related information flow', 'group activities to gain understanding from others' and 'channel for filing complaints'.

Customer-pyramid orientation is studied using interview method with the question components like 'familiarity and ideas of the term 'IM', 'reason for adopting IM and its role', 'fundamental aim of IM', 'implementation of IM and its key activities/key benefits', 'difficulties in implementing IM', 'measuring effectiveness of IM' and 'changes and improvements in IM practice'.

Banking service performance is a measure of performance only construct planned based on the internal customer service value, brand value and corporate value as independent and interdependent factors. Internal Customer values are the intangible benefits promised to bank staff while performing their task in association with other levels of bank employees in the organization. Branding service value is established by a service contract internally for creating ownership for service brands across all levels of the organization (Dobree and Page, 1990). The following components namely 'building a brand proposition', 'overcoming internal barriers', 'measuring delivery against the proposition', 'continual increment' and 'expansion' are measures of brand value. Corporate value is based on the corporate reputation and its assessment have been done in financial methods like share market valuation, intrinsic value and statutory reports on corporate reputation (Dowling, 2006). Corporate value drivers are human, knowledge apart from reputation and financial etc. It is important to measure the realization of customer pyramid orientation in an upside-down pattern in relation to corporate value. Corporate value comprises of internal components like mission, vision, organizational value, core values, brand architecture, service attributes and internal brand identity (Urde, 2001). The distribution of variables, factors and dimensions of internal marketing are presented in the following table.

Table 2: Scale Constructs and Related Variables, Factors and Dimensions

IM Scale [Liao J.F. et al., 2004]	Customer-pyramid Orientation Scale	Banking Performance Scale
Compensation/Reward Internal Communication Intangible Benefits Senior/Supervisor support Intermediary	Manageability support Support service Productivity Support	Internal Customer service performance Brand value perception Corporate Value perception [Corporate Governance]
[Seven-point Likert Scale: 7- Strongly agree; 4-Neither agree nor disagree; 1-Strongly Disagree]		

Table 3: Distribution of Customer Pyramid based on Internal Customer Tiers

Tier I Internal customer [Both Senior and New Generation Employees]	Tier II Internal customer [Both Senior and New Generation Employees]	Tier III Internal customer
Tellers Retail Banker Customer Service Representative	Branch Manager Personal Loan Officer Mortgage Officer	Senior Executive Officers Financial Advisor
210 Staff	210 Staff	80 Staff

The sampling units are proposed to be 60 branches out of 300 branches where the internal marketing is in vogue. The sample size is proposed to be verified with the definite population of CUB banking staff in the senior cadre who are more traditional and new generation staff who are more risk taking and having the drive for speed in growth of their career path.

4.3 Measure of IM Process and Related Scales

IM Marketing perception is measured using 22 point scale from Liao-2004. IM Scale was developed based on Marketing Mix, Human Resource and Literature Review on Marketing Research. There were 147 items in its initial pool. The final validated scale has been adopted for the purpose of IM perception among bank staff. The other two scales have been proposed to be developed using the dimension presented in the paper and the same has been proposed to be pre-tested in both qualitative and quantitative measures. The questionnaire is proposed to be pre-tested in 2 stages. The scale development is proposed to follow firstly, by qualitative pre-test among internal customer pyramid orientation of managers and Scholars and secondly, by questionnaire for frontline employees in the banking service industry. The scale and scale constructs are presented in Appendix A.

5. Implications of Results and Discussion

The study proposes marketing support facility provided by all three categories of bank employees each other as a commitment to service performance. The IM initiative program as a mix is expected to vary among different categories of bank staff, officers and executive officers. The degree of variation in the components of IM mix is again expected to influence the bank employees both as independent and as interdependent components. The level of interdependency is also expected to vary with the banking products and services namely retailing, wholesale and investment banking. The support service as a commitment to a retail banking is expected to be different from the wholesale and investment banking. The degree and intensity of each component influence the expected level of support service to the actual frontline performer. The realization of the needed support by the supporting employee is driven by the IM initiative mix component as a process. The experience out of internal marketing initiative sets awareness and expectation among employees at different tiers in the support services. It is proposed to add value in the form of customer service value, brand value and corporate value. The transformation in the employee is proposed to happen while IM initiative is implemented with a special focus. The proportion of the direct role of employee to the support service is a measure of internal marketing and its effectiveness. The increase in the proportional allocation on the support service from direct role indicate employee transformation from satisfaction to commitment and it is otherwise termed as a movement of individual duties to team commitments. IM has proved its results in human resource management implications and it is proposed to yield in the marketing as well as business development function in banking service

performance in form of added values in an organization.

6. Conclusions

The aim of the paper is to orient the IM concept and its application from human resource to marketing as well as business development functions. It focuses on marketing and its implication of customer pyramid orientation from upside-down approach. The IM Initiative is proposed to be studied in the form of IM mix with five components and in the process of qualitative research exercise few more components are proposed to be identified. The internal customer orientation is expected to vary depending on the need for internal customer service support on the composite banking services from retailing, wholesale to investment banking. The real application is proposed to be seen in the form of banking service performance like internal customer service value, brand value and corporate value. The special focus of IM concept is to drive employee attention and commitment toward core values of corporate brand building using service performers and service supporters in baking sectors. The contribution of research is expected to result in theories connected to marketing applications of IM and its mixes among internal customer tiers of pyramid.

Acknowledgments

This work was financially supported by FCT through the Strategic Project PEst-OE/EGE/UI0315/2011.

References

[1] Ahmed, P. K. and Rafiq, M. (2003), Internal marketing issues and challenges, *European Journal of Marketing*; 37, 9; pg. 1177

[2] Ballantyne, David. (2000b), Internal relationship marketing: a strategy for knowledge renewal, *The International Journal of Bank Marketing*, 18, 6; 274-286.

[3] Ballantyne, David (2000a), 'The Strength and weaknesses of Internal Marketing' in Varey, R. And Lewis, B.(Eds), Internal Marketing Directions for Management, Routledge, London.

[4] Balmer, J. M. T. (1998). Corporate branding and Connoisseurship, *Journal of General management*, Vol.21 nº.1, pp 24-46.

[5] Bell, S. J. (1998), The customer loyalty pyramid, *Academy of Marketing Science, Journal*, 26, 4; p 350.

[6] Berry, L.L., Hensel, J.S, and Burke, M.C. (1976). Improving retailer capability for effective consumerism response. *Journal of Retailing*, vol.52(3), 94.

[7] Berry, L, L.（1981）－ The employee as customer, Journal of Retail Banking, 3（1）, 25－28.

[8] Dobree, J. and A. S. Page (1990). 'Unleashing the Power of Service Brands in the 1990s', Management Decision, 28, pp. 14–28.

[9] Dowling, G. (2006), How good corporate reputation create corporate value, *Corporate Reputation Review* (2006) 9**,** 134 – 143. doi: 10.1057/palgrave.crr.1550017

[10] Gronroos, C. (1994). From scientific management to service management: a management perspective for the age of service consumption, *International Journal of Service Industry Management*, Vol.5 No.1, pp 5-20.

[11] Hubbell, W. D. (2007), *Assessing a customer service model in the financial services industry: a phenomenological study'*, Dissertation, ProQuest Information and Learning Company 300 North Zeeb Road, P.O. Box 1346, Ann Arbor, MI 48106-1346

[12] Jacka, J. Mike. (1994), The upside-down pyramid, *The Internal Auditor*, Institute of Internal Auditors, Inc. 51, Nbr 3; pg. 62

[13] Jun-Fang, Liao. (2009), The effects of internal marketing on customer orientation in the banking industry, *ProQuest Dissertations and Theses;* ABI/INFORM

[14] Khalifa, A. S. (2004), Customer value: a review of recent literature and an integrative configuration. *Management Decision*; 42, 5/6; pg. 645

[15] Krishnaswamy, N. and Selvarasu, A. (2013), 'Effect of Internal Marketing Mix on Cusotmer Pyramid oriented Banking performance', *AIMS International Journal of Management*, Volume 7, Number 1, pp. 41-56

[16] Liao, J.F., Wu, C. H., Jou, Y. H., Huang, Y.Y., (2004), 'A Study of the relationship between internal marketing, customer satisfaction and customer oriented behaviours', International issue, *Sun-Yat-Sen Management Review*, 5

[17] Lowenstein, M. W. (1997), 'The customer loyalty pyramid', Westport, CT: Greenwood. in Aminu S.A. (2012), 'Empirical investigation of the effect of relationship marketing on banks' customer loyalty in Nigeria', *Interdisciplinary journal of contemporary research in business*, vol.4 no.6 pp 1249-1266

[18] Mishra s. (2010), 'internal marketing – a tool to harness employee's power in service organizations in India, *International Journal of Business and Management*, 5, 1, p185-198.

[19] Orr D. (1993), '*A Report of the working Group on Evaluating Team performance'*, Interagency Advisory Group [IAG] Committee on Performance Management and Recognition. Gary McLean, FCC(202)632-7541, FEC (202)219-4290

[20] Papasolomou, I. and Vrontis, D. (2006), 'Building corporate branding through internal marketing: the case of the UK retail bank industry',*The Journal of Product and Brand Management*, 15, 1; pg. 37

[21] Reichheld, Fredrick and Sasser, W. Earl Jr. "Zero Defections: Quality Comes to Services." *HBR* September–October 1990.

[22] Seibert, J. and Lingle, J. (2007), Internal Customer Service: Has It Improved?', Quality Progress; Mar; 40, 3; p.35

[23] Steyn and Rooyen, M. van (2011), 'Internal communication at Dailmer Chrysler South Africa: A Qualitative Prescriptive on Two-way symmetrical communication and Internal Marketing', *Journal of Marketing Development and Competitiveness*, 5 (4), pp131-144.

[24] Urde, M. (2001), 'Core value based corporate brand building', *European Journal of Marketing;* 2003; 37, 7/8; pg. 1017

[25] Zeithaml, Valarie A.; Rust, Roland T.; Lemon, Katherine N. 'The customer pyramid: creating and serving profitable customers', *California Management Review* Summer 2001, Vol. 43 Issue 4, p118

[26] Varey, R. J (1995), 'Internal marketing: A review and some interdisciplinary research challenges', Internatio*nal Journal of Service Industry Management,* 6, 1; pg. 40

Others:

[1] http://ivija.com/ivijasuite/ivija360, website visited on 20.11.2012

APPENDIX A

Construct of Interview Schedule, IM perception Scale and CPO and BSP Scale adopted and derived

Interview schedule adopted for interviewing the senior executive officers, branch managers and front-line employees in banking service

1. Are you familiar with the term 'IM'?
2. What are the underlying ideas of IM within the organization?
3. Why has IM been adopted within the organization? What is its role?
4. What are the fundamental aims of IM in this organization?
5. How is IM implemented within the organization? What are the key activities?
6. What are the key benefits of the adoption of IM?
7. What are the main difficulties with the implementation of IM?
8. How is the effectiveness of IM measured?
9. What needs to be changed or improved in order to improve the IM practice within the organization?

II. Questionnaire – IM Perception scale

Communication

1. The company often announces new policies to us by holding meetings.
2. The company often shares work-related information at Employee events.
3. Web normal can gain understanding of the company policies and practice through attending formal meetings such as department meetings.
4. Company regularly communicates its philosophy and values through training courses.
5. Company regularly reinforces our identification with the company through participation with external sponsor events.

Supervisor

1. Our direct supervisor should motivate us to give him /her best efforts
2. Our direct supervisor is always proactively understand if we encounter job related problems
3. Our direct supervisor fully understand our work performance
4. Our direct supervisor tries to have us provide feedback about him/her leadership
5. Our direct supervisor is regularly discuss with about career development

Intangible Benefits

1. The company treats employees with respect
2. The company treats employees well
3. In my work, I can enhance my interpersonal relationship
4. The company tries to provide us a very comfortable working environment
5. My current job allows me to develop my talents and potential
6. The company tries to make our work interesting

Compensation/Reward

1. The company regularly investigates and understands the employees benefits of competitors
2. The company regularly investigates and understands the employee's salary scale of competitors
3. The company sets up different incentive schemes for different departments

Intermediary

1. The company often announces and shares work-related information with us on the intranet
2. The company often sponsors various employee related group activities to gain support and understanding from employees
3. The company provides us good channel for filing complaints

III. Customer pyramid orientation scale

1. Manageability support
2. Support services
3. Productivity support

IV. Banking service performance scale

1. Internal customer service value [performance based value of 'service contract']
2. Brand value [building a brand proposition', 'overcoming internal barriers', 'measuring delivery against the proposition', 'continual increment' and 'expansion']

Corporate value [mission, vision, organizational value, core values, brand architecture, service attributes, and internal brand identity]

International Journal of Latest Trends in Finance & Economic Sciences

Call for Papers

The journal welcomes high quality original research papers, survey papers, review papers, tutorial, technical notes as well as discussion papers.

- International Economics
- Monetary and Fiscal Policy Decision-Making
- Financial Economics
- Financial Analysis
- Financial Risk Analysis
- Corporate Finance
- Forecasting Financial Markets
- International Finance
- Pricing and Risk of Financial Instruments
- Public Finance Decision-Making
- Economic Development
- International Banking and Portfolio Management
- International Political Economy
- Financial Market Regulation
- Transition Economies
- Exchange Rate Modelling
- Economic Policy
- Portfolio and Asset Management
- Advances in Financial Econometrics and Statistics