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CONTENT

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THE EFFECT OF R&D EXPENDITURE (INVESTMENTS) ON FIRM VALUE: CASE OF ISTANBUL STOCK EXCHANGE

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KEYWORDS

R&D, firm value, stock returns, frirm size.

ABSTRACT

The relationship between Research and Development (R&D) and creating value has been widely discussed in the past. Most of the studies revealed that there were positive relationships between R&D investments and firm value. The research has shown that R&D investments create value for firms due to their competitive advantages for the firm, when they are used as a differentiation strategy that creates new products of processes that are hard to be easily imitated by the competitors and that this creates brand equity. This study tested the ability of R&D investments to explain returns using single and multiple variable regression models. It was observed that (*i*) there were positive and strong relationships between the intensity of R&D investments and returns and (*ii*) firm size, contrary to expectations, was not related with returns.

1. INTRODUCTION

Maximizing future returns of stockholders is one of the principle aims of enterprise management. In this case, it was reported that the enterprises that maximize their market capitalization will be considered to have fulfilled their aims instead of those that make more profit or higher sales revenue. The expected future value of a company's stock reflects firm value and this value mostly depends on the marketing activities of the enterprise (Osinga et al., 2011). Marketing and advertising expenditure made by enterprises can be considered as an investment instrument that will increase the value of the enterprise in the long term (Joshi and Hanssens, 2010). In financial terms, marketing expenditure will enhance future sales, profits and thus the cash flow of enterprises (Graham and Frankenberger, 2000). Similarly, the positive effect of marketing expenditure such as R&D and advertisement on intangible assets like brand equity can also grant a competitive advantage to the enterprise and increase of the value of the enterprise in financial terms.

The relationship between R&D investments and creating value has been analyzed in the past. Most of the studies revealed that there were positive relationships between R&D investments and firm value. The evidence has shown that R&D investments create value for firms due to their competitive advantages for the firm when they are used as a differentiation strategy that creates

new products or processes that are hard for competitors to imitate and that create brand equity[1] (Chauvin and Hirschey, 1993; Chan et al., 2001; Morbey, 1988; Bae and Kim, 2003).

Thus, the aim of this study was to determine the effect of marketing activities on firm value. In this context, through the comparison of this study with one or several sectors and in previous studies carried out abroad, the study analyzed the contribution of R&D investments on creating firm value over the stock values of 40 enterprises that are listed on the Istanbul Stock Exchange (ISE). This study presented proof that R&D and firm value are positively correlated over a 5-year period, from 2006 to 2010.

The literature on the effects of R&D investments on firm value will be reviewed and the hypotheses of the study will be formulated in the following section. The next section will define statistical methods that were used to test the data and hypotheses and final part will discuss the results and their managerial effects.

2. LITERATURE REVIEW

2.1. R&D Investment, Firm Size and Firm Value

Investment in R&D is, in real terms, an investment in intangible assets that contribute to the growth of a firm in the long-term. Therefore, market capitalization of a firm reflects the current value of the intangible assets, as much as that of the tangible assets (Chan et al., 2001). Successful R&D investments results in a new product or service that enables the firm to distinguish itself from other firms. Much of the previous research has shown that (Chan et al., 2001; Bosworth and Rogers, 2001) there is a positive correlation between R&D investments and stock price returns in the following period.[2]

Morbey (1988) found that there was a relationship between R&D investments and the performance of many US firms. Furthermore, the study emphasized that R&D expenditure should be increased if they cause an increase in sales (Morbey, 1988).

In a study carried out in the USA, Germany and Japan, it was determined that US firms made more R&D investments than their Japanese and German rivals. Investments in research and development play a more important role in innovations and the future progress of US firms when compared to those of Japanese firms. It was concluded that, with regard to German firms, the abovementioned relationship was positive, however without a significant coefficient. On the other hand, it was reported that there was a similar relationship between German and Japanese firms in terms of R&D expenditure and market capitalization. In conclusion, research conducted across all three companies revealed that there was a positive relationship between R&D expenditure and market capitalization (Bae and Kim, 2003).

In a study that analyzed the effects of R&D expenditure on the market capitalization of a firm (Chauvin and Hirschey, 1993), it was found that research and development investments was an

[1] Brand equity refers to the positive difference in which a customer agrees to pay more for a product than other products because he/she knows and is familiar with the product brand (Simon and Sullivan, 1990).

[2] In many studies, R&D investments were measured as a percentage of sales, total assets or total market capitalization. The use of R&D investment can be an indication of the firm size and therefore, it can conceal the real relationship between firm performance and R&D investment. This study used a R&D intensity variable (R&D expenditure as a percentage of net sales) to measure R&D investments.

important determinant for the market capitalization of firms just like cash flow, growth, risk and market share. The results of the study that was conducted in manufacturing and non-manufacturing firms demonstrated that the market capitalization of both types of company was affected by R&D expenditure. According to the same study, the effectiveness of R&D expenditure can show variations according to firm size (Chauvin and Hirschey, 1993).

Similar to other studies in the literature, in a study carried out in Australia (Bosworth and Rogers, 2001), it was found that there was a positive and significant relationship between firm value and R&D expenditure. Conolly and Hirscey (1984) found a complicated relationship between R&D, market structure and profit-based market capitalization. The reason for this was believed to be the positive effects of R&D on profit and the negative integration of R&D and intensification.

In addition to these studies in the literature, there is a positive relationship between R&D intensity and firm performance (Hsieh, Mishra and Gobeli, 2003). Furthermore, according to a previous study (Hsieh, Mishra and Gobeli, 2003), R&D investment affected market capitalization two times higher than investment in tangible assets.

According to another study (Szewczyk, Tsetsekos and Zantout, 1996) there was a significant relationship between the announcement of research and development expenditure and market price reactions to it. This relationship was found to be positive in high-technology firms, while the same relationship was found to be negative in low-technology firms. Based on the data in the literature, it is observed that R&D expenditure has significant impacts on firm value. The following hypothesis can be produced in light of the above discussions:

H1: There is a positive relationship between future stock returns of a firm and the R&D intensity of that firm.

3. METHODOLOGY AND DATA

The data concerning the stock return of the 2006-2010 period of 40 companies listed on the ISE, in addition to data on R&D expenditure and market capitalization/book value were used in the study. Data was collected from the database on the official website of the ISE (www.borsaistanbul.com). The availability of all data belonging to the 2006-2010 period was the principle criteria in selecting the firms whose data was used. This limitation arose due to the fact that there is no reliable database in Turkey and that it is not possible to access all data concerning the firms. Furthermore, financial institutions such as banks and insurance companies were not included in the study due to their different financial structures.

Simple and multiple regression methods were used in the analyses. In this context, two models were used to explain stock returns. The models were constructed based on the models developed by Ho et al., (2005) that test the effect of R&D expenditure, advertisement expenditure, market capitalization-book value (mc/bv) and firm size variables on stock returns. The models are presented below:

Model 1:

$$HPR_i(\tau) = \alpha_0 + \alpha_1 RDI_{i,t-1} + \varepsilon_1 \quad (1)$$

The stock returns of a firm in a certain period are affected by various criteria. While some of these factors are internal, some of them are external. A review of the literature on measuring the effect of R&D on stock price reveals that mainly two factors were checked. These factors are firm size (Chauvin and Hirscey, 1993) and sector intensity (Chauvin and Hirscey, 1993; Acs, et.al., 1994).

In a previous study (Chauvin and Hirscey, 1993), it was observed that the effects of R&D expenditure on firm value varied according to firm size. Thus, it can be beneficial to consider firm size as an effective factor on the effectiveness of R&D expenditure. Similarly, Acs et.al. (1994) analyzed the interaction between firm size and R&D and found that R&D studies played a more creative role in large firms when compared to small firms. The study showed that the effects of R&D expenditure varied according to firm size.

In addition to these factors, the study checked the potential effects of *market capitalization-book value and previous year return* variables.

Model 2:

$$HPR_i(\tau)=\alpha_0+\alpha_1 RDI_{i,t-1}+\alpha_2 LNSIZE_{i,t-1}+\alpha_3 MBV_{i,t-1}+\alpha_4 HPR_i(t-1)+\varepsilon_2 \qquad (2)$$

Model 1 is used to test the relationship between R&D expenditure and stock returns, while Model 2 is used to test the effects of mc/bv ratios and firm size on returns, in addition to R&D expenditure.

The variables in the models are presented below:

$HPR_i(\tau)$, return of *i* stock in τ period;

$RDI_{i,t}$ is the ratio of R&D expenditure of firm *i* at the end of *t* year to net sales;

$LNSIZE_{i,t}$ is natural logarithm of total market capitalization of firm *i* at the end of *t* financial year;

$MBV_{i,t}$ is the market capitalization/book value ratio of firm *i* at the end of *t* financial year.

The first model is a single variable regression model, while the second model is a multiple variables regression model. The dependent variable for all models was stock return ($HPR_i(\tau)$). R&D intensity, which was used as independent variable, was measured as the ratio of total net sales to R&D expenditure. Firm size was determined by taking the natural algorithm of total market capitalization of the firm at the end of the financial year (LNSIZE).[3] The established regression model was separately operated for all firms in the sampling.

As mentioned earlier in the text, the study used 5-year data belonging to the 2006-2010 period. Data on annual accounting information, net sales, the shares of shareholders and R&D expenditure were obtained from financial tables published on the ISE. The stock prices of the firms in the sampling were obtained from daily data files compiled by the ISE. For each year, only the firms with available R&D expenditure and stock price data that were needed to make necessary calculations were included. The accounting data for the firms at the end of *t* financial year was matched with stock price at the end of the subsequent year to calculate stock return in a certain period. This was preferred to provide the availability of financial tables of the firms in *t* financial year by the public and to prevent any bias (Ho, Keh and Ong, 2005).

[3] The advantage of using total market value (market capitalization level) at the end of the financial year is that firm size is an objective market criterion. The use of net sales or total assets as the criterion of firm size would not be reliable because they can be affected by the accounting policies practiced by the firm. The use of total market value as the criterion of firm size is the most common approach in research on finance and accounting.

The *Market Capitalization/Book Value* ratio was calculated using the end-year accounting data of the firm. On the other hand, market capitalization was calculated using the accounting data for the firm at the end of the financial year.

Table 1: Descriptive Statistics

Variable	N	Minimum	Maximum	Mean	Median	Standart Deviation
HPR	200	-.60	-.32	-.4828	-.4836	.06233
RDI	200	.0000	.0840	.005976	.003550	.0096259
MBV	200	.00	25.25	2.6938	1.7650	3.02471
LNSIZE	200	28.90	35.92	31.7556	31.3810	1.68501
HPR_{t-1}	200	-.64	-.24	-.4798	-.4800	.07118

Information concerning the independent variables (R&D intensity, market capitalization-book value ratios and firm size) from the previous year was used while constructing the models.

The reason for this was that, in Turkey, the firms listed on the stock exchange announce their financial tables for the current year starting from the April of the subsequent year and thus the investors have to analyze the data of previous year while investing in the aforementioned firm.

4. FINDINGS

Pearson correlation coefficients that show the relationships between the dependent and independent variables in the model are presented in *Table 2*. The shaded areas in the table express the variables with a high probability of linearity. The Pearson test results show that there is a strong, positive relationship between firm size and market capitalization-book value ratio.

Table 2: Corelation Coefficients Between Explanatory and Dependent Variables

	HPR	RDI	MBV	LNSIZE	HPR_{t-1}
HPR	1.000	.258	.088	.112	.215
RDI	.258	1.000	.247	.209	.229
MBV	.088	.247	1.000	.418	.079
LNSIZE	.112	.209	.418	1.000	.096
HPR_{t-1}	.215	.229	.079	.096	1.000

Table 3 indicates the regression results of two models that were used to explain the returns. The results of Model 1, which used the relationship between R&D investments and stock returns, show that there was a positive relationship between annual stock returns and R&D investment intensity. The *F* value that shows the significance of the model is quite high (F=14.088). However, low Adj. R-sq (0.061) is significant in terms of suggesting that other variables apart from R&D investments can affect the stocks. Analysis of the obtained coefficient (α_1=1.669) and t statistics (3.753) values show that there is a linear and statistically significant (99% reliability level) relationship between R&D investments and stock returns. This finding is consistent with the data in the literature.

Table 3: Regression results

F value (Prob > *F*)	Adj. *R*-sq	α (t)	RDI (t) p-value	LNSIZE (t) p-value	MBV (t) p-value	HPR(t_1) (t) p-value
Model 1: $HPR_i(\tau)=\alpha_0+\alpha_1 RDI_{i,t-1}+\varepsilon_1$						
14.088 (0.0002)	0.061	-0.493 (-98.007)	1.669* (3.753) 0.0002			
Model2: $HPR_i(\tau)=\alpha_0+\alpha_1 RDI_{i,t-1}+\alpha_2 LNSIZE_{i,t-1}+\alpha_3 MBV_{i,t-1}+\alpha_4 HPR_i(t-1)+\varepsilon_2$						
5.092 (0.001)	0.076	-0.484 (-5.178)	1.357* (2.892) 0.004	0.002 (.681) 0.497	0.00004 (.026) 0.979	0.141* (2.305) 0.022

* *P<0.01

Regression results of Model 2, which was constructed to check the effect of firm-specific characteristics such as firm size, previous year returns and market capitalization-book value ratio are generally in parallel to single variables model. R&D investments maintained their relationship with the returns at a 1% significance level, like in the previous model (α_1=1.357 and t=2.892). However, contrary to expectations, no size effect was found. On the contrary, the α_1=0.002 and t=-0.681 values of the LNSIZE independent variable reveal that there is no relationship between the returns and firm size. The *F* statistics of the model was found to be significant at a 1% level. Inclusion of internal characteristics of the firm in the model enhanced explanation power of the model.

Although the Adj. *R*-sq value was found to be 0.076, this value is still not high enough. There is still an impression that there are other variables which affect the returns. The Durbin-Watson Statistics results that are used as an indicator of serial correlation generally took values close to 2 in all models.

5. CONCLUSION

This study was carried out to test the power of R&D investments to explain stock returns and thus their effect on creating firm value. The results of the study were generally consistent with data in the literature. Positive and significant (1% level) relationship between R&D expenditure and returns verifies the data in the literature. The aforementioned relationship was apparent in both single variable and multiple variable models. In terms of the analyzed models, the results show that R&D investments affect stock returns; in other words, they create value for the firm. On the other hand, although the effect of firm size on returns has been supported by various studies in the literature, the analyses identified no relationship between the variables. We believe that a larger sampling on the basis of firm size should be used to properly test this effect. Although the study yielded findings in parallel to the literature, the assumption that the contribution of R&D to the firm value was linear is a limitation of the study. Furthermore, the low number of firms with available R&D expenditure data hampers the generalizability of the results.

The inclusion of other variables (like advertising expenditure) that might be related with returns, apart from the explanatory variables used in the present study, will yield more reliable results in future studies. In addition, increasing the number of firms and using a longer period in future studies will be advantageous for the generalizability of the results obtained.

In conclusion, this study determines a significant relationship between stock returns and R&D intensity for the firms that are listed on the ISE. This finding is consistent with the data in the literature. The study found no relationship between market capitalization-book value ratios and stock returns, whose potential effects were analyzed.

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ORGANIZATIONAL CHANGE: THE EFFECTS OF TRUST IN ORGANIZATION AND PSYCHOLOGICAL CAPITAL DURING CHANGE PROCESS

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KEYWORDS

Change, resistance to change, trust in organization, psychological capital.

ABSTRACT

Due to dynamic business environments, organizations must implement changes in their strategies, structures and/or processes when existing conditions are not sufficient to create a competitive advantage in the market. According to Kotter and Schlesinger (1978), most companies must undertake moderate organizational changes at least once a year and major changes every four or five years because of increasing demands from government, growth, competition, technological development, and changes in workforce. With all this movement, organizational change has become a very popular topic for scholars. In this research, factors affecting an individual's response to organizational change were investigated in order to determine how organizational changes can be more successful. The contribution of *psychological capital* on *resistance to change* through *trust in organization* was explored. The research was conducted among 583 employees. The result of the regression analysis showed that psychological capital plays a mediating role between trust in organization to resistance to change.

1. INTRODUCTION

As change is an inevitable part of an organization's day-to-day processes, organizations spend huge amounts of money, time and human capital to be successful in their change efforts. However, Beer, Eisenstat and Spector (1990) noted that change programs often failed or made situations worse. A recent study showed that 58% of change initiatives failed, while 20% created an added value less than expected (LaClair & Rao, 2002). As Kotter (1995) stated, when organizations fail to realize successful change efforts, they lose a great deal of time, money and human resources. Such results have led researchers and practitioners to search how organizations can successfully accomplish change processes. Research has found that reasons for failure in the change process included technological difficulties and lack of money, but most importantly, human related problems (Lawrence, 1954 cited in Foster, 2008). People are still the key to organizational success. Bridges (1991) observed that without employee support, the change process was just a rearrangement of chairs.

Over the last few decades, several studies have focused on understanding and predicting employee reaction to organizational change (Morgan & Zeffane, 2003; Oreg & Sverdlik, 2011; Foster, 2010; Dent & Goldberg, 1999; Bovey & Hede, 2001). Researchers have examined several factors that affect employee reaction and ability to adjust to new conditions, such as participation (Chawla & Kelloway, 2004), perceived justice (Cobb, Foleger & Wosten, 1995), cynicism (Bernerth, Armenakis, Field & Walker, 2007), supervisor/organizational trust and engagement (Mayer & Davis, 1999) and effective communication (Armenakis & Harris, 2002). These antecedents show

that many change efforts fail due to underestimating the importance of the individual differences during organizational change.

This study is based on an individual level perspective of change implementation. So, resistance to change is conceptualized by Oreg's dispositional resistance to change theoretical framework. Oreg stated that people show different responses to change implementations.

Beside, Armenakis & Bedeian (1999) in their review of the organizational change literature, attempted to provide a theoretical framework for organizational change. They indicated that three factors can shape employees' reactions to change efforts. These factors are a) content factors indicating substance and nature of change such as restructuring, reengineering. b) contextual factors indicating forces and conditions existing in a change environment such as culture & climate of organization, trust in organization, perceived organizational support. c) process factors indicating the actions taken in the implementation of a change such as employee participation, commitment, fairness, and open communication.

This research examined employees' reactions to change in the light of Oreg's theoretical framework of dispositional resistance to change. Also, Trust in organization was considered as a contextual factor in order to understand employees' reactions and psychological capital is considered as an individual factor that would have a significant positive effect on diminishing employees' resistance to organizational change. The findings may contribute to better understanding how organizational change process could be more successful.

2. LITERATURE REVIEW

Today's rapidly changing economy and technology underline the fact that organizations need continuous commitment to organizational change. Due to this condition, organizational change has become a very popular subject for scholars and researchers have indicated the importance of change for long-term sustainability of an organization.

2.1. Resistance to Organizational Change

As a result of individual interpretations of the change process, employees respond to organizational change efforts differently. Employees with positive attitudes towards the change effort will usually support its implementation because they feel it will result in, for example, an optimal amount of task variety, a new position, better working conditions, a new promotion structure, etc. On the other hand, some employees view organizational change in a negative way due to unfavorable consequences of the change efforts. For example, major change processes will create a great deal of uncertainty and stress.

The phrase 'resistance to change' gained popularity in the 1970s (Foster, 2010) and the phenomenon has become generally accepted as part of the change process. Previous approaches towards resistance to change focused on situational antecedents (Coch & French, 1948 cited in Foster, 2010; Zander, 1950; Tichy, 1983), but recent studies have begun to focus on factors related with the individual (Wanberg & Banas, 2000; Oreg, 2003; Foster, 2010).

In 2000, Piderit (2000) defined resistance as a tridimensional (negative) attitude, suggesting a model of three different expressions of an employee's evaluation of an object or situation: a) the emotional dimension (an individual's feelings in response to the object, e.g., angry, anxious), b) the intentional dimension (an individual's evaluations of an attitude towards the object, based in past behaviors and intentions to act, e.g., complaining about the change, trying to convince others that the change is bad) and c) the cognitive dimension (the individual's beliefs about the object, e.g., Is it necessary? Will it be beneficial?). Like Piderit, Oreg (2003) conceptualized resistance to

change with a comprehensive approach by noting affective, behavioral and cognitive dimensions, but on an individual level.

Oreg et al. (2008) noted that change is everywhere. It affects all individuals and every aspect of their lives. However, people exhibit different responses to change. Some people accept the notion of change and actively seek it out, other people avoid it if possible and resist it otherwise. Oreg (2006) observed that people with a high dispositional resistance to change are less likely to voluntarily incorporate change into their lives. Usually, these people have stable personality traits. When change is imposed upon them they are more likely to experience negative emotional reactions, such as anxiety, anger and fear.

Oreg (2003) developed a resistance-to-change (RTC) scale that complemented institutional determinants of resistance to change (Hannan & Freeman, 1984) and the psychological processes underlying resistance (George & Jones, 2001) by bringing individual differences into the organizational behavior literature. This scale includes a) **Routine seeking**: A behavioral dimension consisting of people's inclination to adopt routines. Routine seeking involves the extent to which one enjoys and seeks out stable and routine environments (Oreg et. al., 2008). b) **Emotional reaction**: This factor reflects the amount of stress and uneasiness an individual experiences when confronted with change. Loss of control has been cited as the primary cause of resistance to change (Conner, 1992). c) **Short-term focus:** Individuals become distracted by the short-term inconveniences involved in change such that they do not see the long-term benefits. (Oreg et.al. 2008). d) **Cognitive rigidity**: This factor refers to the frequency and ease with which people change their minds. Cognitive rigidity represents a form of stubbornness and an unwillingness to consider alternative ideas and perspectives (Oreg et.al. 2008).

On the other side, Armenakis and Bedeian (1999) provided a theoretical framework that would classify and integrate organizational change literature. They indicated that employees' reactions to change process were shaped by three factors namely content based factors, context based factors and process based factors. a) *Content Based factors* deal with the substance and nature of a particular change. In other words, the content variables identify the "what" in initiatives of the change process (Self, Armenakis, Schraeder, 2001). There would be several content models that have been applied to organizational change such as restructuring, reengineering, and change in corporate culture (Devos, Buelengs and Bouckenooghe, 2007). b) *Contextual Based factors* deal with forces and conditions existing in an organization's internal and external environment. Several contextual factors that were investigated through change process are cynicism (Bernerth et. al., 2007), perceived organizational support (Self et al., 2001; Eisenberger et al., 1990), leader-member exchange (Self et al, 2001 & Larkin & Larkin, 1994), trust in organization (Devos et.al., 2007) and organizational climate (Schneider et al., 1996). c) *Process Based factors* deal with the actions taken in the implementation of an intended change. In other words, how change is implemented influence the reactions of employees. Process factors investigated during change process are persuasive communication (Armenakis et al., 1993), participation (Armenakis & Harris, 2002; Devos et.al., 2007), and justice (Foster, 2010).

Trust in organization was considered as a contextual factor in this research to study its contribution in resistance to change.

2.2. Trust in Organization

Today, establishing long-term employee relationships is difficult because organizations experience constant turnover due to a fiercely competitive business market (Burke & Stets, 1999). When trust within the organization is low, any kind of change may be seen as suspicious and threatening. There is much empirical evidence on the effects of trust on organizational change. Shaw (1997)

pointed out that employee trust is an integral component of competitive organizational change because it increases the likelihood of successful change. Moreover, trust is a vital factor in enhancing an organization's long-term success and survival, especially as the global economy becomes increasingly uncertain and competitive (Waterman, 1987 and Gambetta, 1988).

There are three main types of trust in the organizational studies literature: "trust in organization" (employee-organization), "trust in supervisor" (employee-supervisor) and "trust in coworker" (employee-employee). It is believed that without trust between the employee and organization, employees do not feel secure and confident and they do not develop a feeling of trust towards their supervisor(s) and coworkers. Because of the importance of trust in organization, it is taken as an important predictor of resistance to change in this study.

Kaneshiro (2008) determined that trust in organization is related to beliefs that proper impersonal structures (e.g., regulations, guarantees and contracts) are in place to enable individuals to anticipate successful future outcomes. McCauley and Kuhnert (1992) stated that trust in organization derives from the roles, rules, and structured relations of the organizations. According to Gilbert and Tang (1998), trust in organization refers to employee faith in corporate goal attachment and to the belief that ultimately, organizational action will prove beneficial for employees. Tan and Tan (2000) define trust in organization as the global evaluation of an organization's trustworthiness as perceived by the employee. Morin (1990) indicated that trust in organization stems from a mutual understanding of expectations, experiences and responsibilities developed over time as a result of consistent behavior between parties within an organization. These descriptions imply employee confidence in an organization as well as expected positive actions from the organization. Employees believe that the organization will act in ways that are beneficial, or at least not detrimental, to the employee.

2.3. Psychological Capital

At the beginning of the twenty-first century, psychologists began to move away from focusing only on the negative aspects of human behavior to focusing on the positive aspects. Studies were then extended to the workplace by focusing on the value of positivity in individuals (Luthans, 2002a; Luthans 2002b; Luthans, Youssef & Avolio, 2007). Luthans and his colleagues developed the Positive Organizational Behavior (POB) concept, which focuses on the individual in the organization, particularly on the development process that can be leveraged for performance improvement. Youssef & Luthans (2007) defined positive organizational behavior as the implication of positive psychology in the workplace, which attempts to place renewed emphasis on the importance of a positive approach. From a historical perspective, Luthans, Youssef and Avolio (2007) noted that *human capital theories* (i.e., what you know) treat knowledge, experience, skills and education as currencies or resources. For example, if an organization has highly educated and skilled employees, it has valuable resources. *Social capital theories* (i.e., who you know) have since emerged. These theories describe networking, relationships and friends as currencies. For example, an organization may have highly skilled and experienced employees, but without good networks and relationships, the organization will have no social capital. Lastly, there is *psychological capital (PsyCap)*, which emphasizes the development and growth of individuals from "who they are" to "who they are becoming".

Luthans et al. (2007) defined psychological capital (PsyCap) as an individual's positive psychological state of development, characterized by a) having confidence (self-efficacy) to take on and put in the necessary effort to succeed at challenging tasks, b) making a positive attribution (optimism) about succeeding now and in the future, c) persevering towards goals and, when necessary, redirecting paths to goals (hope) to succeed, d) bouncing back and even

surpassing one's original state (resiliency) to attain success when faced by problems and adversity (Luthans, Youssef & Avolio (2007).

Empirical studies on Psychological Capital (PsyCap) have shown that it helps overcome stress and facilitate positive organizational change (Avey, Wernsing and Luthans, 2008). Further, commitment and job satisfaction have been found to be positively related with Psychological Capital (PsyCap) (Cetin, 2011).

Peterson et al. (2011) found that employees' psychological capital changes overtime, for instance, employees who demonstrated an increase (or decrease) in psychological capital also showed an increase (or decrease) in performance.

Thus, a sustainable growth and increase in organizational performance can be an outcome of developing and managing the psychological capital factors of hope, resilience, optimism and self-efficacy (Luthans, Youssef & Avolio (2007).

2.4. Psychological Capital, Trust in Organization and Organizational Change

Organizational changes are mainly initiated because of a mismatch with the environment (Porras & Silvers, 1994) and are motivated by gaps between the organization's goals and current results (Avey et al., 2008). While management may see the necessity of organizational change to survive in a competitive environment, employees' negative reactions towards the change process are the main reasons for its failure (Armenakis & Bedeian, 1999; Strebel, 1996).

In their studies Kotter & Schlesinger (1979) and Beer (1987) found that lack of trust in organization was one of the main reasons for employee resistance to change. For example, the main organizational change processes, such as mergers and acquisitions, downsizing and reengineering, negatively influence a firm's working climate, with organizational trust especially affected. Due to the high risk factors entailed in large-scale change processes, trust in organization is necessary for employees to feel that management does what is best for the organization and its members (Morgan & Zeffane, 2003; Lines, Selart, Espedal & Johanson, 2005). It was expected that trust in organization provides the right conditions to decrease employees' resistance to change.

On the other hand, organizational behavior scholars have been exploring the reasons for employees' resistance to change and ways to overcome it. Positive organizational behavior may offer new perspectives on achieving organizational change. The theory indicates that positive behavior about organizational change may help employees cope with the changes and assist them in accepting and adjusting to new work conditions.

At this point, psychological capital of employees will be regarded as an individual factor that will affect the relationship between trust in organization and employee's resistance to change. Clapp-Smith, Vogelgesang and Avey (2009) found that psychological capital of employees positively relates to the level of trust in organization.

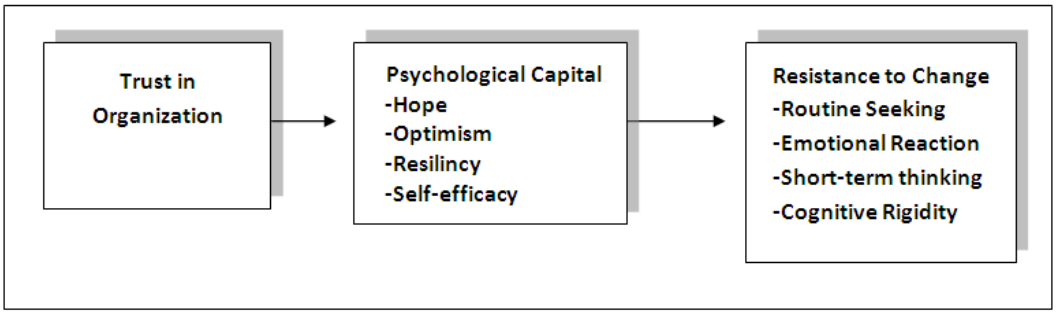
These findings indicated that both psychological capital and trust in organization have positive effects on decreasing employees' aversive reaction to organizational change. However, it is predicted that trust in organization does not always decrease employee resistance to organization change. So, it was hypothesized that trust in organization would create positive attitudes toward change process through first enhancing psychological capital of the employees.

Hypothesis: The relationship between trust in organization and resistance to change is mediated by psychological capital.

Research Model

As a summary of the theoretical framework, the study model is presented below:

Figure 1: Research Model



3. METHODOLOGY AND DATA

The survey collection methods were both online and self-administered questionnaires. The questionnaires are Resistance to change (RTC), Trust in Organization and Psychological Capital (PsyCap Questionnaire).

3.1. Sample

This research was conducted among 583 employees in Turkey. Convenience sampling was used for this study. 58,8 % (N=343) of the participants were male and 41,2% (N=240) were female. In terms of their educational background, 34,5% of the participants were elementary and high school graduates, 54% had a bachelor's degree, 11,5 % had a master's degree / a PhD degree. 26,6 % of the participants had tenure less than 5 years, 51,3 % had 5-15 years of tenure and 22,1 % had more than 15 years of tenure. Only 25 % of the participants had managerial position.

The participants were working full time in private and public sectors including retail & electronic retail sector (21,8%), educational sector (16,6 %), food sector (7%), information technologies sector (6%), medical sector (4,6) etc.

3.2. Instruments

The questionnaire used in this research consisted of four sections. The first section was the cover letter explaining the purpose of the research and assuring participant's strict anonymity.

The second section composed of 9 demographic questions and the rest of the sections consisted of 3 different scales with 50 items. The distribution of the items was as follows; 16 items were used to measure resistance to change, 10 items to measure trust in organization, and 24 items to measure psychological capital.

The respondents evaluated the items on a 6 point scale. This scale illustrates 1= Never, 2= Scarcely, 3= Rarely, 4= Sometimes, 5= Most of the time, 6= Always for all scales.

3.2.1. Resistance to change (RTC)

Resistance to change was measured by Oreg's (2003) RTC (resistance to change) scale used in this research. RTC scale was translated from English to Turkish by the researcher. Then four bilingual

experts reexamined the scale for semantic and syntactic equivalence. Also, the items were reviewed by the academicians in Organizational Behavior field.

RTC scale has four factors. These factors were a) routine seeking b) emotional reaction c) short-term thinking d) cognitive rigidity. The sample questions are "I generally consider changes to be a negative thing", "When I am informed of a change of plans, I tense up a bit". Oreg (2003) found the Cronbach alpha value of the instrument as 0.92.

3.2.2. Trust in Organization

Trust in organization was measured by trust scale developed by Islamoglu, Birsel, and Boru (2007). Sample items are as follows ; "My company is honest and fair" , "My company has peaceful and fair management". Islamoglu et al., (2007) found the Cronbach alpha value of the instrument as 0.95.

3.2.3. Psychological Capital (PsyCap Questionnaire)

Psychological Capital was measured by Luthans, Avolio, Avey, Norman's (2007) PsyCap Questionnaire instrument that was translated from English to Turkish by the researcher. Then four bilingual experts reexamined the instrument for semantic and syntactic equivalence. PsyCap Questionnaire scale has four factors. These factors are a) Hope b) Resiliency c) Self-efficacy d) Optimism. Sample items are as follows ;"I feel I can handle many things at a time at this job", "I feel confident representing my work area in meetings with management", "When things are uncertain for me at work, I usually expect the best". Luthans, Avolio, Avey, Norman (2007) found the Cronbach alpha value of "Hope" factor as 0.80, "Optimism" factor as 0.79, "Self-efficacy" factor as 0.85, "Resiliency" factor as 0.72 .

4. RESULTS

Exploratory factor analysis was conducted to evaluate the construct validities of all measure (resistance to change, trust in organization, psychological capital). The reliabilities of the construct in each scale were determined by Cronbach's Alpha. Then Pearson's Correlation analysis was used to calculate the correlation between the variables. Finally, according to research model, regression analysis were conducted to test the hypotheses.

4.1.Factor and Reliability Analysis of "Resistance to Change" Instrument

Factor analysis was conducted with varimax rotation in order to determine the factors of

"Resistance to change" variable. As a result of the analysis, "Resistance to change" items were collected under two factors that factors which account for 69,981 % of the total variance. Item 15 was deleted since its factor loading was less than 0.50. Items 12, 7, 2 were discarded since they were loaded on more than one factor. After reliability analysis, items 6, 9, 14,16 were discarded due to their low reliability scores.

According to the nature of items, these two factors were named as "routine seeking" and "emotional reactions". Moreover, the Cronbach Alpha values of each factor was determined as 0.841 and 0.836 respectively.

Table 1: Results of the Factor Analysis for Resistance to Change

Factors	Factor Loadings	Variance Explained (%)	Alpha (%)
Factor 1: Routine Seeking			
D11. Often, I feel a bit uncomfortable even about changes that may potentially improve my life.	**.843**		
D13.I sometimes find myself avoiding changes that I know will be good for me.	**.811**		
D4. I generally consider changes to be a negative thing.	**.800**		
D5. I'd rather be bored than surprised.	**.786**		
D10. Changing plans seems like a real hassle to me.	**.770**		
		48.42	**.841**
Factor 2: Emotional Reactions			
D8. When things don't go according to plans, it stresses me out.	**.919**		
D9. If my manager changed my responsibilities, it would probably make me feel uncomfortable even if I thought I'd do just as well without having to do any extra work.	**.712**		
		21.56	**.836**
KMO Measure of Sampling Adequacy		**.871**	
Bartlett's Test of Sphericity			
Approx. Chi-Square		**1737.72**	
df		**21**	
sig.		**000**	

4.2. Factor and Reliability Analysis of "Psychological Capital" Instrument

Factor analysis was conducted with varimax rotation in order to determine the factors of "Psychological capital" variable . As a result of the first step of the factor analysis, "Psychological capital" items were loaded on four different factors. Item 6, 4, 24,5 were deleted since they were loaded on more than one factor. After reliability analysis, items 1, 19, 2, 3, 7 were deleted due to their low reliability scores.

The fifteen items loaded under four factors which account for 73,176 % of the total variance. According to nature of items, these four factors were named as "resiliency" having six items , " self-efficacy " having five items, "optimism" having two items and "pessimism" with two items. Moreover, the Cronbach Alpha values of each factor was determined as 0.903, 0.905, 0.756 and 0.682 respectively.

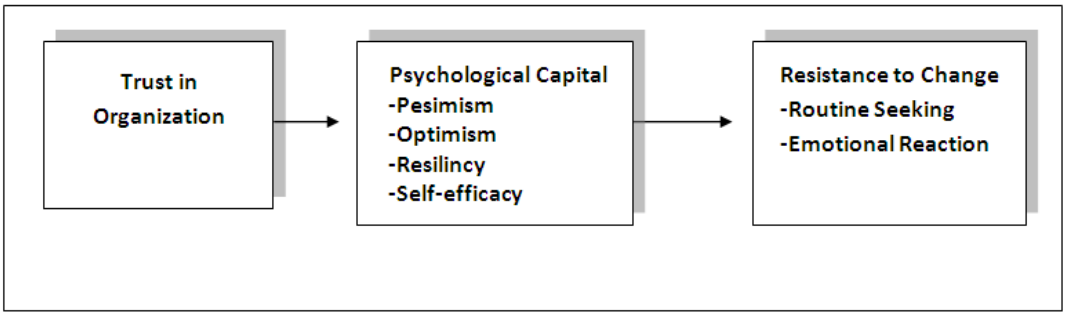
Table 2: Results of theFactor Analysis for Psychological Capital

Factors	Factor Loadings	Variance Explained (%)	Alpha (%)
Factor 1:Resiliency			
R3. I can be "on my own," so to speak, at work if I have to.	**0.824**		
R4. I usually take stressful things at work in stride.	**0.797**		
R5. I can get through difficult times at work because I've experienced difficulty before.	**0.787**		
R6. I feel I can handle many things at a time at this job.	**0.714**		
SE1. I feel confident analyzing a long-term problem to find a solution.	**0.660**		
R2.I usually manage difficulties one way or another at work.	**0.626**		
		25.86	**0.90**
Factor 2: Self-efficacy			
SE 4. I feel confident helping to set targets/goals in my work area.	**0.812**		
SE 3. I feel confident contributing to discussions about the company's strategy.	**0.794**		
SE 5. I feel confident contacting people outside the company (e.g. , suppliers, customers) to discuss problems.	**0.788**		
SE 2. I feel confident representing my work area in meetings with management.	**0.756**		
SE 6.I feel confident presenting information to a group of colleagues.	**0.739**		
		24.80	**0.90**
Factor 3: Optimism			
O4. I'm optimistic about what will happen to me in the future as it pertains to work.	**0.858**		
O 3. I always look on the bright side of things regarding my job.	**0.853**		
		12.01	**0.75**
Factor 4: Pessimism			
O 5. In this job, things never work out the way I want them to.	**0.859**		
O 2. If something can go wrong for me work-wise, it will	**0.858**		
		10.51	**0.68**
KMO Measure of Sampling Adequacy		**.921**	
Bartlett's Test of Sphericity			
Approx. Chi-Square		**5199.71**	
df		**105**	
sig.		**000**	

Revised Research Model

The study model after factor analysis

Figure 2: Revised Research Model



4.3. Means, Standard Deviations and Correlations

As it was indicated table below, the correlation between resistance to change and other variables was very low and negative as expected. The presence of high correlation (generally 0.90 and higher) is the first indication of substantial collinearity (Hair, Black, Babin & Anderson, 2010). Since correlation results were not close to the value of .90, it was ensured that there was no multicollinearity between the variables. In addition, the second measure of multicollinearity is the variance inflation factor (VIF) . If VIF value is lower than 10, then it means there would be no multicollinearity between the variables.(Sipahi, Yurtkoru, Cinko, 2008). It was found that VIF value was lower than 10 for regression analyses. Consequently, we can say that there is no multicollinearity between research variables.

Table 3: Descriptive Statistics and Correlations

	Means	**Standrad Deviataion**	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
(1)Routine seeking	2.10	0.94	1						
(2)Emotional reaction	3.02	1.15	.431**	1					
(3)Trust in organization	4.66	0.91	-.191**	-.039	1				
(4) Resiliency	4.90	0.75	-.321**	-.098*	.352**	1			
(5) Self-efficacy	5.07	0.79	-.327**	-.086*	.357**	.708**	1		
(6) Optimism	4.74	0.90	-.236**	-.028	.389**	.526**	.461**	1	
(7) Pessimism	3.75	1.10	-.263**	-.122**	.265**	.220**	.233*	.173**	1

*Correlation is significant at 0.05 **Correlation is significant at 0.01

4.4. Regression Analysis

4.4.1. The Mediating Role of Psychological Capital between Trust in Organization and Resistance to Change- Main Model

In order to test mediating role of psychological capital between trust in organization and resistance to change, Baron & Kenny's (1986) method was used. Baron & Kenny (1986) mentioned three regression equations to test the linkages of the meditational model.

For testing Hypothesis "The relationship between trust in organization and resistance to change is mediated by psychological capital." multiple regression analysis was conducted. "Trust in Organization" is the independent variable, "Psychological Capital" is the mediator and "Resistance to Change" is the dependent variable.

In the first regression analysis, "Trust in Organization "was regressed on "Psychological Capital". The regression analysis revealed that "Trust in Organization" had a significant contribution on the prediction of on "Psychological Capital" (β=. 404, p=.000). The second regression analysis was conducted between "Trust in Organization" and "Resistance to Change". The regression analysis revealed that "Trust in Organization" had a significant contribution on the prediction of "Resistance to Change" (β=-.141, p=,001). The third regression analysis was conducted for the mediating variable analysis. "Psychological Capital" and "Trust in Organization" were entered as independent variables to examine their contribution on the dependent variable (Resistance to Change).

The result showed that only "Psychological Capital", which was the mediating variable, had a significant effect on "Resistance to Change" (β= -.192 , p= .000) while the significant contribution of "Trust in Organization" on "Resistance to Change" in second regression disappeared during multiple regression (β=-. 0063, p= .152). This result showed that "Psychological Capital" fully mediated the effect of "Trust in Organization" on "Resistance to Change".

Table 4: The Mediating role of "Psychological Capital" between "Trust in Organization" and "Resistance to Change"

	R	Adj R^2	F	B	t	p
Analysis I	0.404	0.162	113,398			
Independent Variable: Trust in Organization				0.404	10.649	0.000
Dependent Variable: Psychological capital						
	R	**Adj R^2**	**F**	**B**	**t**	**p**
Analysis II	0.141	0.018	11,800			
Independent Variable: Trust in Organization				-0.141	-3.435	0.001
Dependent Variable : Resistance to change						
	R	**Adj R^2**	**F**	**B**	**t**	**p**
Analysis III	0.226	0.048	15,539			0.000
Independent Variable: Trust in Organization				-0.063	-1.433	0.152
Mediating Variable: : Psychological capital				-0.192	-4.349	0.000
Dependent Variable: Resistance to change						

4.4.2. The Mediating Role of all Psychological Capital factors between Trust in Organization and all Resistance to Change factors

The Mediating role of all psychological capital factors (self-efficacy, optimism, pessimism, resiliency) was tested by four multiple regression analysis.

"Trust in Organization" is the independent variable, "all Psychological Capital factors" are the mediators and "all Resistance to Change factors" are the dependent variables.

- In the first regression analysis, "Trust in Organization "was regressed on "all Psychological Capital factors (self-efficacy, optimism, pessimism, and resiliency)". The regression analysis revealed that "Trust in Organization" had a significant contribution on the prediction of on "Psychological Capital factors (self-efficacy (β=.357, p=,000), optimism (β=.389, p=,000), pessimism (β=.265, p=,000), resiliency (β=.352, p=,000))"
- The second regression analysis was conducted between "Trust in Organization" and "Resistance to Change- routine seeing". The regression analysis revealed that "Trust in Organization" had a significant contribution on the prediction of "Resistance to Change-routine seeking" (β=-.191, p=,000).
- The third regression analysis was conducted for the mediating variable analysis. "All Psychological Capital factors" and "Trust in Organization" were entered as independent variables to examine their contribution on the dependent variable (Resistance to Change-routine seeking).

The results showed that "all Psychological Capital factors ", which were the mediating variables, had a significant effects on "Resistance to Change- routine seeking" ((self-efficacy (β=-.297, p=,000), optimism (β=-.191, p=,000), pessimism (β=-.228, p=,000), resiliency (β=-.290, p=,000))" while the significant contribution of "Trust in Organization" on "Resistance to Change-routine seeking" in second regression did not disappeared during multiple regression ((self-efficacy (β=-.086, p=,041), optimism (β=-.117, p=,007), pessimism (β=-.131, p=,002), resiliency (β=-.089, p=,033)). This result showed that "all Psychological Capital factors" did not play a mediation role between "Trust in Organization" on "Resistance to Change- routine seeking". The regression analyses are shown in table 6- 8.

Table 5: The mediating role of psychological capital (self efficacy) between trust in organization and resistance to change (routine seeking).

	R	Adj R^2	F	B	T	p
Analysis I	0.357	0.126	84,938			
Independent Variable: Organizational Trust				0.357	9.216	0.000
Dependent Variable: Psychological capital (self-efficacy)						
Analysis II	0.191	0.035	22,102			
Independent Variable: Organizational Trust				-0.191	-4.407	0.000
Dependent Variable : Resistance to change (routine seeking)						
Analysis III	0.337	0.110	37,085			0.000
Independent Variable: Organizational Trust				-0.086	-2.043	0.041
Mediating Variable: : Psychological capital (self-efficacy)				-0.297	-7.085	0.000
Dependent Variable: Resistance to change (routine seeking)						

Table 6: The mediating role of psychological capital (optimism) between trust in organization and resistance to change (routine seeking).

	R	Adj R^2	F	B	T	p
Analysis I	0.389	0.150	103,431			
Independent Variable: Organizational Trust				0.389	10.179	0.000
Dependent Variable: Psychological Capital (optimism)						
Analysis II	0.191	0.035	22,102			
Independent Variable: Organizational Trust				-0.191	-4.407	0.000
Dependent Variable : Resistance to Change (routine seeking)						
Analysis III	0.260	0.067	20,990			0.000
Independent Variable: Organizational Trust				-0.117	-2.696	0.007
Mediating Variable: : Psychological Capital (optimism)				-0.191	-4.380	0.000
Dependent Variable: Resistance to Change (routine seeking)						

Table 7: The mediating role of psychological capital (pessimism) between trust in organization and resistance to change (routine seeking).

	R	Adj R^2	F	B	T	p
Analysis I	0.265	0.069	43,954			
Independent Variable: Organizational Trust				0.265	6.630	0.000
Dependent Variable: Psychological Capital (pessimism)						
Analysis II	0.191	0.035	22,102			
Independent Variable: Organizational Trust				-0.191	-4.407	0.000
Dependent Variable : Resistance to Change (routine seeking)						
Analysis III	0.291	0.082	26,917			0.000
Independent Variable: Organizational Trust				-0.131	-3.180	0.002
Mediating Variable: : Psychological Capital (pessimism)				-0.228	-5.532	0.000
Dependent Variable: Resistance to Change (routine seeking)						

Table 8: The mediating role of psychological capital (resiliency) between trust in organization and resistance to change (routine seeking).

	R	Adj R^2	F	B	T	p
Analysis I	0.352	0.122	82,040			
Independent Variable: Organizational Trust				0.352	9.058	0.000
Dependent Variable: Psychological Capital (resiliency)						
Analysis II	0.191	0.035	22,102			
Independent Variable: Organizational Trust				-0.191	-4.407	0.000
Dependent Variable : Resistance to Change (routine seeking)						
Analysis III	0.332	0.107	37,968			0.000
Independent Variable: Organizational Trust				-0.089	-2.137	0.033
Mediating Variable: : Psychological Capital (resiliency)				-0.290	-6.931	0.000
Dependent Variable: Resistance to Change (routine seeking)						

For last mediating analysis, the independent variable "Trust in Organization" was regressed to "Resistance to Change- emotional reaction". The result of analysis showed that "Trust in Organization" did not have a significant contribution on the prediction of "Resistance to Change- emotional reaction" (β= -.035, p= .394). So, further analysis was not conducted for "Resistance to Change- emotional reaction" due to this result. The result of regression analysis is presented in table9.

Table 9: The mediating Role of Psychological Capital (self-efficacy, optimism, pessimism, resiliency) between Trust inOrganization and Resistance to Change (emotional reaction)

	R	Adj R^2	F	β	t	P
	.035	.000	,727			
Trust in Organization				-.035	-.853	.394

Dependent Variable: **Emotional Reaction**

5. CONCLUSION

Unstable economic and political conditions have increased number of change efforts within organizations. Several studies attempt to explain why change efforts in technology, production methods, management practices and compensation systems have fallen short of expectations or resulted in failure (Oreg, 2006).

There are several factors such as technological difficulties, lack of time and money investment during organizational change implementation process, but the most important factor is the reaction of employee towards change efforts.

At this point, trust has become an important issue for the success of today's organizations. As noted in the literature review, trust in organization indicates that management does not exhibit any behavior that results in unfavorable conditions to employees during the change process (Boon & Holmes, 1991). Several empirical studies showed a strong and negative relationship between trust in organization and resistance to change (Stanley et. al., 2005; Oreg, 2006; Holoviak, 1999) and the important role of trust in organization during organizational change efforts (Cashman, 1998). In line with the literature, the correlation analysis in this research between resistance to change and trust in organization revealed a significant and negative relationship.

Even organizational studies have shown the importance of trust in a range of organizational activities, such as individual performance (Oldham, 1975; Rich, 1997), conflict management (Porter & Lilly, 1996; Zaheer et al., 1997), unit performance (Dirks, 1999) and goal acceptance (Oldham, 1975; Kim & Mauborgne, 1993), there is a limited empirical research examining the relationship between psychological capital and trust in organization. Thus, this research initiates further studies on these concepts.

It was found that there was a significant and negative relationship between psychological capital and resistance to change. Individuals with high psychological capital will present more favorable behaviors towards organizational change. This is consistent with Peterson et al.'s study (2011), who noted thatpsychological capital is considered critical to motivation, cognitive processing, striving for success and the resulting performance in the workplace. Avey et al. (2008) found that employees' positive psychological capital is important for combating negative attitudes (i.e., cynicism and deviance). These attitudes (i.e., cynicism and deviance) usually negatively associated with organizational change and affected employees' adaptation to new working conditions. Avey et al. (2008) also stated that employees' positive resources are positively associated with desired attitudes (emotional engagement) and behaviors (organizational citizenship). These behaviors assist employees to accept organization change outcomes. One can thus conclude that positive psychological capital and trust in organization may strongly support organizational change efforts.

So, it was hypothesized that therelationship between trust in organization and resistance to change is mediated by psychological capital.

The regression analysis showed that psychological capital has a mediating role between trust in organization and resistance to change. Trust within the organization will increase employees' psychological capital. Then, high psychological capital will have a negative effect on resistance to change and thus employees' resistance to change will decrease during the change process. This finding is consistent with the notion that to be successful in organizational change efforts, characteristics of the work environment must support and enhance employees' strengths in order to motivate positive behavior. For example, as it was indicated in this research, both trust in organization and psychological capital have a positive effect on decrease of employees' aversive reaction to organizational change process. However, trust in organization is not always enough to result in less employee resistance to organization change. So, trust in organization would create

positive outcomes on employees' resistance to change process through first enhancing psychological capitals' of employees.

Further regression analyses were conducted with factors of psychological capital (self-efficacy, pessimism, optimism and resilience), the factors of resistance to change (routine seeking and emotional reactions) and trust in organization. Interestingly, the results of the analysis showed that the factors of psychological capital did not play mediating roles between trust in organization and factors of resistance to change. It can be conclude that psychological capital is a recently studied concept in the organizational studies literature. So, further research with different sample compositions and bigger sample sizes should be conducted to better understand the contribution of psychological capital on the relationship between trust in organization and resistance to change.

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THE TWIN DEFICITS PHENOMENON IN TURKEY: AN EMPIRICAL INVESTIGATION

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KEYWORDS

Budget deficit, current account deficit, structural break, causality.

ABSTRACT

The aim of this study is to explore the relationship between budget deficit and the current account deficit for Turkey over the period 1987-2005. Considering the structural breaks in the series, the stationarity analysis is employed by means of Zivot- Andrews unit root test. In the succeeding step of the methodology, by utilizing Toda Yamamato test, the causality relationship between the budget deficit and the current account deficit is examined. The empirical results indicate that current account deficit is a causing variable for the budget deficit in Turkish economy.

1. INTRODUCTION

A wide and expanding literature tries to shed light on the the impact of budget deficit on the current account deficit, in other words twin deficits relation. The regarding relation is based on two theoretical explanations which are the Keynesian approach and the saving-investment interaction. According to the Keynesian view, an expansionary fiscal policy which leads to budget deficit will deteriorate current account balance via an increase in income. Besides, in a small open economy which has a flexible exchange rate system, an increase in the fiscal deficit will lead to a rise in the current account deficit through the interest rate and the exchange rate transmission mechanisms. On the other hand, the current account balance (CAB) is defined by

$$(S^P-I^p)+(S^g-I^g)=CAB \quad (1)$$

where (S^P-I^p) and (S^g-I^g) represent the private sector and the public sector saving-investment balance, respectively. An increase in the budget deficit, in other words a deterioration in the public sector balance in (1) will give rise to current account deficit, i.e. twin deficits if the private sector balance is held constant. Contrarily, Ricardian equivalence theorem asserts that tax payers will increase the private savings to pay the future taxes in consequence of debt-financed government spending. More briefly, budget deficits have no real impact on the external balance since the rise in the private saving will neutralize the alteration in the public sector balance. Beside the Ricardian equivalence theorem, twin deficits relation can be criticized with regard to Summers (1988) that points out the implementation of fiscalpolicies suchas reducing budget deficits in order to improve the current account balance so that the causality runs from the current account balance to the budget balance. Moreover, as Magazzino (2012) states, while budget deficits may cause current account deficits, the existence of significant feedback may cause causality between the two variables to occur in both directions.

Following Baharumshah and Lau (2005), it can be asserted that the recent empirical literature on the budget balance and the current account balance interaction has mainly concluded with four relations mentioned above that are, i) twin deficits relation (Beetsma et al. 2008; Afonso and Rault 2010; Bagnai, 2010; Ketenci and Uz 2010; Bluedorn and Leigh 2011; Stournaras 2013), ii)Ricardian equivalence (Daly and Siddiki 2009;Datta and Mukhopadhyay 2010), iii) the reverse causality from the current account balance to the budget balance (Marinheiro 2008; Katırcıoğlu et al. 2009; Ganchev 2012; Magazzino 2012) and iv) the bilateral causality between the variables in question (Mukhtar et al. 2007; Arize and Malindretos 2008; Pahlavani and Saleh 2009; Barışık and Kesikoğlu 2010). Moreover, there is also a current literature that is devoted to the anlaysis of the budget balance and current account balance relationship for Turkey by utilizing VAR analysis, conventional cointegration tests and Granger causality analysis (Sever and Demir 2007; Yay and Taştan 2007; Erdinç 2008; Ümit and Yıldırım 2010; Varol İyidoğan and Erkam 2013).

In this context, this study empirically examines the validity of twin deficits relation in Turkish economy which has experienced both high fiscal and external deficits over the considered period, 1987-2005. Apart from the existing literature, the regarding relation is investigated by taking into account the structural breaks and employing causality analysis that does not rely on the stationarity properties or the cointegration relation between the series.

2. DATA AND METHODOLOGY

The budget balance and the current account balance relationship for Turkey is analyzed by using 1987-2005[1] quarterly data of the budget balance/GDP (bb) and current account balance/GDP (ca) series. The budget balance, current account balance and GDP series have been generated by means of data which is obtained from the Ministry of Finance General Directorate of Accounting, CBRT Electronic Data Distribution System and Turkish Statistical Institute, respectively. The descriptive statistics of the series are reported in Table 1.

Table 1: Descriptive Statistics

Variables	Current Account Balance	Budget Balance
Mean	-0.013956	-0.070697
Median	-0.013529	-0.052042
Maximum	0.058292	0.012813
Minimum	-0.086843	-0.254566
Standard deviation	0.033797	0.058368
Skewness	-0.102773	-1.080172
Kurtosis	2.627719	3.556539
Jarque-Bera	0.572666	15.75994

[1]The reason for the data not being up-to-date is the change of the budget definition in 2006. Accordingly, while consolidated budget implementation was in question between 1994-2005, central government budget has begun to be used since 2006. Since the harmonization of these two practices has not been completed yet, the analyses in the study is employed using the data of 1987:1-2005:4.

Table 1 shows that average rates of the series are about -0.014 and -0.07 with a standard deviation of 0.034 and 0.058, respectively. The small values of the standard deviation can be interpreted on behalf of the low volatility of the series. The kurtosis value smaller than 3 indicates that "ca" series is small-taled. Besides, both series exhibit leftward skewness due to the negative skewness values. According to the Jarque-Bera test statistics, the null hypothesis of normality is accepted for "ca" series while "bb" series is not found to be normally distributed. This result can be attributed to the skewness value of the ""bb" series that is substantially different from zero, the normal distribution value.

As the first step of the methodology, the stationarity of the series is examined by utilizing the testing procedure of Zivot and Andrews (1992) which endogenously determines the structural breaks in the series. The null hypothesis of unit root is tested through three models that are Model A, B and C in equations (2)-(4). Model A allows for a one-time change in the intercept while Model B permits a one-time change in trend and Model C both allows a break in intercept and trend.

Model A:

$$y_t = \mu^A + \alpha^A y_{t-1} + \beta^A t + \theta^A DU_t(\lambda) + \sum_{j=1}^{k} d_j^A \Delta y_{t-j} + \varepsilon_t \qquad (2)$$

Model B:

$$y_t = \mu^B + \alpha^B y_{t-1} + \beta^B t + \theta^B DT_t(\lambda) + \sum_{j=1}^{k} d_j^B \Delta y_{t-j} + \varepsilon_t \qquad (3)$$

Model C:

$$y_t = \mu^C + \alpha^C y_{t-1} + \beta^C t + \theta^C DU_t(\lambda) + \gamma^C DT_t(\lambda) + \sum_{j=1}^{k} d_j^C \Delta y_{t-j} + \varepsilon_t \qquad (4)$$

$DU_t(\lambda)$ and $DT_t(\lambda)$ dummy variables represent the shifts in intercept and trend, respectively that occur at break time TB. $DU_t(\lambda) = 1$ and $DT_t(\lambda) = t - TB$ if t?TB and zero otherwises. The null of unit root is rejected if α is statistically significant.

After the stationarity analysis, the relationship between the budget balance and the current account balance is examined by applying causality test of Toda and Yamamato (1995). TY analysis does not consider the integration order or the long run relationship between the series so that the problem of misidentification of the stationarity properties or the cointegration relation is avoided. The testing procedure is based on the estimation of VAR($k+d^{max}$) model in equation (5) and (6) where d^{max} and k represent maximum order of integration and the optimal lag length, respectively.

$$ca_t = \mu_{1i} + \sum_{i=1}^{k+d\max} \alpha_{1i} ca_{t-i} + \sum_{i=1}^{k+d\max} \beta_{1i} bb_{t-i} + e_{1t} \qquad (5)$$

$$bb_t = \mu_2 + \sum_{i=1}^{k+d\max} \alpha_{2i} bb_{t-i} + \sum_{i=1}^{k+d\max} \beta_{2i} ca_{t-i} + e_{2t} \qquad (6)$$

3. EMPIRICAL RESULTS

The empirical results are reported in two steps. First, the integration order of the series is determined by applying Zivot Andrews unit root test. Second, the causality relationship between the budget deficit and the current account deficit is examined by means of Toda-Yamamato methodology. In this context, Table 2 reports the results of stationarity analysis.

Table 2: Zivot Andrews Test Results

Variables	**Model A**		**Model B**		**Model C**	
	t-stat	**TB**	**t-stat**	**TB**	**t-stat**	**TB**
Budget balance	-6.718	2003Q1	-8.174	2003Q1	-9.330	2001Q2
Current account balance	-6.176	2003Q1	-6.089	2002Q1	-6.639	2001Q2
	Model A critical values: %1: -5.43, %5:-4.80		Model B critical values: %1: -4.93, %5:-4.42		Model C critical values: %1: -5.57, %5:-5.08	

According to Table 2, in all models the null of unit root can be rejected at %1 significance level implying that both series are stationary at levels. The structural breaks for budget and current account balance occur in 2001Q2 and 2002Q1 that coincide with the crisis period in Turkish economy. More clearly, this result can be explained through the deterioration of fiscal balance and current account balance during 2001 financial crisis. Moreover, according to Model A and Model B, the structural break time for the budget balance series is found to be 2003Q1 that can be attributed to the conractionary fiscal policy implementations aftermath of the 2001 crisis to maintain the public sector balance.

The Toda Yamamato causality analysis is based on both the integration order of the series and the optimum lag structure. The maximum integration order of the series is found to be "0" with regard to the results of Zivot Andrews unit root tests in Table 2. The optimal lag length for the bivariate VAR model is determined through the Akaike Information Criteria (AIC), Schwarz Information Criteria and Hannan-Quinn (H-Q) criteria together with the autocorrelation tests (Table 3)..

Table 3: The Determination of Optimal Lag Length

	AIC	**SC**	**HQ**
0	-6.721703	-6.656423	-6.695837
1	-7.225734	**-7.029896**	**-7.148137**
2	-7.183785	-6.857387	-7.054456
3	-7.159878	-6.702920	-6.978817
4	-7.178824	-6.591308	-6.946032
5	**-7.378762**	-6.660686	-7.094239
6	-7.339100	-6.490465	-7.002845
7	-7.272564	-6.293369	-6.884577
8	-7.282502	-6.172748	-6.842783

The optimal lag length is determined as to be "1" with regard to the results of SC and HQ criteria while "5" according to AIC. However, lag length "1" is preferred to "5" in order to avoid the loss of degrees of freedom. The problem of serial correlation for the optimal lag length is also checked through LM autocorrelation tests. Finally Toda Yamamato causality test which utilizes Wald test is employed to testify whether the β coefficients in (5) and (6) are statistically significant. The results of the Toda Yamamato procedure are given in Table 4.

Table 4: Causality Test Results

	k+dmax	Wald statistic	p-value
bb→ca	1	0.633904	0.4259
ca→bb	1	7.257528	0.0071

The causality test results indicate that current account balance has a causal impact on the budget balance in the considered period of Turkish economy. More briefly, a change in the current account deficit will affect the fiscal balance. On the other hand, there is no evidence of twin deficits hypothesis, in other words causality running from the budget balance to the current account balance. The result is consistent with Varol İyidoğan (2011) and Varol İyidoğan (2013) that analyze the regarding relation for Turkey over the same period, 1987-2005.

4. CONCLUSION

The empirical literature on the twin deficits relation commonly comprises the analysis of the countries which experience both fiscal and current account deficits. Considering 1994 and 2001 crisis which have aroused from both internal and external imbalances, the examination of the budget balance and current account balance relationship is also crucial for Turkish economy. Accordingly, this study empirically analyzes the regarding relationship over 1987-2005 period of Turkish economy. The methodology is based on both Zivot Andrews stationarity analysis and Toda Yamamato causality tests. Zivot Andrews test results indicate that both series are stationary at levels with structural breaks in the period of 2001 financial crisis. Finally, acocording to Toda Yamamato analysis the evidence of reverse causality running from current account balance to budget balance is found in the considered period. This result can be attributed to the impact of the current account balance on the economic growth, thus the tax revenues. On the other hand, the finding can also imply that the current account deficit leads to rise in the external debt service which deteriorates the consolidated budget balance. As a result, it can be concluded that the policies aiming at the current account balance will also contribute to the improvement of the budget balance together with the fiscal policy.

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TRADE LIBERALIZATION AND ECONOMIC GROWTH IN NIGERIA; A COINTEGRATION ANALYSIS

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KEYWORDS

Openness, trade liberalization, economic growth and structural change.

ABSTRACT

Trade liberalization is one of the most controversial policies in international economics and finance. Copious of arguments have been put forward about if free trade and reduction of trade barriers will help the economy or not. Those in favour of the policy believe that it can stimulate economic growth of African economies while others maintained that trade liberalization may not provide positive contribution to long run growth of African economies. This study adopts the ordinary least squares in estimating the influence of trade liberalization on economic growth in Nigeria between1970 and 2012 with a view to examining whether a long term relationship exists between the two and also to check for structural change that may have occurred with the implementation of a free trade regime in 1986.Trade liberalization was conceived as openness and proxied as the ratio of total trade to GDP. Time series data sourced from the World Development indicator (WDI) of the World Bank and the Central Bank of Nigeria (CBN) statistical bulletin and annual reports were analysed. Result shows that liberalization supports economic growth in Nigeria with an evidence of a long run relationship. Strong evidence was found to support a structural change taking place in 1986 with the adoption of free trade policy. However export was reported to be negatively related to growth. The study concluded by recommending that an enabling environment that will engender further growth such as better infrastructural base, adequate financing support adherence to international best practice in export and sound institutional structure be put in place for sustainability.

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1. INTRODUCTION

Trade liberalization is central to the Structural Adjustment Programme implemented by most countries in sub-Saharan Africa including Nigeria. According to Effiom*et al* (2011), the corner stone of the SAP induced policy was the opening up of domestic economies to face increased competition in order to ensure efficiency in resource use, removal of wastages, elimination of persistent misalignment in the external and domestic sectors and a general redirection of the economy to the path of recovery and growth. Trade liberalization is one of the most controversial policies in international economics and finance. The relationship between open trade and growth has been the subject of numerous theoretical and empirical studies (Edward, 1992; Chaudhry*et al.,* 2010; Ersoy and Deniz, 2011; Sakyi, 2011). This is because in a competitive environment prices get lower and products become diversified through which increased welfare emerges. Gains from specialization and efficiency are also further advantages of economic openness, therefore it is quite reasonable that economies generally desire to be economically open.

The growth of the industrial sector in Nigeria in the 1970s was the outcome of a policy of import substitution (Ayorinde and Olayinka, 2012), such policy harmed export partly through the increasing overvaluation of the domestic currency, partly through the encouragement of low return investments by preferential credit policies. Exposure to world prices generated a process of competitive selection in which some firms could not survive because they owe their existence largely to previously sheltered markets or subsidized input supplies.

In this study an empirical investigation of the effect of trade liberalization on economic growth using Nigerian data was carried out. Also carried out was a test for its impact on the growth trajectory via a structural change test which is an area often not considered by most studies. The study is therefore structured thus: section one is the introduction, section two covers literature review, methodology of the study is stated in section three, section four presents results and discussions while section five concludes and presents recommendations.

2. LITERATURE REVIEW

Economic theory traditionally considers trade liberalization to be the reduction or complete removal of existing trade restrictions and economists typically endorse it as allowing for efficiency (Elana, 2005). While removal of trade barriers is the most direct to free trade, many countries have chosen more gradual and flexible approaches. David Ricardo's theory of competitive advantage is central to the efficiency hoped to derivable from global trade openness. One of the enduring legacies of the new growth theory is its emphasis on the role of trade and foreign direct investment as the major drivers of economic growth. The neo-liberals have argued that liberalizing trade has the potentials to promote competition locally and globally. This argument is premised on the fact that in an attempt to enter the foreign market or compete with foreign firms, domestic exporting firms have to eliminate inefficiency and produce high quality goods at low cost. They can only do this by acquiring new and modern technology that will make them competitive at the international market (Adewuyi 2000; Thirlwall 2000).

Nwafor*et al* (2007) examined the effect of trade liberalization on poverty in Nigeria. Using dynamic equilibrium model, their result showed that liberalization has a positive implications for urban household while having negative implications for rural households whose income is land and labour dependent. Ogujiuba*et al* (2004) attempted to answer the questions; should Nigeria liberalize on all countries on all products or opt for a discriminatory approach through unilateral trade agreements?, where should Nigeria liberalize and on what issue should it be closed. Using thecointegration approach for assessing the validity of trade openness for Nigeria's long-run growth, their result showed that there is no significant relationship between trade openness and

economic growth and that unbridled openness could have implications for the growth of local industries, the real sector and government revenue.

In a seminar paper for the International Monetary Fund (IMF), Ebrill*et al* (1999) found that the revenue implications of trade liberalization depend significantly on the form of liberalization and the circumstances under which it occurs. More specifically, trade liberalization would have the fewest consequences on revenue mobilization provided that, (i) the initial position is highly restrictive, (ii) trade liberalization involves the tariffication of quantitative restrictions, (iii) trade liberalization includes such reforms as reduction in tariff dispersion, introduction of minimum tariff or the elimination of exemptions, (iv) trade liberalization is accompanied by reforms in customs and tax administrations which reduce the incentives to evade taxes and (v) trade liberalization is supported by sound macroeconomic policies that ensure liberalization is consistent with external balance. Krugman (1990) summarized the reasons why trade liberalization is good for growth in developing countries. Firstly, developing countries have production patterns that are tended towards labour intensive service, agriculture and manufacturing. People have low per capita income and markets are usually small.

Manni and Afzal (2012) assessed the impact of trade liberalization on Bangladesh economy between 1980 and 2010. Using the OLS technique their results indicated that GDP growth increased consequent to liberalization. Liberalizing trade however does not seem to affect inflation. Nwosa*et al* (2012) examined the relative contribution of trade liberalization trade tax revenue in Nigeria between 1970 and 2009. Their findings revealed that trade liberalization, public debt, gross domestic product and labour force impacted positively on trade tax revenue while exchange rate had a negative effect. They concluded that there is the need for appropriate macroeconomic policy to enhance trade liberalization in Nigeria. Frankel and Romer (1999) using a cross country regression analysis observed that trade has a quantitative large, significant and robust positive effect on income. Dollar and Kraay (2001) provide evidence to conclude that one third of developing countries of the world described as rapid globalizers did extremely well in terms of income growth and poverty reduction over the past two decades. These countries include Bangladesh, India and Sri Lanka in south Asia who have experienced large increases in trade and significant reduction in both tariff and non tariff barriers. In contrast the remaining two third of the developing world with large concentration in Africa did not experience trade expansion due to a lack of sufficient outward orientation performed poorly both in terms of growth and poverty reduction.

2.1 The Nature of Trade Liberalization in Nigeria.

The earliest form of liberalizing trade prior to the Structural Adjustment Programme (SAP) was the import substitution policies in the 1970s. This policy did not record much success as a result of an unconducive macroeconomic environment. The Adoption of SAP in 1986 however brought about the emergence of trade liberalization which was accompanied by the elimination of foreign exchange control to reflect economic realities, removal of price control and disbandment of commodity boards. The policy thrust of SAP in Nigeria was to create an environment conducive to enhance increased capital inflows, transfers, adoption of appropriate technologies and increase the share of trade revenue to government as another means of reducing the total reliance of the economy on crude oil revenue.

Table 1: Economic Indicators in the Pre and Post Liberalization Periods in Nigeria.

	Pre-Liberalization			**Post-Liberalization**			
Economic Indicators (In US $M)	**1973-77**	**1978-82**	**1983-86**	**1987-91**	**1992-97**	**1998-2002**	**2008-2012**
GDP Growth Rate (%)	4.8	4.2	2.1	6.4	2.5	2.6	7.2
GDP per capita	413	772	331	273	314	445	1443
FDI inflow	373	401	455	712	1.079 $B	2.140 $B	7.548 $B
Exchange Rate	0.50	0.67	1.01	9.90	21.88	102.10	139.30
Interest Rate	1.2	3.5	3.8	5.7	7.1	4.2	18.8
Trade % of GDP	11.2	19.8	13.4	27.0	45.2	42.7	52.1
Total Population	67	74	85	97	112	123	156
Inflation Rate	9.0	17.8	44.6	57.2	10.0	15.2	11.7

Source: World Development Indicators 2013.

The economic indicators in table 1 shows that trade as a percentage of GDP per capita rose from the pre-liberalization period but increased significantly in the post-liberalization period. Inflow of foreign direct investment also revealed a similar trend. Virtually all the indicators showed an upward trend from the pre liberalization to post liberalization period. Of interest however is the behaviour of interest rate which continued to rise even significantly in the post liberalization period. This negates the expectation that the availability of cheaper imported products ought to lower prices.

3. METHODOLOGY AND DATA

Time series data covering the period between 1970 and 2012 were collected from the Central Bank of Nigeria (CBN) from 1970 – 2012 for the following variables: openness, foreign direct investment, exchange rates and total population. Using the E-views 7, ordinary least squares, Johansen cointegration technique and Chows breakpoint test were the time series techniques employed for the analysis. The ordinary least squares regression to be estimated is presented below

$$GDP_t = b_o + b_1OPN_t + b_2FDI_t + b_3EXP_t + b_4IMP_t + u_t \quad (3.1)$$

Where OPN is Openness (Import + export/GDP), FDI is Foreign Direct Investment, EXP is Export, IMP is Import, while u_t is the residual terms. A *priori*, $b_1 > 0$, $b_2 > 0$, $b_3 > 0$ and $b_4 > 0$.

The co-integrating relationship was estimated using Johansen Co-integration presented below:

$$Z_t = \sum_{i=1}^{m} A_i Z_{t-i} + E_t \quad (3.2)$$

whereZ_t contains all *n* variables of the model and E_t is a vector of random errors. This model can also be represented in the form of

$$\Delta Z_t = \sum_{i=1}^{m-1} \Gamma_i Z_{t-i} + \Pi Z_{t-m} + E_t \tag{3.3}$$

where

$\Gamma_i = -I + A_1 + \ldots + A_i$ (I is a unit matrix)

$\Pi = -(I - A_1 - \ldots - A_m)$.

Matrix Π can be represented in the following form: Π= α.β, where α and β are both *nxr* matrices. Matrix β is called the *cointegrating matrix* whereas matrix α is referred to as the *adjustment matrix* or the *feedback matrix*. The Johansen method does not only provide direct estimates of the cointegrating vectors but also enables us to construct tests for the order (or rank) of cointegration, *r* and there can be at most *r = N-1*cointegrating vectors. All time series used were tested for unit root using the Augumented Dickey Fuller (ADF) test.

4. EMPIRICAL RESULTS

The ADF test showed that all the variables were stationary after first differencing therefore all are I(1) series. The results are as summarized in table 2 below.

Table 2: Unit Root Test on Variables

Augumented Dickey-Fuller test			
Variables	ADF at level	ADF at 1st Difference	Status
GDP	0.833573	6.973197*	I(1)
OPN	-2.047507	-8.730712*	I(1)
FDI	0.072270	-7.805025*	I(1)
EXP	0.092243	3.187912**	I(1)
IMP	0.064518	3.613547*	I(1)

*/** denotes stationarity at 1% and 5% respectively.

With regard to the central objective of the study which is to examine the effect of trade liberalization on economic growth, appendix 1 presents the summarized result while the linear representation of the estimated ordinary least squares equation 3.1 is as thus;

GDP = 272339.8 + 998334.2OPN + 8.7556FDI – 2.7859EXP + 3.3357IMP

(1.1353) (2.1031) (3.2972) (-5.3327) (9.4739)

$R^2 = 0.8941$ $\bar{R}^2 = 0.8734$ F = 152.14 D-W = 2.26

(t- statistics are in parentheses)

The overall performance of the model as evidenced in the probability of the F-statistics is good. The R-squared and adjusted R-squared were high and statistically significant. The Durbin-Watson

statistics of 2.26 is not far from 2.0 and rules out the problem of autocorrelation. The results revealed a positive and significant relationship between openness and GDP. This implies that liberalizing trade has enhanced economic growth. Only export though significant, has a negative effect on the GDP. The negative relationship may not be totally unexpected because of the uncompetitive nature of Nigeria's manufacturing sector beset with inadequate infrastructural facilities coupled with unconducive macroeconomic environment. Foreign direct investment and import turned out with the expected signs and are also both statistically significant signifying that FDI and imports support growth in Nigeria.

The pairwise Granger Causality test result presented in table 3 further lend credence to the direct effect of openness in causing growth. This is because the null hypothesis of OPN not causing GDP was rejected as informed by the probability value.

Table 3: Pairwise Granger Causality Tests

Sample: 1970 2012

Null Hypothesis:	Lag	F-Statistic	Prob.	Decision
GDP does not Granger Cause OPN	1	0.02187	0.88354	ACCEPT
OPN does not Granger Cause GDP		0.01229	0.00450	REJECT

Next, the Johansen cointegration test was employed to investigate for possible long term relationship between the variables especially between openness and growth. The choice of Johansen cointegration is informed by the fact that all the series are integrated of order one. Our result (see appendix 2) shows that three variables are cointegrated with GDP. This is because at one percent critical value, the likelihood ratio is greater. When compared to the 5 percent critical value, all the variables are cointegrated. This implies the existence of a long run relationship between the variables. Lastly we employed the Chow's breakpoint test to investigate whether openness impact on the growth trajectory effective from 1986 as breakpoint date. The result as presented below (Table 4).

Table 4: Chow Breakpoint Test: 1986

Null Hypothesis: No breaks at specified breakpoints

Varying regressors: All equation variables

Equation Sample: 1971 2011

F-statistic	2.641247	Prob. F(5,31)	0.0281
Log likelihood ratio	4.035250	Prob. Chi-Square(5)	0.0040
Wald Statistic	3.206235	Prob. Chi-Square(5)	0.6682

The hypothesis of no structural change at breakpoint date was rejected as indicated by the probability of the F-statistics, suggesting that openness impacted on growth trajectory of Nigeria.

5. CONCLUSION

The quantitative analysis undertaken in this study suggests that openness has a favourable effect on economic growth of Nigeria. Export however was found to be negatively related to growth. This runs contrary to expectation and it calls for urgent measures in terms of policies targeted at boosting domestic production by revitalizing domestic industries, adherence to international best practices in export processing, export duties collection at ports, financing support for exporters and so on. The co-integrated behaviour of our explanatory variables suggests that, in the long run, movement in openness, foreign direct investment, export and import could be used to raise growth in Nigeria.

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Appendix 1

Regression Result Outputs

Dependent Variable: D(GDP)

Method: Least Squares

Date: 04/17/13 Time: 22:31

Sample: 1970 2011

Included observations: 42				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	272339.8	239867.6	1.135375	0.2635
D(OPN)	998334.2	474691.0	2.103124	0.0125
D(FDI)	8.755613	2.655413	3.297270	0.0022
D(EXP)	-2.785968	0.522430	-5.332710	0.0000
D(IMP)	3.335716	0.352095	9.473917	0.0000
R-squared	0.894114	Mean dependent var		5563255.
Adjusted R-squared	0.873477	S.D. dependent var		8862107.
S.E. of regression	715742.0	Akaike info criterion		29.91137
Sum squared resid	1.90E+13	Schwarz criterion		30.11824
Log likelihood	-623.1388	Hannan-Quinn criter.		29.98720
F-statistic	152.143	Durbin-Watson stat		2.262080
Prob(F-statistic)	0.000000			

Appendix 2

Johansen Cointegration Test Result

Test assumption: No deterministic trend in the data

Series: D(GDP) D(OPN) D(FDI) D(EXP) D(IMP)

Lags interval: 1 to 1				
	Likelihood	5 Percent	1 Percent	Hypothesized
Eigenvalue	Ratio	Critical Value	Critical Value	No. of CE(s)
0.891919	126.5612	81.49	90.45	None **
0.749318	96.78951	59.46	66.52	At most 1 **
0.677332	59.43307	39.89	45.58	At most 2 **
0.410949	28.89250	24.31	29.75	At most 3 *
0.149607	4.375516	3.84	6.51	At most 4 *

*/** denotes rejection of the hypothesis at 5%/1% significance level

L.R. test indicates 5 cointegrating equation(s) at 5% significance level

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THE EFFECT OF FOREIGN DIRECT INVESTMENTS ON UNEMPLOYMENT: EVIDENCE FROM PANEL DATA FOR SEVEN DEVELOPING COUNTRIES

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KEYWORDS

Foreign direct investments, unemployment, panel unit root, panel cointegration, panel causality.

ABSTRACT

In this study, the relationship between foreign direct investment and unemployment are investigated for 7 developing countries, namely Argentina, Chile, Colombia, Philippines, Thailand, Turkey and Uruguay by using the panel data analysis. Panel unit root, panel cointegration and panel causality tests performed by using yearly data from 1981 to 2009 for all countries show that foreign direct investment and unemployment move together in the long run but although foreign direct investment increases unemployment in Turkey and Argentina, it reduces unemployment in Thailand. However, causality tests only depict that there is a relationship from foreign direct investment to unemployment in the long run.

1. INTRODUCTION

By the acceleration of globalization tendencies, capital movements and their effects have attracted increasing attention in recent years. Most of the developing countries which do not have adequate national savings in order to support economical development try to meet the deficit by foreign resources. It is assumed that especially foreign direct investments among the foreign resources have positive effects on some economic variables of a country such as national income, balance of payments, inflation, productivity and poverty. Moreover, it is expected that unemployment rate will decrease as another result of that type of investments. Unemployment is described as the state of not having a job for some people who are able to and want to work but unable to find a job. The economical and social costs caused by the people who do not take part in the production process are quite high. In the economies having higher unemployment rate, first of all the actual rate of national output falls behind the potential rate of national output since all of the resources cannot be used effectively. Furthermore, unemployment constitutes an important risk factor for poverty.

In the open economies, the solution of the unemployment problem can be ensured by foreign direct investments (FDI). Because FDI creates employment possibilities by assisting the developing process of industries and these developing industries generate additional business spaces by forward and backward linkages. Actually, FDI has some both positive and negative direct or indirect effects on the quantity, quality and location of employment. When the quantity of employment considered, inward FDI adds to net capital and creates jobs in expanding industries (positive direct effect) while it creates jobs through forward and backward linkages and multiplier effects in local economy (positive indirect effect). On the other hand, acquisitions may result in rationalization and job losses (negative direct effect) and reliance on imports or displacement of existing firms may result in job loss (negative indirect effect). When we look at the quality of employment, inward FDI pays higher wages and has higher productivity (positive direct effect)

and there is a spillover of "best practice" work organization to domestic firms (positive indirect effect). However, it can introduce practices in e.g. hiring and promotion that are considered undesirable (negative direct effect) and erode wage levels as domestic firms try to compete (negative indirect effect). Finally in terms of the location of employment, inward FDI adds new and perhaps better jobs in areas with high unemployment (positive direct effect) and encourages migration of supplier firms to areas with available labor supply (positive indirect effect). Nevertheless, when FDI has come to an area, crowds can congest urban areas and it may worsen the regional imbalances (negative direct effect). Moreover, inward FDI may displace the local producers, adding to regional unemployment, if foreign affiliates substitute for local production or rely on imports (negative indirect effect) (Jenkins, 2006).

2. LITERATURE REVIEW

There are a lot of studies examining the effects of FDI on both employment and unemployment. Even though an important part of the results shows that FDI decreases the rate of unemployment, some findings could be coincided which show that there is no causal relationship between FDI and unemployment or there is a negative relationship between them.

Craigwell (2006) examined the relationship between employment and foreign direct investment for 20 English and Dutch Speaking Caribbean Countries for the period 1990-2000. He found that an increase in FDI in the entire sample of Caribbean countries leads to an approximate one-to-one increase in employment. Jayaraman and Singh (2007) investigated the relationship between employment and foreign direct investment for Fiji through a multivariate modeling strategy by including GDP. They found unidirectional long run causality running from foreign direct investment to employment and a unidirectional causality running from foreign direct investment to GDP in the short-run. Massoud (2008) studied the empirical evidence on the direct effects of FDI inflows to Egypt throughout the period 1974-2005. The results of the effect of FDI on the demand for labour; where aggregate FDI had an insignificant effect on the demand for labour, except when it interacted with the size of the technology gap, then aggregate FDI had a negative effect impact on the demand for labour. Greenfield and manufacturing FDI had a positive effect when they interacted with the level of human capital and exports, while mergers and acquisitions, agriculture and services FDI had negative direct effect and insignificant interactive effects. Ajaga and Nunnekamp (2008) investigated the long-run relationships between inward FDI and economic outcomes in terms of value added and employment at the level of US states and found a fairly strong evidence of favorable FDI effects on output and employment at the level of US states. At the same time, feedback effects play an important role. In the study for Turkish Economy performed by Hisarcıklılar et. al (2009), they suggested that FDI inflow through mergers and acquisitions did not increase employment. On the other hand, according to the findings of Aktar and Öztürk (2009) there was not any causal relationship between FDI inflow and employment in Turkey. Karlsson et. al (2009) analyzed FDI and employment in China using a large sample of manufacturing firms for the period 1998-2004. The results show that FDI has positive effects on employment growth. Employment growth is also relatively high in private domestic Chinese firms. There also seems to be a positive indirect effect of FDI on employment in private domestically-owned firms, presumably caused by spillovers. In the study for in Mexico's non-maquiladora manufacturing sector Waldkirch et. al (2009) reached a conclusion that FDI has a significantly positive, though quantitatively modest impact on manufacturing employment. Lipsey et. al (2010) examined the employment growth in Indonesia in a large panel of plants between 1975 and 2005, and especially in plants taken over by foreign owners from domestic ones. Employment growth is relatively high in foreign-owned establishments, although foreign firms own relatively large domestic plants, which in general grow more slowly than smaller plants. For plants that change the

nationality of ownership during our period, they found a strong effect of shifts from domestic to foreign ownership in raising the growth rate of employment, but no significant effects of shifts from foreign to domestic ownership. According to Saray (2011), for the data set of 1970-2009 periods, there was not a long term significant relationship between foreign direct investment and employment in Turkey and his findings showed that foreign direct investment did not have any contribution to reduce employment in Turkey. Yaylı and Değer (2012) in their study where dynamic panel causality tests for 27 developing countries had been used setting the 1991-2008 periods as a basis, observed a unidirectional casual relationship from foreign direct investments to employment in the short run. In another study, Habib and Sarwar (2013) focused the impact of foreign direct investment on employment level in Pakistan between 1970 and 2011. The variables in the study were employment level, foreign direct investment, exchange rate and GDP per capita. According to the findings, they determined the existence of a long run relationship. Göçer et. al (2013) analyzed the effect of export and foreign direct investments on unemployment in Turkey by using the data of the period 2000:Q1-2011:Q1. They found that in the long term, export and foreign direct investments have a declining effect on unemployment and the influence of export is higher. In another study for Turkey, Bakkalcı and Argın (2013) investigated the relationship between FDI, growth, productivity, employment and wages using 1991-2011 data and stated that inward FDI affects the employment and firm performances positively and therefore it creates a more productive structure in the Turkish economy.

A summary of the studies investigating the causal relationship between these two variables is demonstrated in Table 1.

Table 1: Selected Empirical Studies on Foreign Direct Investment – Unemployment Nexus

Authors	Country	Period	Methodology	Conclusion
Craigwell (2006)	English and Dutch Speaking Caribbean Countries	1990-2000	Panel Data Analysis	FDI to unemployment
Jayaraman and Singh (2007)	Fiji	1970-2003	Cointegration, Granger Causality	FDI to unemployment
Massoud (2008)	Egypt	1974-2005	TSLS Regression Technique	FDI to unemployment
Ajaga and Nunnekamp (2008)	USA	1977-2001	Panel Cointegration Approach	FDI to unemployment
Hisarcıklılar et. al (2009)	Turkey	2000-2007	Generalized Method of Moments (GMM)	FDI to unemployment
Aktar and Öztürk (2009)	Turkey	2000-2007	VAR Analysis	No causality
Karlsson et. al (2009)	China	1998-2004	OLS Technique	FDI to unemployment
Waldkirch et. al (2009)	Mexico	1994-2006	Generalised Method of Moments (GMM)	FDI to unemployment
Lipsey et. al (2010)	Indonesia	1975-2005	Probit Model	FDI to unemployment
Saray (2011)	Turkey	1970-2009	ARDL Test, Error Correction Model	No causality
Yaylı and Değer (2012)	27 Developing Countries	1991-2008	Dynamic Panel Data	FDI to unemployment
Habib and Sarwar (2013)	Pakistan	1970-2011	Johansen Co-integration Approach	FDI to unemployment
Göçer et. al (2013)	Turkey	2000-2011	Boundary Test Approach	FDI to unemployment
Bakkalcı and Argın (2013)	Turkey	1991-2011	Causality Tests	No causality

3. METHODOLOGY AND DATA

In this study, the relationship between foreign direct investment (FDI) and unemployment (UNEMP) are investigated for 7 developing countries, namely Argentina, Chile, Colombia, Philippines, Thailand, Turkey and Uruguay by using the panel data analysis. Yearly data from 1981 to 2009 for all countries are obtained from the databank of World Bank. The choice of the starting period was constrained by the availability of data. The empirical analysis is performed through three levels:

a. panel unit root tests

b. panel cointegration tests

c. panel causality tests

3.1. Panel Unit Root Tests

In the research process of panel cointegration relationship, first of all it is necessary to determine the existence of unit root in the series. There are many kinds of methods of panel unit roots test. In this study, the tests developed by Levin, Lin and Chu (LLC), Im, Peseran and Shin (IPS) and Hadri were used.

3.1.1. LLC Test

LLC (2002) argued that individual unit root tests have limited power against alternative hypotheses with highly persistent deviations from equilibrium. This is particularly severe in small samples. LLC suggest a more powerful panel unit root test than performing individual unit root tests for each cross-section. The null hypothesis is that each individual time series contains a unit root against the alternative that each time series is stationary (Baltagi, 2005: 240). The model used by Levin, Lin and Chu (2002) in their study can be shown as follows:

$$\Delta y_{it} = \rho y_{it-1} + \sum_{L=1}^{p_i} \theta_{iL} \Delta y_{it-L} + \alpha_{mi} d_{mt} + \varepsilon_{it} \qquad \text{m=1,2,3} \qquad (1)$$

where d_{mt} is used to indicate the vector of deterministic variables and α_m is used to indicate the corresponding vector of coefficients for a particular model m=1; 2; 3. Thus, $d_{1t} = \theta$ (the empty set); d_{2t} ={1}and d_{3t} ={1; t}. Since the lag order p_i is unknown, LLC suggest a three-step procedure to implement their test. These steps are (Levin et., 2002: 5):

a. Different ADV regressions are applied for each cross sections.

b. An estimation is made from long-term standard deviations to short-term deviations. Long-term variance of the model is estimated under the unit root null hypothesis.

c. Panel test statistics are calculated and compared with table values of LLC (2002). If H_0 hypotheses is rejected it is decided that the series does not include unit root and is stationary.

3.1.2. IPS Test

The Levin, Lin and Chu test is restrictive in the sense that it requires ρ to be homogeneous across *i*. IPS allow for a heterogeneous coefficient of y_{it-1} and propose an alternative testing procedure based on averaging individual unit root test statistics. IPS suggest an average of the ADF tests when u_{it} is serially correlated with different serial correlation properties across cross-sectional units (Baltagi, 2005: 242).

The model can be shown as the following equation (N is for cross section and T is for time):

$$\Delta y_{it} = \alpha_i + \beta_i y_{i,t-1} + \varepsilon_{it} \qquad (2)$$

Unit root test is based on zero equation of β coefficient just as ADF test. Null hypotheses in IPS test is $H_0 : \beta_i = 0$ for all i and alternative hypotheses is $H_1 : \beta_i < 0$. *t*-bar statistics is used in order to test H_0 hypotheses. *t*-bar statistic can be written as follows (Im et. al., 2003: 55):

$$\overline{Z} = \frac{\sqrt{N}\left[\bar{t} - E(\bar{t})\right]}{\sqrt{Var(\bar{t})}} \rightarrow N(0,1) \qquad \bar{t} = \frac{1}{N}\sum_{i=1}^{N} t_{\beta_i} \qquad (3)$$

Where $t = (1/N)\sum_{i=1}^{N} t_{\beta_i}$, $E(\bar{t})$, and $Var(\bar{t})$ are the mean and variance for each t_{β_i} respectively. IPS test has more favorable finite sample properties than the LLC test (Zhu and Zhao, 2008: 826).

3.1.3. Hadri Test

Contrary to the previous first generation tests, the test proposed by Hadri (2000) is based on the null hypothesis of stationarity. It is an extension of the stationarity test developed by Kwiatkowski et. al. (1992) in the time series context. Hadri proposes a residual-based Lagrance multiplier test for the null hypothesis is that the individual series y_{it} (for $i = (1,...,N)$ are stationary around a deterministic level or around a deterministic trend, against the alternative of a unit root in panel data (Hurlin and Mignon, 2004: 7).

It is based on the following regression (Maeso-Fernandez et. al., 2004: 16):

$$y_{it} = \alpha_i + \gamma_i t + \sum_{t=1}^{T} u_{it} + \varepsilon_{it} \qquad (4)$$

where the deterministic terms are defined as in (4) above, and the error term has two components: ε_{it}, which is white noise, and $\sum_{t=1}^{T} u_{it}$, which is a random walk. The test is based on the fact that under the null hypothesis of stationarity the variance of the random walk component $\left(\sigma_u^2\right)$ is zero.

The test statistic takes the form $\frac{\sigma_u^2}{\sigma_\varepsilon^2}$, which has a standard normal distribution under the null hypothesis.

3.2. Panel Cointegration Tests

The cointegration tests are implemented through two main tests, namely Pedroni (1997, 1999 and 2000) and Larrson et.al. (2001). In this study we utilize Pedroni's panel cointegration technique to examine whether there is a long-run relationship between FDI and unemployment. The implementation of Pedroni's cointegration test firstly requires estimating the following long run relationship (Pedroni, 1999: 656):

$$y_{it} = \alpha_i + \delta_i t + \beta_{1i} x_{1,it} + \beta_{2i} x_{2,it} + ... + \beta_{Mi} x_{M,it} + \varepsilon_{it} \quad (5)$$

for $i = 1,...,N$; $t = 1,...,T$; $m = 1,...,M$

where T refers to the number of observations over time, N refers to the number of individual members in the panel, and M refers to the number of regression variables. The structure of estimated residuals is as follows (Bangake and Eggoh, 2011):

$$\hat{\varepsilon}_{it} = \hat{\rho}_i \hat{\varepsilon}_{it-1} + \hat{u}_{it} \quad (6)$$

Pedroni had developed seven panel cointegration statistics for varying intercepts and varying slopes. Four of them, pooled panel cointegration statistics, are within-dimension based statistics. The other three, group mean panel cointegration statistics, are between-dimension based. The pooled panel cointegration test statistics are as follows (Ho and Huang, 2009):

$$\text{Panel } v \text{ statistics} = \left(\sum_{i=1}^{N} \sum_{t=1}^{T} \hat{L}_{11i}^{-2} \hat{e}_{i,t-1}^2 \right)^{-1} \quad (7)$$

$$\text{Panel rho-statistic} = \left(\sum_{i=1}^{N} \sum_{t=1}^{T} \hat{L}_{11i}^{-2} \hat{e}_{i,t-1}^2 \right)^{-1} \sum_{i=1}^{N} \sum_{t=1}^{T} \hat{L}_{11i} \left(\hat{e}_{i,t-1} \Delta \hat{e}_{it} - \hat{\lambda}_i \right) \quad (8)$$

$$\text{Panel PP-statistic} = \left(\sigma^2 \sum_{i=1}^{N} \sum_{t=1}^{T} \hat{L}_{11i}^{-2} \hat{e}_{i,t-1}^2 \right)^{-1/2} \sum_{i=1}^{N} \sum_{t=1}^{T} \hat{L}_{11i}^{-2} \left(\hat{e}_{i,t-1} \Delta \hat{e}_{it} - \lambda_i \right) \quad (9)$$

$$\text{Panel ADF-statistic} = \left(\hat{s}^{*2} \sum_{i=1}^{N} \sum_{t=1}^{T} \hat{L}_{11}^{-2} \hat{e}_{i,t-1}^{*2} \right)^{-1/2} \left(\sum_{i=1}^{N} \sum_{t=1}^{T} \hat{L}_{11i}^{-2} \hat{e}_{1,t-1}^{*} \Delta \hat{e}_{i,t}^{*} \right) \quad (10)$$

The group-mean panel cointegration test statistics are as follows:

$$\text{Group rho-statistic} = \sum_{i=1}^{N} \left(\sum_{t=1}^{T} \hat{e}_{i,t-1}^2 \right)^{-1} \sum_{t=1}^{T} \left(\hat{e}_{i,t-1} \Delta \hat{e}_{i,t} - \hat{\lambda}_i \right) \quad (11)$$

$$\text{Group PP-statistic} = \sum_{i=1}^{N}\left(\hat{\sigma}_i^{\,2}\sum_{t=1}^{T}\hat{e}_{i,t-1}^{2}\right)^{-1/2}\sum_{t=1}^{T}\left(\hat{e}_{i,t-1}\Delta\hat{e}_{i,t}-\hat{\lambda}_i\right) \quad (12)$$

$$\text{Group ADF statistic} = \sum_{i=1}^{N}\left(\sum_{t=1}^{T}\hat{S}_i^{-2}\hat{e}_{i,t-1}^{*2}\right)^{-1/2}\sum_{t=1}^{T}\hat{e}_{i,t-1}^{*}\Delta\hat{e}_{i,t}^{*} \quad (13)$$

Large positive values reject the null hypothesis that means there is no cointegration in the panel ν-statistic which is a one-sided test. However, the other statistics diverge to negative infinitely meaning that large negative values reject the null hypothesis. The critical values are also depicted by Pedroni (1999). These tests are able to accommodate individual specific short-run dynamics, individual specific fixed effects and deterministic trends as well as individual specific slope coefficients (Pedroni, 2004).

3.3. Panel Causality Tests

Panel causality test is used in order to examine the direction of causality between the variables in a panel context. The fact that if two non-stationary variables are cointegrated, a vector autoregression (VAR) in first differences will be mis-specified was first suggested by Engle and Granger (1987). If there exists a long-term equilibrium relationship between FDI and unemployment when we test it for Granger causality, we need to bring out a model with a dynamic error correction representation meaning that the traditional VAR model is augmented with a one period lagged error correction term. The Granger causality test is based on the following regressions:

$$\Delta FDI_{it} = \alpha_{1i} + \sum_{k}\theta_{11ik}\Delta FDI_{it-k} + \sum_{k}\theta_{12ik}\Delta UNEMP_{it-k} + \lambda_{1i}ECT_{it-1} + u_{1it} \quad (14)$$

$$\Delta UNEMP_{it} = \alpha_{2i} + \sum_{k}\theta_{21ik}\Delta UNEMP_{it-k} + \sum_{k}\theta_{22ik}\Delta FDI_{it-k} + \lambda_{2i}ECT_{it-1} + u_{2it} \quad (15)$$

where Δ denotes the first difference of the variable, ECT is the error –correction term, and k denotes the lag length. From the system, the panel Granger-causality tests are examined by testing whether all the coefficients of ΔFDI_{it-k} or $\Delta UNEMP_{it-k}$ are statistically different from zero as a group based on a standard F-test and/or the $\lambda_{i,i}$ coefficient of the error correction is also significant (denoting long run causation). The coefficients of the ECTs measure how fast the values of the variables of the system come back to the long-run equilibrium levels when they deviate from it.

3.4. Empirical Results

As in the time series analysis, variables are needed to be stationary in order to prevent spurious regressions between variables in the panel data analysis which performs both time and cross section analysis together. LLC, IPS and Hadri were used among panel unit root tests for the stationarity testing[1]. The findings about unit root test are demonstrated in Table 2.

Table 2: Results of Panel Unit Tests

	Levin, Lin & Chu		**Im, Pesaran and Shin**		**Hadri**	
FDI	-0.90929	0.1816	-0.26902	0.6060	6.32380	0.0000
UNEMP	0.20204	0.5801	-0.36314	0.3582	2.46312	0.0069
Δ FDI	-15.8483	0.0000	-15.2585	0.0000	0.14826	0.4411
Δ UNEMP	-4.09629	0.0000	-6.45714	0.0000	0.14994	0.4404

Note: Automatic lag length selection based on Modified Schwarz Criteria and Bartlett kernel.

Since the probability values calculated in LLC and IPS are bigger than the critic value 0.05, the null hypothesis accepting that series involve unit root is not rejected. However, as the probability values calculated in Hadri are smaller than 0.05, the null hypothesis accepting that series do not involve unit root is rejected. Therefore, the findings of three tests support each other. According to these results, it is seen that series are not stationary in level but in the unit root tests after their first difference are taken they seem to become stationary. The stationarity of the series at their first difference shows that there may be a relationship between them in the long run.

The Pedroni Panel Cointegration Approach was used for determining the long-term relationship between the series in our study. Pedroni developed 7 tests in order to determine the cointegration in the panel data models. In these tests, H_0 null hypothesis shows that there is no cointegration. The results of Pedroni panel cointegration tests are demonstrated in Table 3.

[1]All estimation was done using EViews 5.1.

Table 3: Panel Cointegration Tests: Pedroni

Within-dimension	**Constant**	**Constant and Trend**
Panel v-Statistic	1.96308**	-0.09306
Panel rho-Statistic	-2.28360**	0.09879
Panel PP-Statistic	-1.93431**	-0.08523
Panel ADF-Statistic	-2.08167**	-0.51904
Between-dimension		
Group rho-Statistic	-0.89396	1.08438
Group PP-Statistic	-1.36132	0.63992
Group ADF-Statistic	-1.81333**	0.06257

Note: All statistics are from Pedroni's procedure (1999) where the adjusted values can be compared to the N(0,1) distribution. The Pedroni (2004) statistics are one-sided tests with a critical value of -1.64 ($k < -1.64$ implies rejection of the null), except the *v*-statistic that has a critical value of 1.64 ($k > 1.64$ suggests rejection of the null). ** indicates rejection of the null hypothesis of no-co-integration at 5%, level of significance.

In constant level, panel v statistical value is bigger than the critical value 1.64 and four of the other six statistics are smaller than the critical value 1.64. In this context, the Pedroni's tests indicate that there is a long-run relationship between foreign direct investment and unemployment. Since there is a long-term relationship in the panel group, Dynamic Ordinary Least Squares (DOLS) and Fully Modified Ordinary Least Squares (FMOLS) estimators were used in order to estimate the panel cointegration vector in our study[2]. Spurious regression -when the series are nonstationary- is a result of the use of normal OLS techniques. In this situation, specific panel cointegration techniques have to be used. Phillips and Moon (2000) show that in the case of homogeneous and near-homogeneous panels, the coefficient of cointegration can be estimated by a fully modified (FM) estimator. This method is non-parametric as it employs kernel estimators of the nuisance parameters affecting the asymptotic distribution of the OLS estimator. It overcomes the possible problem of endogeneity of the regressors as well as the autocorrelation of residuals. Alternatively, Kao and Chiang (2000) and Mark and Sul (2003) proposed a dynamic least square estimator (DOLS). This estimation procedure is parametric and has the advantage of computing convenience (Bodart, et. al., 2011: 10). DOLS and FMOLS estimators were developed since the cointegrated regression model which was composed of series having a long-term relationship between each other showed deviated results when it was estimated by least squares method. The results for the panel DOLS and FMOLS estimations are reported in Table 4.

[2] DOLS and FMOLS were estimated using the software program RATS 7.0

Table 4: Individual Panel DOLS and FMOLS Estimators

Country	DOLS		FMOLS	
	Coefficient	t-statistic	Coefficient	t-statistic
Argentina	2.79**	3.55	1.15	1.48
Chile	-0.24	-0.74	-0.22	-0.59
Colombia	0.76	1.20	0.43	0.79
Phillippines	1.11	1.75	0.52	0.99
Thailand	-0.43**	-2.09	-0.14	-0.68
Turkey	1.40**	4.05	0.92**	2.80
Uruguay	-0.12	-0.42	-0.23	-0.84
Panel group	0.75**	2.76	0.35	1.49

Note:** denotes statistical significance at 5 percent level of significance.

The results of DOLS estimates confirm the existence of a long run relationship between FDI and unemployment. According to the results of DOLS panel cointegration, while the sign of coefficient belonging to FDI variable for Argentina and Turkey is positive, the sign of the coefficient for Thailand is negative and it is statistically significant. However, there is not any similar relationship for Chile, Colombia, Philippines and Uruguay. On the other hand, the results of FMOLS demonstrated that there is not a strong relationship for the panel group. Only the finding that FDI has a positive effect on unemployment was reached as parallel to the finding obtained in DOLS for Turkey. This situation can be explained through the fact that FDI inflow to Turkey is mainly brownfield investments which is generally composed of mergers and acquisitions instead of greenfield investments which create new employment opportunities. Moreover, the rationalization process in the companies in which foreign investors gain the power of control has a negative effect on employment.

Table 5: Panel Granger Causality

	Short-run causality		Long-run causality
	Δ UNEMP	Δ FDI	ECT
Δ UNEMP		1.46 [0.4812]	0.13 (2.90)
Δ FDI	2.72 [0.2566]		-0.014 (-0.28)

The *p*-values and t-ratios are in brackets and parentheses.

Table 5 demonstrates the results of panel causality between FDI and unemployment. In equation 14, as the coefficient of ΔFDI_{it-1} is statistically insignificant, there is no causality relationship

from FDI to unemployment in the short run. However, λ_{1i} -the coefficient of ECT_{it-1}- is statistically significant at the level of 10% and there is a causal relationship from FDI to unemployment in the long run. In equation 15, since the t statistical values are insignificant in both short and long run, there is not any causality relationship from unemployment to FDI. This consequence is important in a sense that FDI has an important factor for the employment policies of developing countries.

4. CONCLUSION

Unemployment is among the most important problems of all countries whatever their levels of development are. The fundamental factors making this problem so important are its negative effects on both economic and social fields of the society. The most effective and healthy way of eradicating these negative effects is unquestionably economic growth. Ameliorating the investment environment in a country is a determining factor in terms of economic growth which means an increase in the quantity of goods and services manufactured in a specific time period. The capital accumulation which is needed to boost economic growth is tried to be furnished with domestic resources firstly. The capital deficit occurring from low income level and inadequate savings can only be compensated by foreign investment. The investment type which affects the economic growth and accordingly the level of employment in the most efficient way is foreign direct investment. FDI creates important positive externalities in terms of technology and knowhow as much as economic growth and employment. Therefore, developing countries exert very much effort to attract FDI from foreign investors. In this paper, the impact of FDI on unemployment were analyzed for 7 developing countries, namely Argentina, Chile, Colombia, Philippines, Thailand, Turkey and Uruguay through panel data technique by using yearly data from 1981 to 2009 for all countries. The findings disclosed that these two variables are cointegrated in the long run and whilst FDI increases unemployment in Turkey and Argentina, reduces it in Thailand. On the other hand, causality tests displayed that there is only a causal relationship from FDI to unemployment in the long run even though there is no relationship between the variables in the short run.

Consequently, it can be argued that the negative effect of FDI on unemployment is mainly a consequence of brownfield investments which is generally composed of mergers and acquisitions. Therefore, the policymakers should make more emphasis on greenfield investments which are able to create new employment opportunities.

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EMPIRICAL ANALYSIS OF THE SAVINGS-GROWTH NEXUS IN TURKEY

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Savings, economic growth, Toda-Yamamoto causality test, bootstrapping, Turkey.

ABSTRACT

This paper investigates the causality relationship between savings and economic growth in Turkey from 1961 to 2012 using the bootstrap, process-based, Toda-Yamamoto, linear Granger causality test. According to empirical analyses, a bidirectional causality exists between savings and economic growth in Turkey. Thus we can say that the feedback hypothesis is valid. That is, both the Keynes and the Solow model are relevant for Turkey.

1. INTRODUCTION

The analysis of the causal relation between savings and economic growth is of high importance for the government and related authorities to reach intended macro economic targets. If savings occur before economic growth and result in economic growth, policy makers can apply policies that increase the mobilization of savings to provide a higher level of economic growth. On the other hand, if economic growth occurs before and results in savings, the acceleration of economic growth is necessary to eliminate the obstacles to expansion to increase the level of savings. On certain occasions, there may not be a causal relation between economic growth and the level of savings. This result cannot be obtained especially in countries in which the per capita income level is very low. In these countries, people earn enough income only to survive. The entire income, therefore, is spent to fulfill their basic needs. Governments in these countries should pay attention to social policies and give priority to increasing developmental levels before economic growth.

Economic growth requires physical and human investments. Even though savings in other countries support these kinds of investments, these investments are generally funded by domestic savings. It would be very challenging to realize economic growth without productive investments and their components. Besides, savings are not solely required and sufficient to accelerate economic growth. However, savings are certainly expected to enhance economic growth.

This study investigates whether there is a causal relation between savings and economic growth in Turkey between 1961 and 2010. This study is a causality analysis. Studies in this area in the literature mainly used the standard Granger causality test. The standard Granger causality test is highly responsive to the order of the stationarity of variables. Furthermore, the standard Granger causality test is implemented in different ways depending on whether the variables are co-integrated, and it requires that the variables are stationary. In the Toda-Yamamoto causality test based on bootstrap distribution used in the study developed by Hacker and Hatemi-J (2006), the series are not required to be stationary or co-integrated. This paper is organized as follows: In the following section, a theoretical backgroundis presented**.** The literature review is presented in section 3. In section 4, the econometric methodology is explained. Section 5 presents the data and empirical findings, and, in the last section, the conclusion is presented.

2. THEORETICAL BACKGROUND

Although a causal relation between the rate of savings and economic growth is highly important for policy makers, there are ongoing discussions on the direction of this causal relation. Empirical applications on the relation between savings and economic growth are based on the model by Keynes (1936) and Solow (1956).

According to the Keynes model, savings (S) are the function of growth (Y) and explained by the following model:

$$S = \alpha_0 + \alpha_1 Y + U_1 \quad (1)$$

where S represents savings, Y economic growth, α_0 constant, α_1 the coefficient that indicates the sensitivity of savings to economic growth, and U_1 error term.

On the other hand, savings are a determinant of economic growth according to the hypothesis by Solow. In this respect, economic growth as a function of savings can be indicated as follows:

$$Y = \beta_0 + \beta_1 S + U_2 \quad (2)$$

where S represents savings, Y economic growth, α_0 constant, α_1 the coefficient that indicates the sensitivity of economic growth to savings, and U_1 error term (Mistzal, 2011: 19).

The Keynes model emphasizes that output growth is the reason for the growth of savings. According to this model, an increase in the output causes the income level to increase. This increase in income causes the national savings level to increase (Abu, 2010: 94).

In the Solow model, the rate of savings is a key determinant of the stationary state capital stock. In other words, if the rate of savings is high, the economy will have higher levels of capital and output per employee. It is the contrary when the rate of savings is low. Thus, it can be concluded for the Solow model that increases in the rates of savings result in rapid growth. However, this is only valid in the short term. Increases in the saving rates increase the short-term growth rate, and this process lasts until it has reached the new stationary state. Therefore, increases in the saving rates do not affect long-term growth rates. Increases in the saving rates increase the levels of capital per employee and output per employee. This causes the economy to become richer compared to the previous state (Berber, 2006: 157–158).

Increases in the saving rates increase the level of output per employee and the growth rates during transition periods. While the level of output per employee maintains its condition in time, the growth rate decreases and reaches the long-term growth rate again. Increases in savings result in increases in the capital stock per employee and output per employee (Konya, 2005: 232). However, increases in the growth level realized in the short term due to increases in investments are not continuous. Because the diminishing returns on capital are legally applicable, the economic growth rate diminishes in the long term to the labor force increase rate again. Therefore, increases in savings do not affect growth in the long term (Berber, 2006: 157-158).

3. LITERATURE

Saltz (1999) studied the causal relationship between savings and growth rates of real outputs for a group of 18 Latin American and newly industrialized countries from1960 to 1991 using the Granger causality test. He found that higher growth rates of real output cause higher growth rates of savings.

Sinha (1996) investigated a cointegration relationship between savings and growth in India for the period of 1960 to 1995. He found that the variables were cointegrated by using the Johansen and Juselius (1990) cointegration test, but a Granger causality test indicated that savings and economic growth are neutral according to the results of empirical analyses by Sinha (1998).

Tang and Chua (2009) examined the savings-growth nexus in Malaysia with quarterly data from March 1991 to September 2006. They found that the variables were cointegrated by the Bierens (1997) nonparametric cointegration test and a bilateral causality existed between savings and economic growth by the multiple rank F-test.

K´onya (2005) investigated the causality between savings and growth in 84 countries from 1961 to 2000. He used the Granger causality analysis with bootstrapping on panels of countries. He found a two-way Granger causality between the savings ratio and the growth rate in Austria, a one-way causality from growth to savings in Finland, France, Japan, Sweden, Switzerland and Niger, and a one-way causality from savings to growth in Ireland, Trinidad & Tobago, and the Central African Republic; but in all other cases, there was no empirical evidence of Granger causality in either direction.

Al-Foul (2010) examined the causal relation between savings and economic growth for Morocco (1965–2007) and Tunisia (1961–2007) with the cointegration approach by Pesaran et al. (2001). His empirical results showed that no evidence of a long-run relationship existed for Tunisia while a long-run relationship existed between the variables for Morocco. Also, the Granger causality test supports that there is a unidirectional Granger causality from savings growth to economic growth in the case of Tunisia and a bidirectional causality between economic growth and savings growth in Morocco.

Abu (2010) studied the savıngs-economıc growth nexus in Nigeria from 1970 to 2007 using Granger causality and co-integration analyses. He concluded that the variables are co-integrated and a long-run equilibrium existed between them. Furthermore, the Granger causality test revealed that a one-way causality runs from economic growth to savings.

Lean and Song (2009) examined the relationship between the growth of domestic savings and economic growth in China for the period of 1955–2004. They detected a co-integrated relationship between economic growth and household savings, enterprise savings. Also, they found that in the long-run, a unidirectional causality existed running from the domestic savings growth to the economic growth and that bilateral causality existed between domestic savings growth and economic growth in the short-run

Mohan (2006) studied the relationship between domestic savings and economic growth for various economies with different income levels using the Granger causality test. He used time series annual data from 1960 to 2001. His emprical results showed that there was a unidirectional Granger causality from economic growth rate to growth rate of savings in 13 countries, and there is a unidirectional Granger causality from growth rate of savings to economic growth rate in two countries. Also a bi-directional causation was found in five countries.

Anoruo and Ahmad(2001) explored the causal relationship between economic growth and the growth rates of domestic savings for the Congo, Coˆted'Ivoire, Ghana, Kenya, South Africa, and Zambia for the period 1960–1997. They used Johansen and Juselius's (1990) co-integration test and the Granger causality test. They found a long-run relationship between economic growth and the growth rates of domestic savings and that economic growth causes growth rate of domestic savings for most of the countries under consideration.

Ciftcioglu and Begovic (2010) investigated the effects of higher saving rates on economic growth for a sample of Central and Eastern European countries over the period of 1995–2003 by panel data analysis. They concluded that domestic savings rates had exerted a statistically significant effect on growth rates of the GDP over the sample period.

Misztal (2011) studied the cause and effect relationship between economic growth and savings in advanced economies and in emerging and developing countries from 1980 to 2009. His results showed the existence of a one-way causal relationship from gross domestic savings to GDP in the case of developed countries as well as in developing and transition countries.

4. ECONOMETRIC METHODOLOGY

In this study, we will use the Toda-Yamamoto (1995) causality test with a leveraged bootstrap distribution introduced by Hacker and Hatemi-J (2006).

Hacker and Hatemi-J (2006) investigated the size properties of the Toda–Yamamoto modified Wald (MWALD) test. They show that particularly in small samples, the asymptotic distribution of this test is a poor approximation. They demonstrated that, especially when this distribution has the characteristics of the error term autoregressive conditional heteroscedasticity (ARCH) and non-normality, MWALD-test statistics generate biased results that reject the null hypothesis. To improve on the size properties of the modified Wald test, they suggested a leveraged bootstrap distribution that is not sensitive to non-normality and the existence of ARCH.

Toda and Yamamoto's MWALD test is attractive due to the advantage of implementing, regardless of whether the processes are integrated or even cointegrated. Toda and Yamamoto (1995) suggested following an augmented VAR($p+d$) model.

$$y_t = v + A_1 y_{t-1} + \ldots\ldots A_p y_{t-p} + \ldots\ldots A_{p+d} y_{t-(p+d)} + \mu_t \qquad (1)$$

Where y_t is the number of variables in the VAR model, v is an vector of intercepts, μ_t is a vector of error terms, r A_p is a matrix of parameters for lag p, which is assumed to be known, and d, which is equal to the integration order of the variables.

The k th element of y_t does not Granger-cause the j th element of y_t if the null hypothesis that is defined following is not rejected.

H_0 : the row j , column k element in A_r equals zero for $r = 1,\ldots, p$

The following denotations for a sample size T are suggested to describe the Toda-Yamamoto test statistic in a compact way:

$Y := (y_1,\ldots, y_T)$ $\quad (n \times T)$ matrix,

$$\hat{D} := \left(\hat{v}, \hat{A}_1, ..., \hat{A}_p, ..., \hat{A}_{p+d}\right) \qquad \left(n \times \left(1 + n\left(p + d\right)\right)\right)_{\text{matrix,}}$$

$$Z_t := \begin{bmatrix} 1 \\ y_t \\ y_{t-1} \\ \vdots \\ y_{t-p-d+1} \end{bmatrix} \qquad \left(\left(1 + n\left(p + d\right)\right) \times 1\right)$$

matrix for $t = 1, ..., T$

$$Z := \left(Z_0, ..., Z_{T-1}\right) \qquad \left(\left(1 + n\left(p + d\right)\right) \times T\right)_{\text{matrix}}$$

and

$$\hat{\delta} := \left(\hat{\varepsilon}_1, ..., \hat{\varepsilon}_T\right) \qquad \left(n \times T\right)_{\text{matrix}}$$

Thus, the augmented $VAR(p+d)$ model is in a simple form as follows:

$$Y = \hat{D}Z + \hat{\delta} \quad (2)$$

Toda and Yamamoto (1995) suggested the MWALD test statistic for testing non-Granger causality as follows:

$$MWALD = \left(C\hat{\beta}\right)' \left[C\left(\left(Z'Z\right)^{-1} \otimes S_U\right)C'\right]^{-1} \left(C\hat{\beta}\right) \quad (3)$$

where S_U is the variance-covariance matrix of residuals from the unrestricted regression(3), $\hat{\beta} = vec\left(\hat{D}\right)$ [vec denotes the column-stacking operator], $\otimes$ is the Kronecker product, and C is a $p \times n\left(1 + n\left(p + d\right)\right)$ indicator matrix. Using these notations, the null hypothesis of the no-Granger causality is defined as the following.

$$H_0 : C\beta = 0$$

The MWALD test statistic is asymptotic χ^2 distributed with the number of degrees of freedom equal to *p*, which is the number of restrictions to be tested.

The bootstrap simulation procedure is conducted following the procedure that was introduced by Hacker and Hatemi-J (2006). We first estimated regression (4) through OLS with the null hypothesis of no-Granger causality imposed. For each bootstrap simulation, we created the simulated data, y_t^*, $t = 1, ..., T$ based on the coefficient estimates from this regression $\widetilde{A}_1, ..., \widetilde{A}_p$, the original $y_{t-1}, ..., y_{t-p}$ data, and $\widetilde{\mu}_t^*$ as the bootstrapped residuals. The bootstrap

residuals are based on T random draws with replacement from the regression's modified residuals, each with an equal probability of $1/T$.

We are generated the empirical distribution for the MWALD based on conducting the bootstrap simulation 10,000 times and calculating the MWALD-test statistics for each time. Then we calculated the MWALD statistic using the original data. If the MWALD-test statistic was higher than bootstrap critical values, then the null hypothesis of non-Granger causality would be rejected; otherwise, we did not reject the null hypothesis.

5. DATA AND EMPIRICAL RESULTS

We investigated the savings and economic growth causality relationship in Turkey over the years 1961–2012. We used the proportion of gross domestic savings in the GDP (hereafter GDS) and the annual percentage change of real per capita GDP (the growth). These data were extracted from the World Development Indicator (WDI).

To examine the savings-growth reletionship for Turkey, we used the Hacker and Hatemi-J (2006) bootstrap, process-based, Toda-Yamamoto (1995), linear Granger causality. Toda-Yamamoto-test statistics for Granger causality are used when the data generate process is characterized for both variables by integration of the same order (degree zero, one, or two) or when it is characterized by different integration orders for the two variables.

First, we studied the integration order or the variables with the Phillips-Perron unit root test. The results are presented in Table 1.

Table 1: Phillips-Perron Unit Root Test

Variables	$H_0 : I(1)$		$H_0 : I(2)$	
	Intercept	Intercept and Trend	Intercept	Intercept and Trend
GDS	0.2501	0.6027	0.0000	0.0000
GDP	0.0000	0.0000		

Notes: p-values are presented.

As indicated in Table 1, GDS is I(1) and GDP is I(0). The results of the Toda-Yamamoto (1995) linear Granger causality based on the Hacker and Hatemi-J (2006) bootstrap process is given in Table 2.

Table 2: Toda- Yamamoto (1995) Linear Granger Causality Based on Hacker and Hatemi-J's (2006) Bootstrap Process

Null Hypothesis	*Estimated test Value*	*1% bootstrap critical value*	*5% bootstrap critical value*	*10% bootstrap critical value*
GDS $\not\Rightarrow$ GDP	4.361*	9.896	4.185	2.785
GDP $\not\Rightarrow$ GDS	2.943**	7.213	3.474	2.803

The null hypothesis (A$\not\Rightarrow$B) implies that A does not Granger-cause B. "*" and "**" are significant respectively at the 5% and 10%. We obtained bootstrap critical values from 10,000 replications.

We discovered that bidirectional causality exists between savings and growth for Turkey according to the results in Table 2.

According to these results, the feedback hypothesis is valid in Turkey. Theoretically, it is understood that both the Keynes and the Solow models are applicable for Turkey. Turkey is a developing country. Although the current deficit and the investment-savings deficit are generally met by foreign savings in developing countries, the domestic savings rate can be used to find the current deficit and investment-savings deficit, which can affect economic growth. However, uncertainty in developing countries encourages people and investors to act with caution. Therefore, people and investors prefer to make savings rather than making investments and consumption in an uncertain environment. Accordingly, while savings affect economic growth in developing countries, people rather tend to favor savings because they frequently encounter the atmosphere of uncertainty. Instability in economic growth causes uncertainty. This uncertainty results in increases in savings. Turkey's position as a developing country plays a significant role in the interaction between savings and economic growth.

6. CONCLUSION

According to these results, savings in Turkey both get affected by economic growth and have an effect on it. Thus, policy makers, especially in developing countries, are required to implement policies to increase savings. In developing countries, although foreign savings are generally preferred for funding macroeconomic actions such as balance of payments disequilibrium and sustainable growth, the source of financing obtained in this manner poses a great risk. There are many factors that affect the direction of savings of foreign countries to any country, such factors include interest, exchange rate, profitability, and other factors highly important in attracting this source of financing. Foreign investment inflow is available in a country as long as interest, exchange rates and profitability rates are suitable. On the contrary, foreign capital tends towards other countries. Therefore, foreign capital can immediately enter and leave a country. For this reason, we should be encouraged to increase domestic savings and to turn them into investment. Accordingly, stability should be ensured in economic and political arenas. Policy makers should create an environment of trust in this respect.

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MIXTURE DISTRIBUTION APPROACH IN FINANCIAL RISK ANALYSIS

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KEYWORDS

Financial risk, value-at-risk (VaR), normal mixture distribution.

ABSTRACT

In recent years, major changes occurred in the prices of stock exchange appeared the necessity of measuring the financial risk. Nowadays, Value-at-Risk (VaR) is often used to calculate the financial risk. Parametric methods which need normality are mostly used in the calculation of VaR.If the financial data does not fit the normal distribution, mixture of normal distribution models can be fitted to this data. In this study, the financial risk is calculated by using normal mixture distribution models as a new approach to parametric method.

1. INTRODUCTION

In daily life almost everything involves a risk that is in all areas of life lots of people and company exposed to risk. For the finance and economy, uncertainty of future returns cause a risk and this risk has an increasing importance.Financial Risks can be defined as incidents that affect the strategies and goals of an organization negatively. This risk also causes it to gain less than expected and may damage the organization.The financial risks which investors and operations come across are categorized as systematic and unsystematic risks.Systematic risks occur as a result of unexpected economical events and effect the whole organization negatively.Unsystematic risks do not occur in the whole economy but they are the risks which occur in according to the change of the organization's situation due to the fluctuations on the cost of instruments such as stock certificates, bond and treasury notes (Aven, T. 2008).The risks that might occur in banking do not only affect that field but also affects the whole economical system,however it can be reduced by a successful management.The major changes occurred in the prices of stock exchange revealed the necessity of measuring the financial risk. The firms' works about the financial risk measurement started in 1970's. VaR which was developed by Morgan (1994) is used to measure the highest loss in stock exchange in a certain confidence level and in a certain time period.

The basic presentation of VaRin mathematical form is;

$$\mathrm{Var} = \left(\mu + z_{1-\alpha} \times \sigma \times \sqrt{t}\right) \times A \quad (1)$$

whereμ is average return, $1-\alpha$is confidence level, σ is standard deviation, $t$is given timeperiod and$A$ is the amount of investment.

VaRcan be calculated by using different methodsbut the simplest way of VaR calculation is the Parametric Method.However there is normality assumption in the parametric method and also based on the variation of portfolio. In this method for the portfolio incomes, each portfolio's variation should be computed. When there is a tailed normal structure for financial data or this data has not a normal distribution, calculated VaR value will not reflect the real risk level.

If the financial data has a heterogeneous structure, the normal distribution doesn't fit the data, properly. In this case financial risk can be calculated by using a mixture of normal distribution model approach in the Parametric Method (Alexander, 2008).Alexander (2008) used EM (Expectation-Maximization) algorithm with the maximum likelihood method to estimate the unknown parameters of mixture of normal distribution model. In addition to Alexander (2008), in case of moderate and volatile money policy within a certain time, Dardac and Grigore (2011) showed that using mixture of normal distribution models in Parametric method for estimating portfolio returns will give more accurate results than Historical Simulation and Monte-Carlo Simulation.

In this paper, the daily changes of the shares of Tofas, Turkcell, Vestel, Ulker, Eczacıbaşı from IMKB (İstanbul Stock Exchange) are taken and using them, a portfolio created. Also four currency units (Euro/TL, Dollar/TL, Pound/TL, Franc/TL) and a portfolio created from these units are used as a new financial data sets. For these data sets normality tests are applied and the VaR is calculated by using normal and mixture of normal distributions.

2. MIXTURE OF NORMAL DISTRIBUTION MODELS

Mixture distribution models are more appropriate distribution models for the heterogeneous data structures in many areas.In mixture distribution models, the most appropriate method to estimate the unknown parameters is EM algorithm with maximum likelihood estimation method (Dempster et al., 1977).

In univariate case, the probability density function of X is as follows (Çalış, 2005);

$$p(x) = \pi_1 f_1(x) + \cdots + \pi_g f_g \qquad (x \in C) \quad (2)$$

where C is the sample space and X's are random variables. In this case X has finite mixture distribution. Where $\pi_1, \pi_2, \ldots, \pi_g$are the mixture weights and $f_1(.), f_2(.), \ldots f_g(.)$ are functions providing the following properties:

$$0 \leq \pi_i \leq 1 \qquad (i = 1, \ldots, g) \quad (3)$$

$$\pi_1 + \pi_2 + \cdots + \pi_g = 1 \quad (4)$$

$$f_i(.) \geq 0 \quad (5)$$

$$\int_c f_i(.)\, dx = 1 \qquad (i = 1, \ldots, g) \quad (6)$$

Here the mixture of normal distribution model with two components may be as follows,

$$p(x|\Psi) = \pi\Phi(x|\mu_1, \sigma) + (1-\pi)\Phi(x|\mu_2, \sigma) \quad (7)$$

where$\Phi(x|\mu_1, \sigma); (i = 1,2)$ is normally distributed with meanμ_i and varianceσ^2 for the univariate case. Also $\pi_1 = \pi,\ \pi_2 = 1 - \pi$ are mixture weights of mixture of normal distribution model with two components.

3. DATA AND METHODOLOGY

In this section, two different portfolios created, one is from the daily changes of the shares of Tofas, Turkcell, Vestel, Ulker, Eczacıbaşı from IMKB (İstanbul Stock Exchange), and the other is from four currency units (Euro/TL, Dollar/TL, Pound/TL, Franc/TL). For these data sets normality tests are applied and the VaR is calculated by using normal and mixture of normal distributions.

3.1. Stock Certificate Data

In this section, normal distribution and mixture of normal distribution approaches are used for the Parametric method and also VaR values are calculated for the ISE-30 Index (Istanbul Stock Exchange National 30 Index). The daily changes of the shares of Tofas, Turkcell, Vestel, Ulker, Eczacıbaşı and the portfolio of these stocks from December 2, 2008 to May 14, 2012 are analyzed.

According to the normal and the mixture of normal distribution approach, VaR values are calculated for each of the Tofas, Turkcell, Vestel, Ulker, Eczacıbaşı stocks and also the portfolio of them.

For this purpose normality tests are performed and descriptive statistics that belong to portfolio data and the stocks are examined.

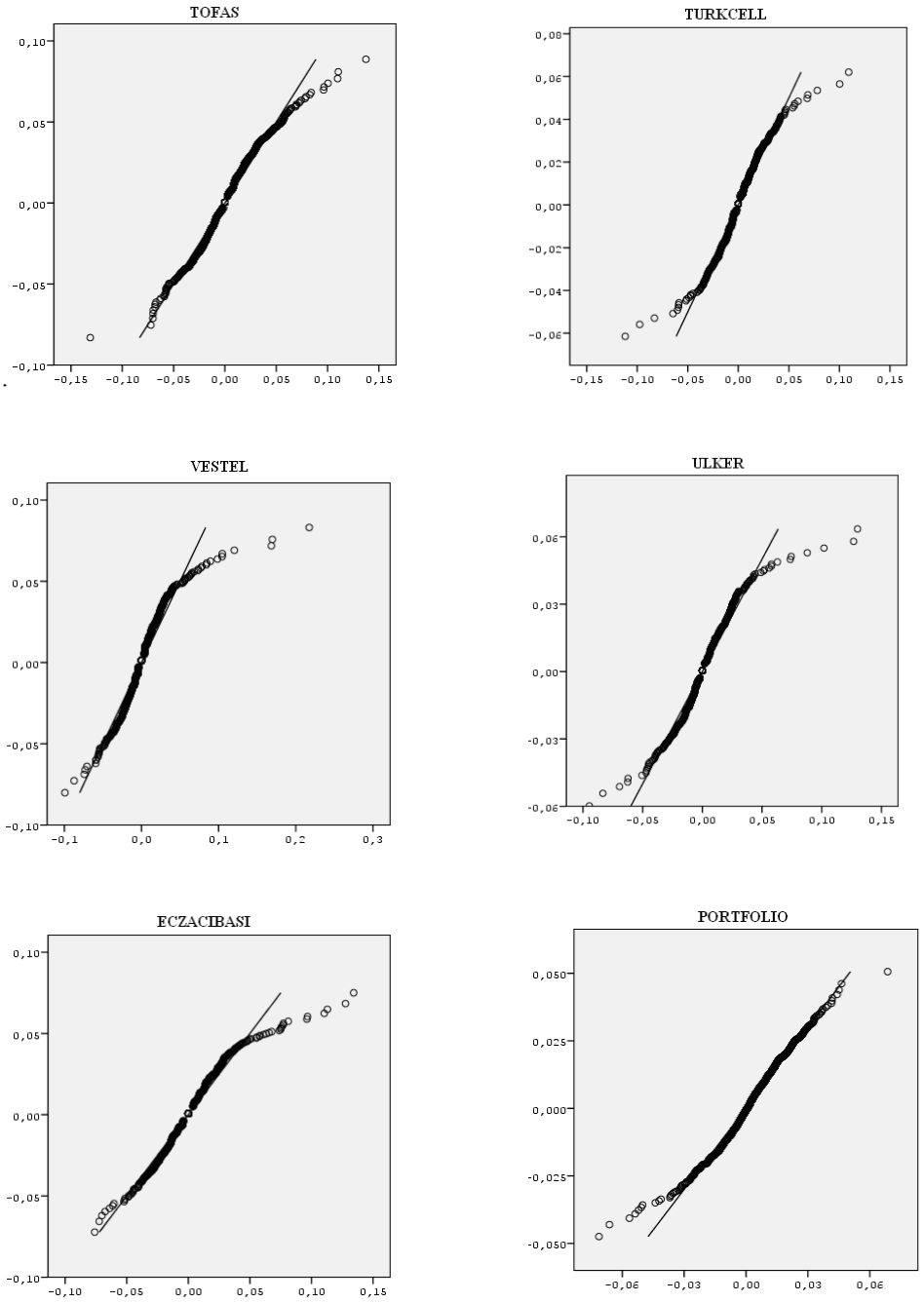
Table 1: Descriptive statistics that belong to portfolio data and stocks and Normality Tests

	Mean	**Minimum**	**Maximum**	**Standart Dev.**	**Skewness**	**Kurtosis**	**K-S test p**
PORTFOLIO	0,00158	-0,07129	0,06865	0,01539	-0,324400	1,906296	**<,001**
TOFAS	0,00280	-0,13121	0,13736	0,02695	0,339280	2,350493	**<,001**
TURKCELL	0,00029	-0,11186	0,10918	0,01938	0,023342	4,668816	**<,001**
VESTEL	0,00153	-0,09914	0,21739	0,02561	1,657750	11,35580	**<,001**
ULKER	0,00186	-0,09462	0,12998	0,01935	0,649661	6,669241	**<,001**
ECZACIBASI	0,00141	-0,07595	0,13426	0,02311	0,905236	4,334453	**<,001**

In Table 1, kurtosis, skewness and the results of the Kolmogrov-Smirnov test statistics show that the data are not normally distributed.

In order to see graphically whether the stocks and the portfolio have normal distribution or not, the Q-Q plots are constructed to see graphically.

Figure 1: Q-Q plots of stocks and the return series of the portfolio



In Q-Q plots, the distribution line of the return series follows a different pattern from the standard normal line. As a result, it can be said that return series don't correspond with the normal pattern.

Table 2: The MSE and KS (Kolmogorov-Smirnov) test statistics values which belong to normal and mixture of normal distribution models for the portfolio

Distribution	**MSE**	**KS**
Normal	18,99	0,0526
Normal Mixture	4,15*	0,0147*

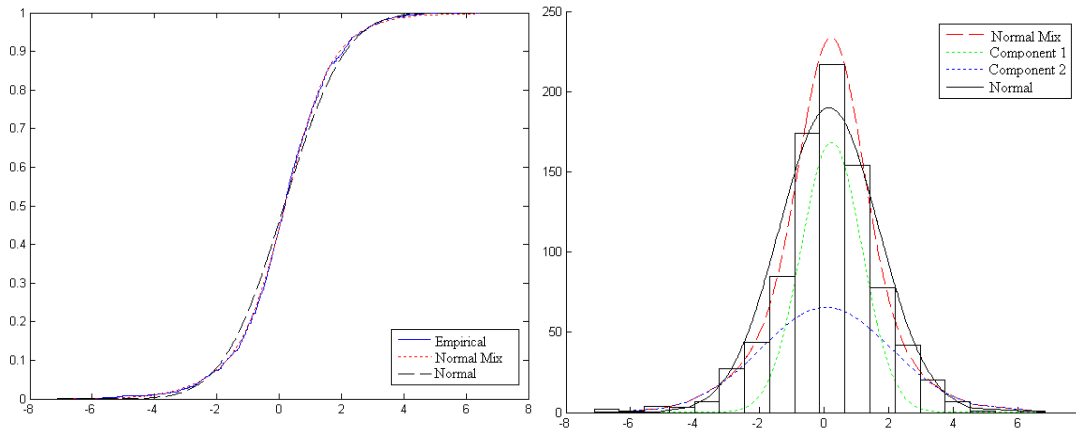
From Table 2 it can be seen that the mixture of normal distribution is more convenient for the portfolio data.

Table 3: The parameters regarding the mixture of normal distribution developed for the portfolio data (Here, π_1 and π_2 areselectedusing EM algorithm)

Component	**Mixture Weight**	**Mean**	**Covariance Matrices**
Component 1	$\pi_1 = 0{,}8303$	$\mu_1 = \begin{bmatrix} 0{,}0021 \\ 0{,}0008 \\ -0{,}0003 \\ 0{,}0007 \\ 0{,}0005 \end{bmatrix}$	$\Sigma_1 = \begin{bmatrix} 0{,}00056 & 0{,}00009 & 0{,}00019 & 0{,}00015 & 0{,}00017 \\ 0{,}00009 & 0{,}00025 & 0{,}00006 & 0{,}00005 & 0{,}00006 \\ 0{,}00019 & 0{,}00006 & 0{,}00030 & 0{,}00013 & 0{,}00018 \\ 0{,}00015 & 0{,}00005 & 0{,}00013 & 0{,}00020 & 0{,}00013 \\ 0{,}00017 & 0{,}00006 & 0{,}00018 & 0{,}00013 & 0{,}00032 \end{bmatrix}$
Component 2	$\pi_2 = 0{,}1697$	$\mu_2 = \begin{bmatrix} 0{,}0021 \\ -0{,}0020 \\ 0{,}0106 \\ 0{,}0075 \\ 0{,}0060 \end{bmatrix}$	$\Sigma_2 = \begin{bmatrix} 0{,}00156 & 0{,}00007 & 0{,}00061 & 0{,}00031 & 0{,}00047 \\ 0{,}00007 & 0{,}00099 & 0{,}00016 & 0{,}00022 & 0{,}00023 \\ 0{,}00061 & 0{,}00016 & 0{,}00229 & 0{,}00051 & 0{,}00057 \\ 0{,}00031 & 0{,}00022 & 0{,}00051 & 0{,}00117 & 0{,}00039 \\ 0{,}00047 & 0{,}00023 & 0{,}00057 & 0{,}00039 & 0{,}00157 \end{bmatrix}$

Figure 2: (a) Normal, mixture of normal and empirical cumulative distribution functions for the stocks portfolio

(b) The mixture of normal distribution and the approximate distribution of the returns



(a) **(b)**

The functions of the normal, mixture of normal and empirical cumulative distributions of the stocks portfolio are shown in Figure 2 (a). For the stocks portfolio data, the mixture of normal distribution function is fitted to achieved the empirical distribution function in a more adequate level according to the normal distribution

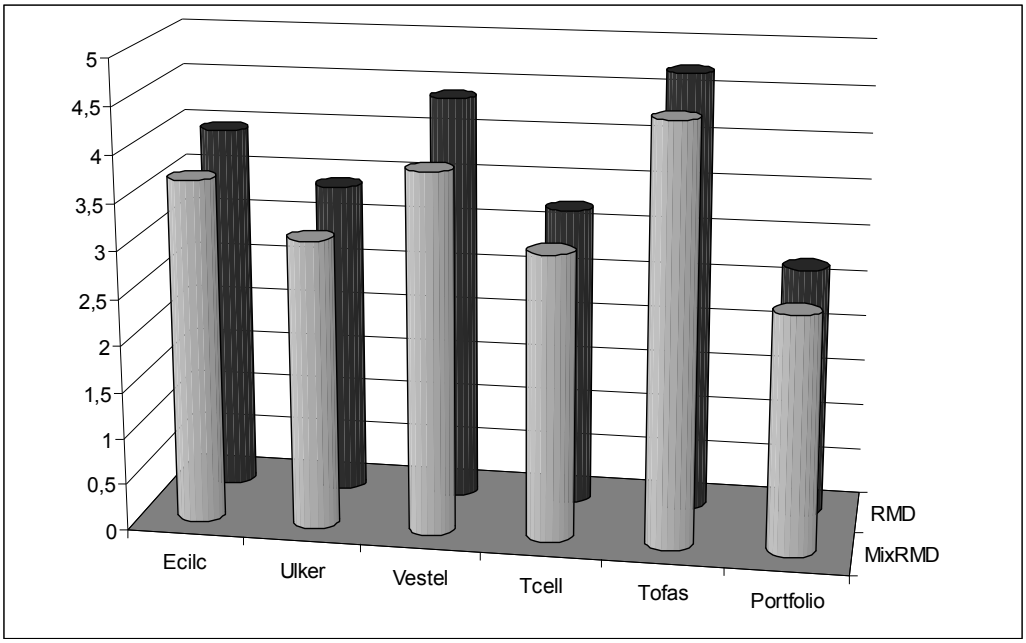
In Figure 2 (b), the approximate distribution of the returns is shown by using the mixture of normal distribution approach for the portfolio. This distribution combines 2 different normal distribution. One of them has a slighter standard deviation and this is related with a moderate market regime. The other one has a larger standard deviation that is it has a more volatile market regime.

In Table 4,VaR and Mixture VaR for the stocks and the stock portfolio are given.

Table 4: VaR and Mixture VaR values calculated for stocks and the portfolio

α=0,05	VAR	Mix VAR	W
PORTFOLIO	2,6974	2,5551	[0,2 0,2 0,2 0,2 0,2]
TOFAS	4,7274	4,4817	[1 0 0 0 0]
TURKCELL	3,2271	3,0678	[0 1 0 0 0]
VESTEL	4,3795	3,8691	[0 0 1 0 0]
ULKER	3,3797	3,1013	[0 0 0 1 0]
ECZACIBASI	3,9546	3,6855	[0 0 0 0 1]

Figure 3: The bar charts of the VaR and Mixture VaR values of Table 4



3.2. Currency Units Data

In this section, the normal distribution and the mixture of normal distribution approach are used for the Parametric method.And VaR values are calculated for the data (four currency units (Euro, Dollar, Pound, Franc) and a portfolio of them)from December 2, 2008 to May 14, 2012.

According to normal and mixture of normal approach, VaR values are calculated for each of the Euro, Dollar, Pound, Franc currencies and also the portfolio created from these currencies.

For this purpose, descriptive and normality tests are examined.

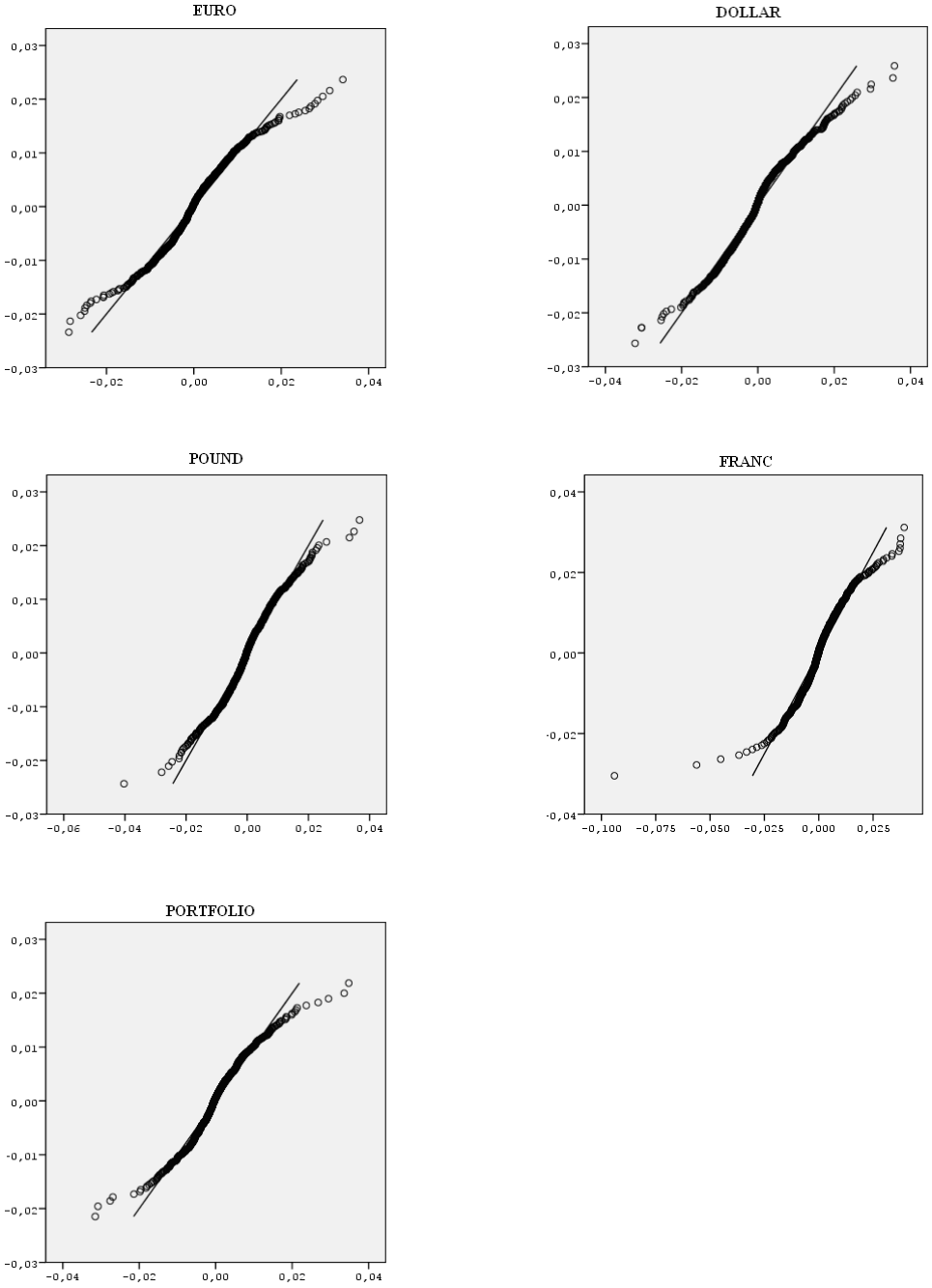
Table 5: Descriptive statistics that belong to portfolio data and currencies and the Normality Tests

	Mean	Minimum	Maximum	Standart Dev.	Skewness	Kurtosis	K-S test p
PORTFOLIO	0,00020	-0,0315	0,0348	0,00668193	0,227144	3,342304	**<,001**
EURO	0,00014	-0,0286	0,0341	0,00724964	0,218171	2,680215	**<,001**
DOLLAR	0,00011	-0,0322	0,0358	0,00794295	0,329346	2,043935	**<,001**
POUND	0,00022	-0,0403	0,0367	0,00756838	0,092997	2,618297	**<,001**
FRANC	0,00035	-0,0940	0,0393	0,00949999	-0,85117	12,07023	**<,001**

In Table 5, kurtosis, skewness and the results of the Kolmogrov-Smirnov test statistics show that the data is not normally distributed.

In order to see graphically whether the currencies and the portfolio have normal distribution, the Q-Q plots can be given.

Figure 4: Q-Q plots of currencies and the return series of the portfolio



In Q-Q plots, the distribution line of the return series follows a different pattern from the standard normal line. As a result, it can be said that return series doesn't correspond with the normal pattern.

Table 6: The MSE and KS (Kolmogorov-Smirnov) test statistics

Distribution	**MSE**	**KS**
Normal	28,138	0,0696
Normal Mixture	6,570*	0,0264*

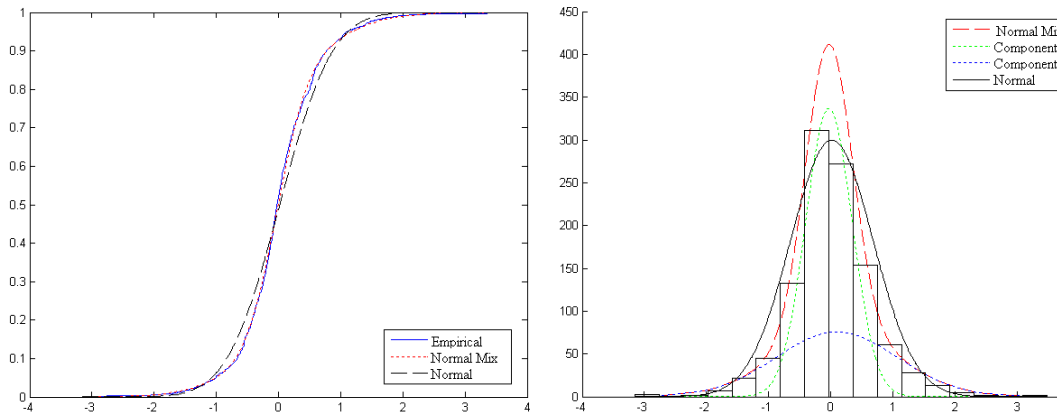
From Table 6, it can be seen that the mixture of normal distribution is more suitable for the portfolio.

Table 7: The parameters of the mixture of normal distribution for the portfolio.

Component	**Mixture weight**	**Mean**	**Covariance Matrices**
Component 1	$\pi_1 = 0{,}4384$	$\mu_1 = \begin{bmatrix} 0{,}000495 \\ 0{,}001018 \\ 0{,}000773 \\ 0{,}000773 \end{bmatrix}$	$\Sigma_1 = \begin{bmatrix} 0{,}000095 & 0{,}000052 & 0{,}000060 & 0{,}00009 \\ 0{,}000052 & 0{,}000112 & 0{,}000055 & 0{,}00008 \\ 0{,}000060 & 0{,}000055 & 0{,}000101 & 0{,}00006 \\ 0{,}000093 & 0{,}000080 & 0{,}000069 & 0{,}00018 \end{bmatrix}$
Component 2	$\pi_2 = 0{,}5616$	$\mu_2 = \begin{bmatrix} -0{,}000143 \\ -0{,}000595 \\ -0{,}000219 \\ 0{,}000016 \end{bmatrix}$	$\Sigma_2 = \begin{bmatrix} 0{,}000019 & 0{,}000010 & 0{,}000014 & 0{,}00001 \\ 0{,}000010 & 0{,}000024 & 0{,}000014 & 0{,}00001 \\ 0{,}000014 & 0{,}000014 & 0{,}000023 & 0{,}00001 \\ 0{,}000017 & 0{,}000010 & 0{,}000013 & 0{,}00002 \end{bmatrix}$

Figure 5: (a) Normal, mixture of normal and empirical cumulative distribution functions for the currencies portfolio

(b) The mixture of normal distribution and the approximate distribution of the returns



(a) **(b)**

The functions of the normal, mixture of normal and empirical cumulative distributions of the portfolio of currencies are shown in Figure 5 (a). For this data, the mixture of normal distribution function is fitted to the empirical distribution function in a more adequate level then the normal distribution.

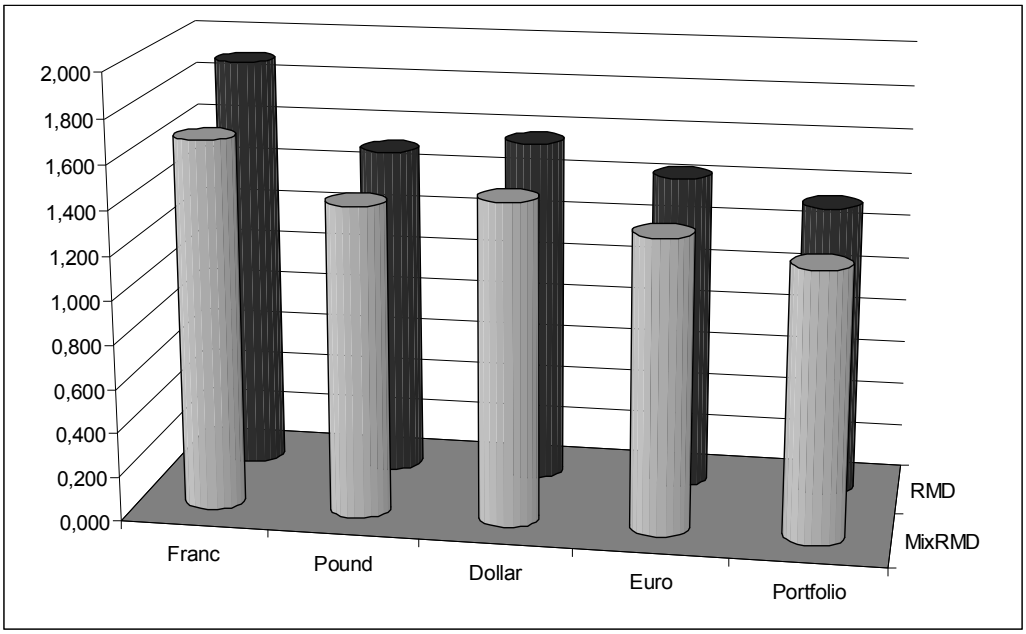
In Figure 5 (b) the approximate distribution of the returns is shown by using mixture of normal distribution.This mixture distribution combines two different Normal Distributions. One of them has a slighter standard deviation i.e. this has a moderate market regime. The other distribution has a larger standard deviation that is a more volatile market regime is available here.

In Table 8, VaR and Mixture VaR for currencies and currency portfolio are given.

Table 8: VaR and Mixture VaR values calculated for currencies and the portfolio

α=0,05	VAR	Mix VAR	W			
PORTFOLIO	1.1212	1.0334	[0,25	0,25	0,25	0,25]
EURO	1.2099	1.1232	[1	0	0	0]
DOLLAR	1.3218	1.2273	[0	1	0	0]
POUND	1.2704	1.1898	[0	0	1	0]
FRANC	1.6023	1.4160	[0	0	0	1]

Figure6: The bar charts of the VaR and Mixture VaR values of Table 8.



4. CONCLUSION

In this study, the normal distribution and the mixture of normal distribution models are compared in the Parametric method to analyse the financial risks. For this purpose, VaR values are calculated for the Stock Certificate Data and Currency Units Data.

The results show that mixture of normal distribution models is more appropriate according to normal distribution for the data. And also it is seen that Mixture VaR values are less then VaR values for the normal distributions. So it can be said that Mixture VaR values are more realistic. In financial risk analysis, the Mixture VaR calculation in parametric method is a new and an alternative approach to VaR based on normal distribution. Consequently it would be more convenient to calculate VaR or Mixture VaRvalues, according to distribution of the data, to compareand to comment the results.In future studies, other methods for calculating VaR (such as Historical Simulation Method and Monte-Carlo Simulation Method) can be used and this methods can be compared totheMixturedistributionapproach.

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