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YÜKSEK LİSANS TEZİ

**THE EFFECTS OF INDIVIDUAL RETIREMENT
SYSTEM OVER SAVINGS AND CAPITAL
MARKETS IN TURKEY**

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TÜRKİYE’DE BİREYSEL EMEKLİLİK SİSTEMİNİN TASARRUFLAR VE SERMAYE PİYASALARI ÜZERİNDEKİ ETKİSİ

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ÖZ

Yaşlı nüfusun toplam nüfus içindeki payındaki artışı ve popülist politikalar, tüm dünyada Sosyal Güvenlik açığına neden oldu. Aynı zamanda, uzun vadeli fonlar yüksek büyüme oranı için zorunluluk olmuştur. Bu nedenle, özellikle ekonomideki liberalizasyon ile, devletler Bireysel Emeklilik Sistemini kullanmaktadır. Böylece, Bireysel Emeklilik Sistemi ile sosyal güvenlik yükü azalabilecek ve ekonomi daha yüksek büyüme oranı ve yatırım oranına sahip olabilecektir. Çalışmanın amacı, Bireysel Emeklilik Sistemini ve onun Türkiye’deki tasarruflar ve sermaye piyasaları üzerindeki etkilerini incelemektir. Ayrıca, Türkiye ve ABD’de Bireysel Emeklilik Sistemi ve Türkiye’deki tasarruf seviyeleri diğer ülkelerle karşılaştırılarak yorumlanacak ve Türkiye’deki tasarruf düzeyinin etkisi tartışılacaktır. Ampirik analizde, uzun süreli ilişkiler bulmak için Johansen Eşbütünleşme Testi ve kısa dönemli nedensellik yönünü bulmak için ise VEC Granger Nedensellik Testi uygulanmıştır. Ampirik analizlerin sonuçları, Bireysel Emeklilik Sistemi’ndeki katılımcıların toplam fon tutarının uzun vadede şirket tahvillerini ve hisse senedi piyasasını olumlu yönde etkilediğini göstermektedir. VEC Granger Nedensellik Testi kısa dönemde Bireysel Emeklilik Sistemi’ndeki toplam katılımcı fon tutarından özel sektör tahvillerinin piyasa değerine doğru tek yönlü nedenselliğin var olduğunu ve kısa dönemde BIST100 endeksinin Bireysel Emeklilik Sistemi’ndeki katılımcıların toplam fon tutarına neden olduğunu göstermektedir.

Anahtar Kelimeler: Bireysel Emeklilik Sistemi, Sermaye Piyasaları, Tasarruflar, Tahviller, Hisse Senedi Piyasası, Büyüme, Yatırım, Sosyal Güvenlik Sistemi

THE EFFECTS OF INDIVIDUAL RETIREMENT SYSTEM OVER SAVINGS AND CAPITAL MARKETS IN TURKEY

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ABSTRACT

Increases in share of elderly people in total population and populist policies led to Social Security deficit all over the world. At the same time, long term funds are a necessity for high growth rate. Therefore, especially with liberalization movement in countries, governments use individual retirement system. Thus, social security burden might decrease and economy might have higher growth rate and investment rate. The aim of study is to examine individual retirement system and its effects on savings and capital markets in Turkey. In addition, Individual Retirement System in Turkey and USA and saving levels in Turkey will be interpreted by comparing other countries and, effects of savings level in Turkey will be discussed. In the empirical part, Johansen Cointegration Test and was applied for detecting long run relationships and, VECM Granger Causality Test is applied for finding short run causality among the variables. The results of empirical analysis show that total amount of participant's funds in individual retirement system affect positively both corporate bond and stock markets in the long run. VECM Granger Causality Test indicates that there is a unilateral causality from total amount of participant's funds in Individual Retirement System to market value of corporate bonds in the short run and, BIST100 Index causes total amount of participant's funds in Individual Retirement System in the short run.

Keywords: Individual Retirement System, Capital Markets, Savings, Bonds, Stock Market, Growth, Investment, Social Security System

PREFACE

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CONTENTS

ÖZ.....	I
ABSTRACT.....	II
PREFACE.....	III
CONTENTS.....	IV
LIST OF TABLES	VII
LIST OF FIGURES	X
LIST OF ABBREVIATIONS	XIII
INTRODUCTION.....	1

CHAPTER ONE

INDIVIDUAL RETIREMENT SYSTEM IN TURKEY

1.1 Social Security System in Turkey.....	3
1.1.1 History of Social Security System in Turkey.....	3
1.1.2 Economic and Fiscal Condition of Social Security System in Turkey..	4
1.2 Demographic Changes in Turkey.....	8
1.2.1 Life Expectancy at 65 in Turkey.....	8
1.2.2 Fertility Rates in Turkey.....	9
1.2.3 Elderly Population Rate in Turkey	10
1.2.4 Elderly Dependency Ratio in Turkey	11
1.2.5 Population Growth Rate in Turkey	12
1.3 Individual Retirement System.....	13
1.3.1 Historical Process of Individual Retirement System.....	13
1.3.2 Types of Private Pension Plans.....	14

CHAPTER THREE

THE EFFECTS OF INDIVIDUAL RETIREMENT SYSTEM ON CAPITAL

MARKETS IN TURKEY: EMPIRICAL ANALYSIS

3.1 Previous Empirical Studies.....	100
3.2 Dataset, Methodology and Empirical Results.....	100
3.2.1 Unit Root Tests.....	101
3.2.2 Johansen Cointegration Test.....	106
3.2.3 VECM Granger Causality	109
CONCLUSIONS.....	111
REFERENCES.....	116
APPENDIX.....	128

LIST OF TABLES

Table 1: Rate of Pension Spending in Public Sector to GDP in Turkey.....	5
Table 2: Ratio of Social Security Contributions to GDP in Turkey.....	6
Table 3: Social Security Deficit in Turkey.....	7
Table 4: Life Expectancy at 65 in Turkey.....	8
Table 5: Fertility Rate in Turkey.....	9
Table 6: Elderly Population Rate in Turkey.....	10
Table 7: Elderly Dependency Ratio (Demographic Projection) in Turkey.....	11
Table 8: Annual Population Growth Rate in Turkey.....	12
Table 9: Receiving Rate of Government Contributions Over The Years of Stay in the Individual Retirement System in Turkey.....	18
Table 10: General Appearance of Individual Retirement System Based on Private Pension Companies in Turkey (02.11.2018).....	19
Table 11: Key Statistics About Individual Retirement System in Turkey	25
Table 12: Total Amount of Employee Funds and Contributions in AES in Turkey	34
Table 13: Change Rates of Contributions Per Capita in AES and IRS in Turkey	36
Table 14: Changes in Number of Employee and Participants in AES and IRS in Turkey.....	39
Table 15: Total Net Asset Values and Average Returns of Fund Groups in Individual Retirement System in Turkey	45
Table 16: General Appearance of Types of Pension Mutual Funds in Turkey.....	46
Table 17: Portfolio Distribution of All Private Pension Plans in Turkey (June 2018).....	50
Table 18: The Volume of Private Pension Funds in Oecd Countries in 2016.....	51
Table 19: Private Pension Assets by Types of Private Pension Plans in USA in 2016.....	53

Table 20: IRA Assets by Types of IRA in USA in 2016.....	53
Table 21: Defined Contribution Plan Assets by Type of Plan in USA in 2016.....	54
Table 22: Portfolio Distribution of Private Pension Plans in 2016 in USA.....	54
Table 23: DC Plan Holdings of Mutual Funds by Type of Fund in USA in 2016.....	55
Table 24: IRA Holdings of Mutual Funds by Type of Fund in USA in 2016.....	55
Table 25: Structural Appearance of Finance Sector in Turkey in 2017.....	80
Table 26: Outstanding Securities in Turkey.....	81
Table 27: Total Market Capitalization of BIST Companies	82
Table 28: General Indicators of BIST100 Index	83
Table 29: Number of Companies in BIST100	84
Table 30: The Share of Investment and Savings to GDP in Turkey	87
Table 31: The Ratio of Final Consumption Expenditure of Resident Households and Consumption of Non-Profit Institutions Serving Households to GDP in Turkey.....	88
Table 32: Average Savings Rate of OECD Countries Between 2008 and 2017	88
Table 33: General Indicators of Individual Retirement System in Turkey During 2008 Global Crisis.....	95
Table 34: General Appearance of Stocks Market in Turkey During 2008 Crisis.....	98
Table 35: Public Sector Bonds and Bills Market in Turkey During 2008 Crisis	99
Table 36: ADF Unit Root Test in Level for Model I	102
Table 37: ADF Unit Root Test in First Difference for Model I.....	102
Table 38: Phillips-Perron Unit Root Test in Level for Model I	103
Table 39: Phillips-Perron Unit Root Test in First Difference for Model I.....	103
Table 40: ADF Unit Root Test in Level for Model II.....	104
Table 41: ADF Unit Root Test in First Difference for Model II.....	104
Table 42: Phillips-Perron Unit Root Test in Level for Model II.....	105

Table 43: Phillips-Perron Unit Root Test in First Difference for Model II.....	105
Table 44: Johansen Cointegration Test Results for Model I	107
Table 45: Long Run Model Normalized Cointegrating Coefficient for Model I.....	107
Table 46: Johansen Cointegration Test Results for Model II.....	108
Table 47: Long Run Model Normalized Cointegrating Coefficient for Model II.....	108
Table 48: VECM Granger Causality Test in The Short Run for Model I.....	109
Table 49: VECM Granger Causality Test in The Short Run for Model II.....	110



LIST OF FIGURES

Figure 1: Private Pension Assets by Types of Private Pension Plans in Turkey in 2016.....	21
Figure 2: Age Distribution of the Participants in Individual Retirement System in Turkey (02.11.2018).....	21
Figure 3: Distribution of Contracts Entering the System according to Participants' Age Groups by Years in Individual Retirement System in Turkey.....	22
Figure 4: Participants Average Entrance Age to the System in Individual Retirement System in Turkey.....	23
Figure 5: Distribution of Participants' Fund Amount according to Contracts' Age (TL) in Individual Retirement System in Turkey in 2016.....	24
Figure 6: Participants' Average Monthly Regular Contribution Planned to be Paid, According to Age Groups in Individual Retirement System in Turkey in 2016.....	24
Figure 7: Contributions in Individual Retirement System in Turkey	27
Figure 8: Distribution of Participants' Fund Amount and Contracts according to their Types in Individual Retirement System in Turkey (02.11.2018).....	27
Figure 9: Distribution of Fund Amount according to Participants' Profession in Individual Retirement System in Turkey in 2016.....	28
Figure 10: Distribution of Participants and Participants' Fund Amount According to Income Levels (%) in Individual Retirement System in Turkey in 2016.....	29
Figure 11: Distribution of Participants according to Number of Contracts Owned in Individual Retirement System in Turkey in 2016.....	30
Figure 12: Development of Number of Contracts and Amount of Contributions in Individual Retirement System in Turkey.....	30
Figure 13: Comparison of Total Invested Amount and Participants' Fund Amount in Individual Retirement System in Turkey (TL).....	31
Figure 14: Distribution of Terminated Contracts According to Termination Reason in Individual Retirement System in Turkey.....	32

Figure 15: Termination Ratio of Contracts According to the Month of Enforcement in Individual Retirement System in Turkey	32
Figure 16: Change in Contributions Paid for Contracts in Force According to Years in Individual Retirement System in Turkey.....	33
Figure 17: Total Amount of Employee Funds and Contributions in AES in Turkey.....	35
Figure 18: Change Rates of Contributions Per Capita in AES and IRS in Turkey.....	37
Figure 19: Number of Employee and Participants in AES and IRS in Turkey	38
Figure 20: Financial Instruments of No-Interest Pension Mutual Funds.....	41
Figure 21: Change of Net Asset Values of Fund Groups by Years (Increases and Decreases in Annual) in Individual Retirement System in Turkey.....	46
Figure 22: Variation of Pension Mutual Funds' Net Asset Values in Turkey	47
Figure 23: Net Asset Value of Pension Mutual Funds according to Fund Groups and Their Growth Rate in Turkey in 2016.....	48
Figure 24: Asset Allocation of Flexible Funds in Individual Retirement System in Turkey..	49
Figure 25: Percentage of Workers Paying Tax Aged 26 to 64 with a Form W-2 who are Active Participants in a Pension Plan by Age and Wage and Salary Income in USA in 2013.....	56
Figure 26: Millions of Worker Paying Tax Aged 26 to 64 with a Form W-2 by Age and Wage and Salary Income in USA in 2013.....	57
Figure 27: Forms of Retirement Savings among Non-Retirees in USA in 2017.....	58
Figure 28: Lack of Retirement Savings and Perception of Preparedness (by Age) in USA in 2017.....	58
Figure 29: Retirement Savings are on Track (by Age and Amount of Savings for Retirement) in USA in 2017.....	59
Figure 30: Number of Participants in Pension Plans by Type of Plan in USA, 1975-2015 (numbers in millions).....	60
Figure 31: Pension Plan Contributions by Type of Plan in USA, 1975-2015.....	61
Figure 32: USA Total Pension Assets (Billion Dollar).....	62

Figure 33: Defined Contribution Plan Assets by Type of Plan in USA (Billion Dollar).....	63
Figure 34: Total Pension Assets' Share of Household Financial Assets in USA	63
Figure 35: Percentage of Active 401(k) Plan Participants and 401(k) Plan Assets by Participant Age in USA in 2016.....	65
Figure 36: Percentage of Participants with Account Balances in 401(k) Plan in Specified Ranges in USA in 2016.....	65
Figure 37: Percentage of Participants with Account Balances in 401(k) Plan in Specified Ranges by Participant Age in USA in 2016.....	66
Figure 38: Percentage of Participants with Account Balances in 401(k) Plan in Specified Ranges by Years of Tenure in USA in 2016.....	66
Figure 39: 401(k) Plan Asset Allocation (Percentage of Total Assets) in USA in Selected Years.....	67
Figure 40: Percentage of USA Households within Each Age Group that Own IRAs in 2017	68
Figure 41: Percent Distribution of Households Owning IRAs by Household Income in USA in 2017.....	69
Figure 42: Percentage of Traditional IRA Balances in USA in 2016.....	69
Figure 43: GDP Growth Rate (%) in Turkey	91
Figure 44: Gross Domestic Product (Thousand TL) in Turkey.....	92
Figure 45: Unemployment Rate in Turkey (%).....	93
Figure 46: Balance of Current Account (Million Dolar) in Turkey.....	93

LIST OF ABBREVIATIONS

ADF:	: Augmented Dickey- Fuller
AES	: Automatic Enrollment System
BAG-KUR	: Social Security Institution of Craftsmen, Tradesmen and other Self-Employed
BIST	: Borsa İstanbul
BRSA	: Banking Regulation Supervision Agency
DB	: Defined Benefit Plans
DC	: Defined Contribution Plans
FED	: Federal Reserve System
FX	: Foreign Exchange
GDP	: Gross Domestic Product
GHI	: General Health Insurance
ICI	: Investment Company Institute
IRAs	: Individual Retirement Accounts
IRS	: Individual Retirement System
İMKB	: Istanbul Stock Exchange
OECD	: The Organisation for Economic Co-operation and Development
PP	: Phillips-Perron
RF	: Retirement Fund
SEP IRA	: Simplified Employee Pension
SGK	: Social Security Institution
SIMPLE IRA:	Savings Incentive Match Plan for Employees
SSI	: Social Security Institution

TL : Turkish Lira

TURKSTAT : Turkish Statistical Institute

USA : United States of America



INTRODUCTION

After the Second World War, population and elderly population had been decreased. Afterward, Social Security System was established by Welfare State era. In Welfare States era, high percentage of young population and growth rate prevented Social Security deficit and its other negative effects. However, at the end of the Welfare State, reducing growth rate, populist policies and decreasing young population led to Social Security deficits. These deficits increased budget deficits and domestic debt. Therefore, economies faced a lot of problems.

In the 1980s, most of countries preferred liberalist policies which argued minimum government interventions. According to liberalist policies, government should minimize its expenditures. Due to this cause, liberalist policy suggests minimum social security expenditures and balanced social security budget. By liberalist policies, a lot of countries began to minimize social security expenditures. Thus, they looked for new tools. In Chile, individual retirement system which was established in 1981, was found alternative for social security system. Individual retirement system moves social security burden to private sector by own retirement plans made up by private pension firms. By the way, governments have less social security expenditure. The main target of individual retirement system is decreasing social security expenditures when it was established. After years, individual retirement system is essential for high growth rate and investment rate by using collecting private pension funds. Thus, collecting funds in private pension funds were directed fund lender and created more loanable funds and less interest rate. Nowadays, private pension funds have reached billion dollars in a lot of countries.

In Turkey, Social Security System does not have deficit by demographic structure. The source of deficits in Turkey is populist policies and structural problems. But demographic dataset and simulations indicate that population tend to age. On account of these causes, individual retirement system was set up in 2001. In the beginning, individual retirement system had tax incentive for only taxpayer. At the beginning of 2013, until %25 government contributions was activated for monthly contribution. In 2017, automatic enrollment system in Individual Retirement System has begun. In the

new system, every employee had to register to the Individual Retirement System mandatorily.

Total amount of participant's funds in Individual Retirement System are invested on many financial assets. These financial assets include public debt instruments and private sector capital market instruments. Total amount of participant's funds in Individual Retirement System are invested in government bonds and treasury bills as public debt instruments and mostly stocks and corporate bonds as private sector capital market instruments.

The main purpose of this study is to analyze empirically the impact of contributions in Individual Retirement System in Turkey over capital market instruments by the Johansen Cointegration Test and Vector Error Correction (VEC) Granger Causality Test. In addition, developments and current situations of Individual Retirement System in Turkey and USA, savings in Turkey and general economic indicators and capital markets in Turkey during 2008 crisis will discussed.

CHAPTER ONE

INDIVIDUAL RETIREMENT SYSTEM IN TURKEY

1.1 Social Security System in Turkey

1.1.1 History of Social Security System in Turkey

Social security hasn't been established for long in Turkey. The social security system in Turkey was based on European social security system. "In the 1990s, the welfare regime started to become more market-oriented, in conformity with the dominance of neoliberal ideology. The Turkish social insurance system consists of three main institutions: the Social Insurance Institution (SSI), the Retirement Fund (RF), and the Social Security Institution of Craftsmen, Tradesmen and other Self-Employed (Bag-Kur). They were set up in 1946, 1950 and 1971, respectively, and were designed to cover blue-collar workers employed in the public sector and all workers in the private sector; civil servants; farmers and artisans; and other self-employed people. The Green Card Program, the main part of the social assistance system, covers 13.5 million individuals and was introduced in 1992. The objective of the program is to provide health services to poor people who do not have any social security (Elveren and Hsu, 2007: 12)."

SII, RF and Bag-Kur have pay-as-you-go (PAYG) system, which is supported by the active workforce and government. This system started to give a deficit in the 1990s, because of increase in the elderly population and structural economic problems. Insufficient law regulations, informal economic activities, increase in unregistered employment and problem of collecting social security contributions led to social security problems. Due to very large budget deficit, government focused on social security system reforms at the same period. Two reform packages were enforced in 1999 and 2006. With in 1999 reform, social security system was applied a two-pillar system, public social security institutions had some changes, due to the first pillar and private pension (second pillar). Another target of this reform was to increase gradually

retirement age. The 2006 social security reform started to establish a new retirement insurance program. Thus, all social security institutions were combined as single social security institution. This institution is called Social Security Institution (SGK). SGK covers all people who have public social security. Social Insurances and General Health Insurance (GHI) law were that accepted in April 2008, it was brought to have general health insurance to all population in Turkey and provided norm and standard unity between social security programs.

1.1.2 Economic and Fiscal Condition of Social Security System in Turkey

Rate of pension spending in public sector and social security contributions to GDP and social security budget balances are used for analyzing fiscal and economic condition of social security system. Rate of pension spending in public sector and social security contributors to GDP gives us that which reasons cause social security budget deficit or surplus. Finally, social security budget balances might cause problems for future of social security system.

According to Table 1, while Pension spending rate was %0,7 in 1990, it reached %7,72 in 2016. Percentage of pension spending in public sector to GDP increased eleven times. The causes of increase are low retirement ages, rising elderly population rates and structural problems of social security system. Number of retired people went up by low retirement age for live expectancy and elderly population rate. Thus, retirement expenditures increased. Populist policies led to excess social security expenditure. Ratio of social security contributions to GDP rose up nearly 2,5 times between 1990 and 2016 statistics in Table 2. This means less increase than rate of pension spending to GDP. The reason of this situation may be non-effective contribution collection methods and excess pension spending domains.

Table 1: Rate of Pension Spending in Public Sector to GDP in Turkey

Year	Pension Spendings in Public Sector (%GDP)
1990	0.7
1991	0.5
1992	0.52
1993	0.56
1994	0.55
1995	0.56
1996	0.66
1997	0.84
1998	0.76
1999	0.93
2000	3.91
2001	4.34
2002	4.63
2003	5.53
2004	5.85
2005	6.05
2006	6.12
2007	6.5
2008	6.51
2009	7.51
2010	7.41
2011	7.13
2012	7.29
2013	7.18
2014	7.14
2015	7.1
2016	7.72

Source: OECD, Pension Spending, (Online) <https://data.oecd.org/socialexp/pension-spending.htm>, 4 May 2018

Table 2: Ratio of Social Security Contributions to GDP in Turkey

Year	Social Security Contributions (%GDP)
1990	2.85
1991	2.99
1992	3.32
1993	3.24
1994	2.55
1995	1.98
1996	2.9
1997	2.93
1998	2.98
1999	4.18
2000	4.41
2001	5.5
2002	4.74
2003	5.24
2004	5.57
2005	5.24
2006	5.27
2007	5
2008	5.79
2009	5.76
2010	6.18
2011	7.22
2012	6.77
2013	6.95
2014	7.01
2015	7.28
2016	7.29
2017	7.3

Source: OECD, Social Security Contribution, (Online) <https://data.oecd.org/tax/social-security-contributions.htm>, 6 May 2018

Table 3: Social Security Deficit in Turkey

Year	Social Security Budget Deficit (Thousand TL)
2000	2,411,206
2001	4,470,166
2002	7,964,275
2003	13,419,538
2004	15,932,374
2005	18,691,935
2006	18,036,589
2007	25,040,571
2008	25,901,978
2009	28,702,655
2010	26,724,118
2011	16,235,312
2012	17,294,948
2013	19,675,361
2014	20,071,505
2015	11,443,621
2016	20,655,602
2017	24,405,871

Source: Social Security Institution (SSI), “Monthly Statistics Information”, April 2018, (Online) http://www.sgk.gov.tr/wps/wcm/connect/744055f7-3209-4b0d-8329-1873ab5ae6f5/mali_2018_04.xlsx?MOD=AJPERES&CACHEID=744055f7-3209-4b0d-8329-1873ab5ae6f5, 8 May 2018

In Table 3, it was shown that social security budget always had deficit from 2000 to 2018. Social security deficit increased almost ten times in this period. This reflects budget income collecting as ineffective. In some years, budget deficits are less than other years. But this trend could not protected. This situation indicates that Social Security Institutions have structural problems.

1.2. Demographic Changes in Turkey

1.2.1 Life Expectancy at 65 in Turkey

Life expectancy at 65 defines that expected lifetime after 65 years. Age 65 is generally accepted as retirement age or out of working age. Therefore, Life expectancy at 65 is important measurement for demographic structure and social security expenditure. Table 4 shows that life expectancy of women is more than men. When Turkey is observed, in the years 1990 and 2015, Life expectancy at 65 usually increased in Turkey. Especially, increases in health service standard caused more lifetime longevity.

Table 4: Life Expectancy at 65 in Turkey

Year	MEN	WOMEN
1990	12.8	14.3
1991	12.8	14.3
1992	12.9	14.4
1993	13	14.5
1994	13	14.6
1995	13.1	14.6
1996	13.2	14.8
1997	13.2	14.8
1998	13.3	14.9
1999	13.4	15
2000	13.4	15.1
2001	13.5	15.2
2002	13.6	15.3
2003	13.7	15.4
2004	13.8	15.5
2005	13.9	15.6
2006	13.9	15.7
2007	13.9	15.7
2008	14	15.8
2009	14	15.9
2010	14	16
2011	14.1	16.1
2012	14.1	16.1
2013	16.2	19.5
2014	16.1	19.4
2015	16.1	19.4

Source: OECD, Life Expectancy at 65, (Online) <https://data.oecd.org/healthstat/life-expectancy-at-65.htm>, 4 May 2018

1.2.2 Fertiliy Rates in Turkey

Fertility rate is another important demographic variable. Increase in fertility rates might give rise to population growth and increasing ratio of young population. Table 5 indicate that in Turkey, while fertility rate is % 3,1 in 1990, This rate declined to % 2,2. Only this rate might lead to increasing elderly population and decreasing population growth rate.

Table 5: Fertility Rate in Turkey

Year	Fertility Rate
1990	3.1
1991	3
1992	2.9
1993	2.9
1994	2.8
1995	2.8
1996	2.7
1997	2.6
1998	2.6
1999	2.5
2000	2.3
2001	2.4
2002	2.2
2003	2.1
2004	2.1
2005	2.1
2006	2.1
2007	2.2
2008	2.2
2009	2.1
2010	2.1
2011	2
2012	2.1
2013	2.1
2014	2.2

Source: OECD, Fertility rates, (Online) <https://data.oecd.org/pop/fertility-rates.htm>, 4 May 2018

1.2.3 Elderly Population Rate in Turkey

Elderly population is one of the most significant indicators for demographic analysis. Rising elderly population rate is negative demographic development for countries. Because increasing elderly population rate led to decreasing working population and increasing social security expenditure. According to Table 6, Elderly population rate increased approximately two times in Turkey. So, elderly population rate is a problem for Turkey.

Table 6: Elderly Population Rate in Turkey

Year	Elderly Population (% Population)
1990	4.37
1991	4.56
1992	4.76
1993	4.97
1994	5.2
1995	5.45
1996	5.71
1997	5.99
1998	6.28
1999	6.6
2000	6.74
2001	6.7
2002	6.68
2003	6.68
2004	6.69
2005	6.72
2006	6.78
2007	6.85
2008	6.87
2009	6.92
2010	7.12
2011	7.29
2012	7.43
2013	7.6
2014	7.83

Source: OECD, Elderly Population, (Online) <https://data.oecd.org/pop/elderly-population.htm>, 4 May 2018

1.2.4 Elderly Dependency Ratio in Turkey

Elderly Dependency Ratio defined the ratio of elderly people to people who have between 15 and 64 age. This indicator is significant for Social Security expenditure. Since, when this ratio rises, retirement and health expenditure will increase and Social Security burden will increase. Table 7 indicates that while elderly dependency rate in 2000 is % 10,5, in 2025, it is expected to be %16,4. As a result, elderly dependency rates usually have an increasing tendency and this leads to an increase in Social Security Burden

Table 7: Elderly Dependency Ratio (Demographic Projection) in Turkey

Year	Elderly Dependency Ratio (%)
2000	10.5
2001	10.4
2002	10.3
2003	10.2
2004	10.2
2005	10.2
2006	10.2
2007	10.3
2008	10.2
2009	10.5
2010	10.8
2011	10.9
2012	11.1
2013	11.3
2014	11.8
2015	12.2
2016	12.3
2017	12.6
2018	12.9
2019	13.4
2020	14.2
2021	14.6
2022	14.8
2023	15.2
2024	15.7
2025	16.4

Source: TURKSTAT, Demographic Indicators, (Online)

http://www.tuik.gov.tr/PreIstatistikTablo.do?istab_id=1636, 4 May 2018

1.2.5 Population Growth Rate in Turkey

Population growth rate shows that annual percentage changes in total population. With having high population growth, youth population goes up. Thus, Working age population increases in the next terms. With helping result of Table 8, Population growth rate has a decreasing tendency. This situation might cause aging for total population next years.

Table 8: Annual Population Growth Rate in Turkey

Year	Population Growth Rate
1990	1.71
1991	1.7
1992	1.66
1993	1.62
1994	1.6
1995	1.56
1996	1.53
1997	1.5
1998	1.43
1999	1.44
2000	1.42
2001	1.4
2002	1.28
2003	1.2
2004	1.2
2005	1.23
2006	1.25
2007	1.24
2008	1.27
2009	1.39
2010	1.53
2011	1.48
2012	1.28
2013	1.17
2014	1.11

Source: OECD, Population, (Online) <https://data.oecd.org/pop/population.htm>, 4 May 2018

1.3 Individual Retirement System

1.3.1 Historical Process of Individual Retirement System

Individual Retirement System is a solution tool for reducing the social security burden that has started to increase in all countries since 1975. In 1980s, transformation process, which begins to collapse traditional thinking pattern and to gain acceleration with liberalization movement in economic area, brought along solution suggestions that were based on liberal policy for reducing problems which arose in various areas. The reintegration of market mechanisms since the 1980s following the ongoing state politics since the Second World War and the growing belief in the virtue of individual initiative parallel to it have made the alternatives of individual-based solutions one of the fundamental elements of the new economic order (Oktayer and Oktayer, 2007: 59).

Demographic and Economic developments have reduced the effectiveness of the Social Security System, and this has required new tools to be used for reducing the burden on the social security system. In developed and developing countries, public social security expenditures have constantly increased in terms of the national income rate, and this increase has reached to threatening proportions in terms of national budgets. This system, which was initiated in 1981 under the leadership of Chile, was later implemented in many countries of the world either as complementary to the public social security system, without replacing it or removing the existing public social security system. This implementation, launched in the lead of Chile, has led to a shift from distribution-based systems to funding-based systems and, unlike traditional social security systems based on intergenerational solidarity, individualized pension systems based on the principle that individuals can provide their own needs with their savings. The main difference between the countries of the world in terms of implementation of the system is that the system is based on mandatory or voluntary basis. When we look around the world, it is seen that in countries where pension systems offered by the state have a solid basis, private pension systems are offered on a voluntary basis in line with the public social security system. Private pension systems, however, are the focus of the social security system in some other countries

where the services provided by the public are devoid of sound foundations and, therefore, significant financial crises are experienced (Oktayer and Oktayer, 2007: 60).

1.3.2 Types of Private Pension Plans

There are many variety private pension plans in the world. Private pension plans which are generally invested, are classified into two main groups as Defined Benefit Plans (DB) and Defined Contribution Plans (DC). A defined benefit plan is a pension plan which enables the participant a certain monthly returns at retirement. Benefit Payments in defined benefit plans are calculated under the following structure:

$$\text{Benefit Payments} = \text{Contributions} + \text{Investment Returns} - \text{Operating Expenses}$$

Usually, the employee and the employer contribute to the pension plan, and the contributions are collected and directed investment by the plan sponsor. Sum of collecting contributions and investment returns are enough to cover benefit costs is important to defined benefit plan structure. Benefits of an employee's plan will get at retirement is found from a formula :

$$(\text{years of service}) \times (\text{final average salary}) \times (\text{multiplier}) = \text{annual benefit}$$

In defined benefit plans, benefit levels of contributor are the necessity of the plan sponsor. Beside to retirement benefits, defined benefit plans may comprise disability benefits, survivorship benefits, early retirement incentives, and post-retirement cost-of-living adjustments.

Defined contribution plans are retirement plans that both the employee and the employer or either employee or employer contribute to the employee's pension account under the plan. Returns of the account at retirement age calculated by the contributions and investment gains or losses, minus any investment and administrative fees. In defined contribution plans, the amount of the contribution of participants is defined, and the benefits of participants are variable. When participants are retired, the benefit can be received as a whole or as equal payments.

1.4 Individual Retirement System in Turkey

Many countries in the world have used various tools and policies to solve the problems that emerged in the field of social security since 1980. Despite this, Turkey was late in finding solutions to problems in the field of social security. Instability and uncertainty in the political and economic areas, the problems in the social security system could not be given importance and the system which was left to itself caused more and more problems, due to effects of the political and administrative regulations made with political concerns (Oktayer and Oktayer, 2007: 62). In parallel with the delay in the arrangements made in the field of social security, pension system in Turkey, compared to many other countries, it is an application that started much later. Although the late start of the application provided advantages by examining examples in the world which find advantage or disadvantages of different individual retirement system and selecting the best suitable model, it has been criticized, on account of small savings not to be put into economic system in the previous years (Oktayer and Oktayer, 2007: 70). In Turkey, the reform preparations dealing with Individual Retirement System beginning in 1999. In this context, financial, institutional and administrative restructuring aims to revise the existing public social security system and to reorganize existing institutions and to provide a more qualified social security service, on the other hand, in addition to provided public service, complementary programs are intended to be integrated into the system. Arrangements in the field of private pension have constituted an important part of the reform. (Oktayer and Oktayer, 2007: 62)

Individual Retirement System which was established with Individual Retirement Saving and Investment System Law no. 4632 enacted in 2001, was virtually begun to apply on 27th October 2003. The objectives of the system in the Law No. 4632 are summarized as follows:

- Providing the necessary funds for long-term infrastructure investments and thus increasing employment,
- To increase the long-term borrowing possibility of the public,
- Reduce short-term speculative pressures in the markets,
- To increase the national saving tendency,

- To contribute to the deepening of capital markets,
- To create a structure that will provide individuals with safe, advantageous products that can control their investments and easily access their accounts.

Tax incentives are used for faster development of Individual Retirement System which bases on voluntary participation in the first year. The first incentive for tax applications was related to the deduction of the contributions paid from the tax base within certain limits. As a result of the regulations made in the Income Tax Law, it has been decided that the contributions paid by the employee shall be considered as a discount in the determination of taxable income and on the other hand, the contributions paid by the employers on behalf of the wage earners can be written as expense. However, the said discount amounts are not unlimited and two different limitations have to be taken into account at the same time; the sum of the contributions paid by both employers and employee and in the determination of the tax base shall not exceed 10% of the wage and the gross amount of the annual minimum wage for that year. The tax advantage for the deduction of the paid contributions from the tax base is recognized not only for the wage-earners, but also for the taxpayers who obtain one or more of the and who submit an annual declaration. These taxpayers can deduct the contributions they pay under the individual retirement system, such as wage-earners, on the condition that they comply with the 10% limit and the annual minimum wage limits. Another part of the tax incentives was related to the advantages that occurred during the retirement phase. Those who had to leave the system due to compulsory reasons for 10 years and staying in the system for 10 years were subject to income tax withholding discount. (Oktayer and Oktayer, 2007: 64) In Law No. 4632, some changes and improvements have been made for both the working order of pension companies and the rights of participants. The first amendment to the law was made in 2007 with the provisions added to Law No. 5684. The tax incentives provided by Law No. 6237 did not provide the necessary inclusion, remained only for the taxpayers and could not have all the

participants. On the other hand, the awareness of the incentives by the participants remained low.

In the second revision made by Law No. 6327 published in the Official Gazette on 29.6.2012, comprehensive changes were made in the system and many innovations were put into practice. These innovations were primarily aimed at achieving a more efficient incentive structure of Individual Retirement System, increasing institutional-based participation in the system, lowering costs in terms of both companies and participants, and improving fund performance. As a result of the amendments made, the application of government contribution has been introduced, except for the application of the employer to deduct the contributions paid on behalf of the wage earners from the principal tax base of commercial earnings by employers, instead of applying tax deduction from the tax base. Accordingly, government contribution calculation was applied to the amount of 25% of the contributions paid by the participant to the individual pension account. As a result of the amendment, participants were obliged to remain in the system for a certain period of time in order to be eligible for government contribution and its returns. The following conditions are introduced to encourage longer stay in the system (Rakıcı and Ela, 2016: 101):

- Those who remain in the system for at least three years will receive 15% of the state contribution and its return,
- Those who remain in the system for at least six years will receive 35% of the state contribution and its return,
- Those who remain in the system for at least ten years will receive 60% of the state contribution and its return,
- Those who receive the right to pension from the Individual Retirement System and those who leave the system due to death or disability will be eligible for the state contribution and if any, their benefits.

Table 9: Receiving Rate of Government Contributions Over The Years of Stay in the Individual Retirement System in Turkey

Year of Remain in IRS	Received the State Contribution and its Return (%)
At Least Three Years	15%
At Least Six Years	35%
At least Ten Years	60%
Leave the System due to Death or Disability	100%

Source: Cemil Rakıcı and Mehmet Ela: “Türkiye’de Bireysel Emeklilik Sistemine Yönelik Vergisel Teşvikler”, AİBÜ Sosyal Bilimler Enstitüsü Dergisi, Volume: 16, No:3, 2016, pp.89-110, (Online) <http://sbedergi.ibu.edu.tr/index.php/sbedergi/article/viewFile/1424/1347>, 2 July 2018

In Turkey, one of the aims is to increase the savings of the Individual Retirement System. For this purpose, an innovation has been made in the IRS and the Law No. 6740 was adopted on 10.08.2016. With the Law No. 6740, Automatic Enrollment System has been implemented in Individual Retirement System. In accordance with automatic enrollment, which came into force on 1 January 2017, employers are obliged to involve their employees in the Automatic Enrollment System (AES). Accordingly, employers send to the system at least three percent of the premium-based earnings and of the pension deduction-based salary for the private sector and the public sector, respectively (www.egm.org.tr). Employees have the right to stay on this system for as long as they wish. AES covers employees who depend on an employer in the public or private sector, are citizens of the Republic of Turkey or that have a blue card and have not completed 45 years of age. 25% of the contributions paid are automatically registered as government contributions. In addition, when the first time system is entered, for one time, 1,000 TL are added to Automatic Enrollment Account as additional government contribution. The number of private pension companies was 13 in 2010, 14 in 2011 and 17 in 2012. In 2014, the Company continued to implement individual pension system with 18 companies. Today shows 18 pension companies operating in Turkey. Table 10

provides some information about the private pension companies operating on November 2, 2018.

Table 10: General Appearance of Individual Retirement System Based on Private Pension Companies in Turkey (02.11.2018)

Private Pension Company	Number of Participants	Total Amount of Participant's Funds (TL)	Total Amount of Participant's State Contribution Funds (TL)	Total Amount of Contributions (TL)	Number of Retired
Aegon Emeklilik ve Hayat	39,411	128,071,282	14,271,766	93,753,823	586
Allianz Hayat ve Emeklilik	102,157	2,443,573,285	301,137,806	1,755,651,826	3,549
Allianz Yaşam ve Emeklilik	753,590	10,443,671,368	1,101,642,911	7,564,983,578	10,404
Anadolu Hayat Emeklilik	1,126,069	13,967,906,374	2,114,624,363	10,704,019,649	21,631
Avivasa Emeklilik ve Hayat	847,164	14,720,496,038	1,927,288,921	11,145,149,074	16,831
Axa Hayat ve Emeklilik	35,254	351,881,153	66,797,502	286,263,572	54
Bereket Emeklilik ve Hayat	102,253	335,836,619	68,187,452	252,872,934	30
BNP Paribas Cardif Emeklilik	184,899	1,986,129,219	277,345,823	1,532,750,485	2,230
Cigna Finans Emeklilik ve Hayat	93,922	637,394,524	119,309,957	525,934,421	114
Fiba Emeklilik ve Hayat	95,151	1,436,191,169	161,462,287	1,086,442,119	790
Garanti Emeklilik ve Hayat	1,163,844	10,899,508,003	1,649,756,131	8,395,392,854	12,356
Groupama Emeklilik					2,974
Halk Hayat ve Emeklilik	532,390	3,217,376,720	578,001,803	2,737,671,180	300
Katılım Emeklilik ve Hayat	222,480	1,125,326,627	228,443,764	961,576,028	70
Metlife Emeklilik ve Hayat	189,212	1,405,392,683	242,863,762	1,192,597,274	390
NN Hayat ve Emeklilik	260,121	2,697,802,007	388,999,963	2,050,006,058	4,544

Vakıf Emeklilik ve Hayat	522,982	5,987,742,121	806,319,625	4,430,773,877	7,585
Ziraat Hayat ve Emeklilik	627,388	3,551,790,995	667,419,160	2,987,952,212	1,112
Total	6,898,287	75,336,090,186	10,713,872,998	57,703,790,966	85,550

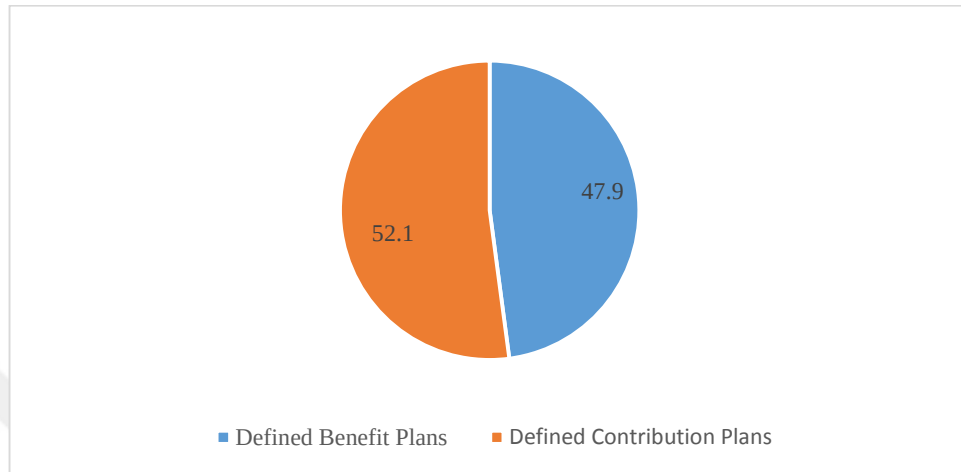
Source: Pension Monitoring Center, Summary IPS Data, (Online)

http://web2.egm.org.tr/webegm2/chart/besgosterge/wg_sirketview_tablolu.asp?raportar1=02.11.2018&raportar2=02.11.2018&sirketlist=26,52,95,24,25,29,23,36,34,32,42,22,45,58,33,69,82,94,100&raportip=10&yayin=W, 2 November 2018

1.4.1 General Indicators of Individual Retirement System in Turkey

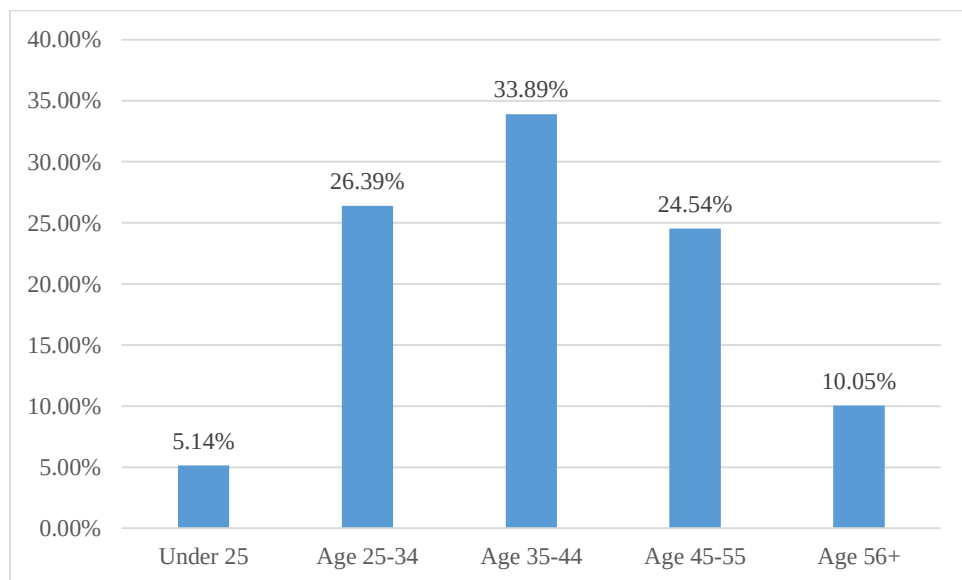
There are many indicators for the development of the individual retirement system in Turkey. With these indicators, it is possible to see the negative and positive aspects of the individual retirement system. As seen in figure 1, DB and DC plans are close to each other as asset amount but DB plans are predominant. When the dataset in the figure 2 is analyzed, the people having age between 35 and 44 were mostly in the Individual Retirement System. Then, the second largest participant age range is age between 25 and 34 in the Individual Retirement System. The third largest participant age range is the age 45-55 range. Participants under 25 have 5.14% as small percentage. When the data are analyzed, due to increasing the cumulative funds accumulated through providing more long-term accumulation of funds in Turkey and reducing the burden on the social security system, the Individual Retirement System of participation of people in the younger age range should be increased. Based on the data in the figure 3, it is seen that the 25-34 age group had the largest participation in the individual retirement system in 2013, based on the number of contracts. As of 2014, the participants with a 35-44 age group gained the majority when based on the number of contracts. Due to the increase in the number of participants aged 56 and over and the age range of 35-44, there is an increase, in general, in the age of persons who participate in the private pension system.

Figure 1: Private Pension Assets by Types of Private Pension Plans in Turkey in 2016



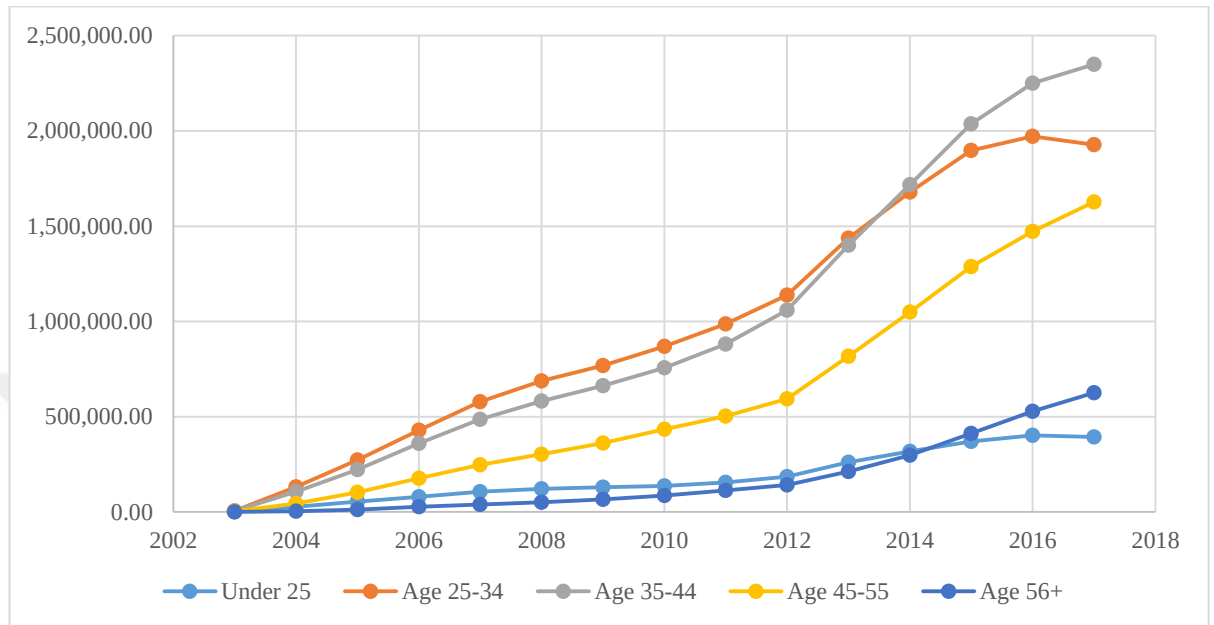
Source: OECD, “Pension Markets in Focus No.14”, 2017, (Online) <http://www.oecd.org/pensions/private-pensions/Pension-Markets-in-Focus-2017.xlsx>, 24 September 2018

Figure 2: Age Distribution of the Participants in Individual Retirement System in Turkey (02.11.2018)



Source: Pension Monitoring Center: Age Distribution of the Participants, (Online) <https://www.egm.org.tr/data-center/statistics/ips-statistics/age-distribution-of-the-participants/>, 2 November 2018

Figure 3: Distribution of Contracts Entering the System according to Participants' Age Groups by Years in Individual Retirement System in Turkey

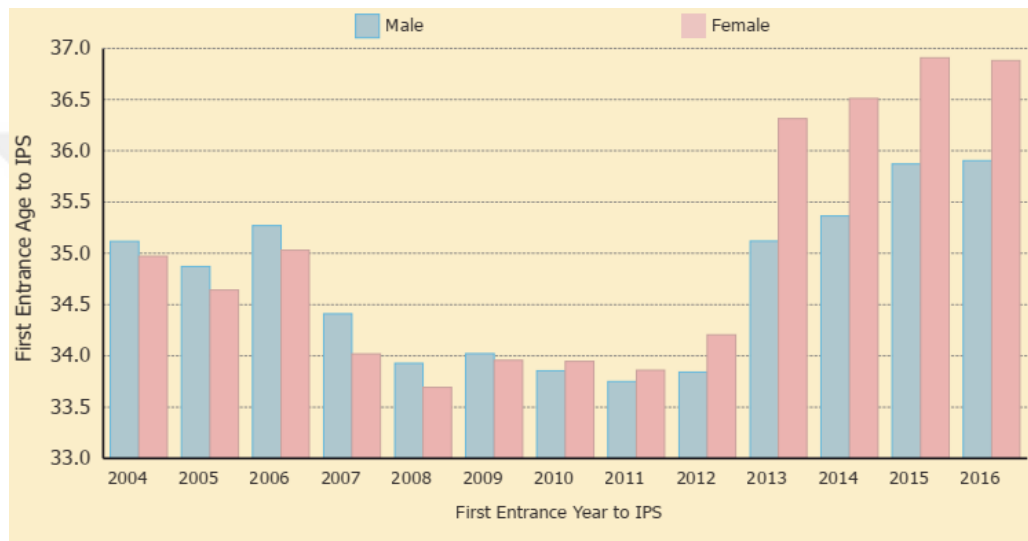


Source: Pension Monitoring Center, Age Distribution of the Participants, (Online) <https://www.egm.org.tr/data-center/statistics/ips-statistics/age-distribution-of-the-participants/>, 2 November 2018

When the average age of entry into the system in figure 4 is examined on a yearly basis, the average age of entry to the individual retirement system has reduced by 2011, starting from the table. As of 2012, the average age of entry into the system has started to increase. If we interpret the table in terms of gender, the mean age of male participants was higher than that of females, while the average age of females in 2010 was higher than males. Since 2012, the average age of women has increased tremendously. As seen in the figure 5, the most fund accumulation was in individual retirement contracts between 3-4 years. The fund size of long term contracts is lower than the short term contracts. When the number of contracts is considered, long term contracts represent a smaller ratio than short term contracts. The data in the figure 6 shows that the maximum regular monthly contribution is made age 56 and over. Based on regular monthly contribution, the age 45-55 range is second. As the age range becomes younger, the monthly contribution is reduced. Participants in the age 35-44 and age 25-34, who have the highest number of participants, contributed less than age

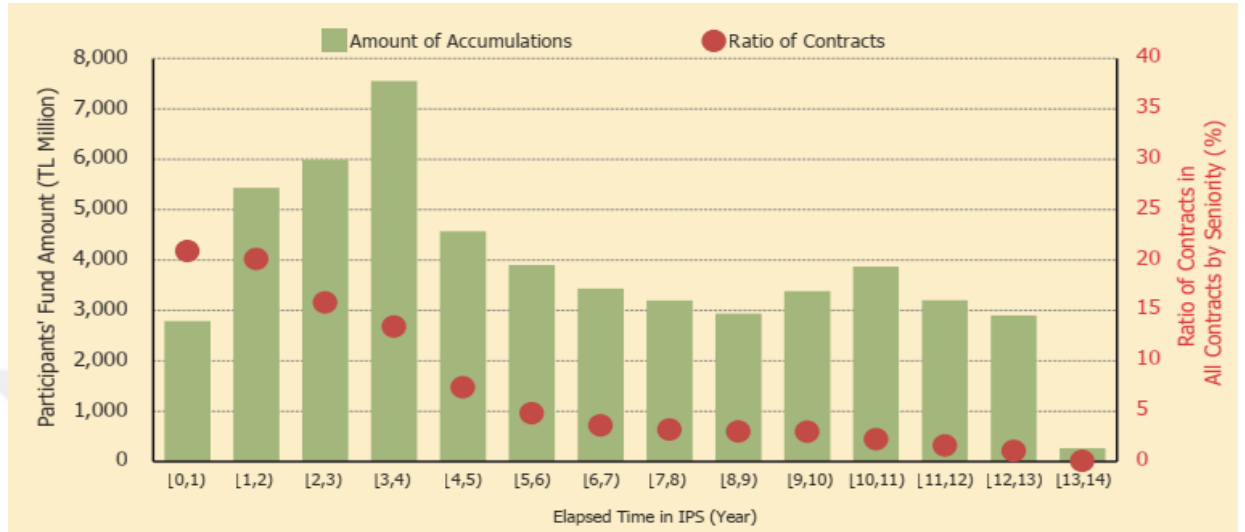
45-55 and less than age 56 and over. From this point of view, the participation of younger participants to the private pension system should be ensured in a way that contributes to higher monthly contributions for higher level of fund volumes and individual benefits.

Figure 4: Participants Average Entrance Age to the System in Individual Retirement System in Turkey



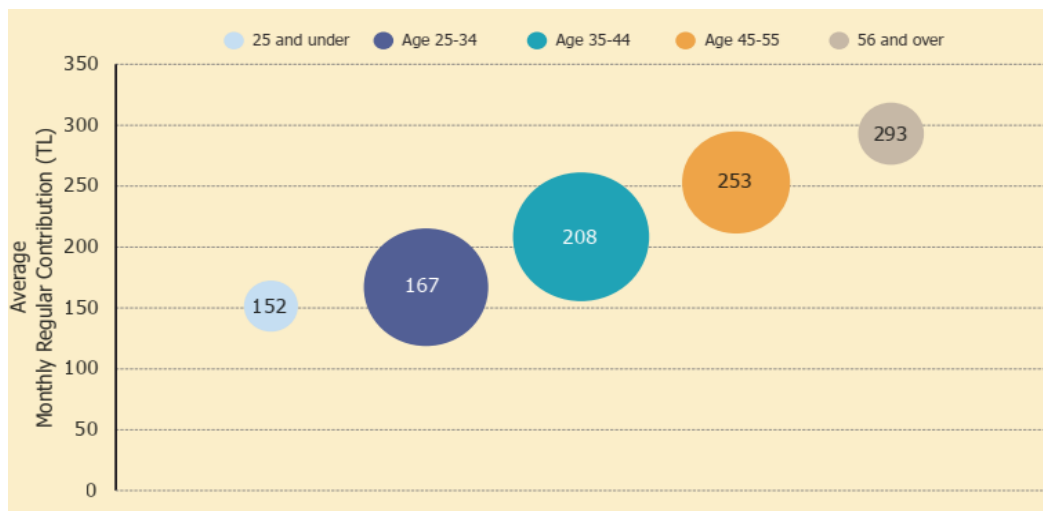
Source: Pension Monitoring Center, “Individual Pension System Progress Report 2016”, 3 July 2017, (Online) https://www.egm.org.tr/bes2016gr/English/IPS%20Progress%20Report%202016/E-Book/files/downloads/IPS2016_EN.pdf, 10 November 2018, p. 26.

Figure 5: Distribution of Participants' Fund Amount according to Contracts' Age (TL) in Individual Retirement System in Turkey in 2016



Source: Pension Monitoring Center, “Individual Pension System Progress Report 2016”, 3 July 2017, (Online) https://www.egm.org.tr/bes2016gr/English/IPS%20Progress%20Report%202016/E-Book/files/downloads/IPS2016_EN.pdf, 10 November 2018, p. 15.

Figure 6: Participants' Average Monthly Regular Contribution Planned to be Paid, According to Age Groups in Individual Retirement System in Turkey in 2016



Source: Pension Monitoring Center, “Individual Pension System Progress Report 2016”, 3 July 2017, (Online) https://www.egm.org.tr/bes2016gr/English/IPS%20Progress%20Report%202016/E-Book/files/downloads/IPS2016_EN.pdf, 10 November 2018, p. 23.

Table 11: Key Statistics About Individual Retirement System in Turkey

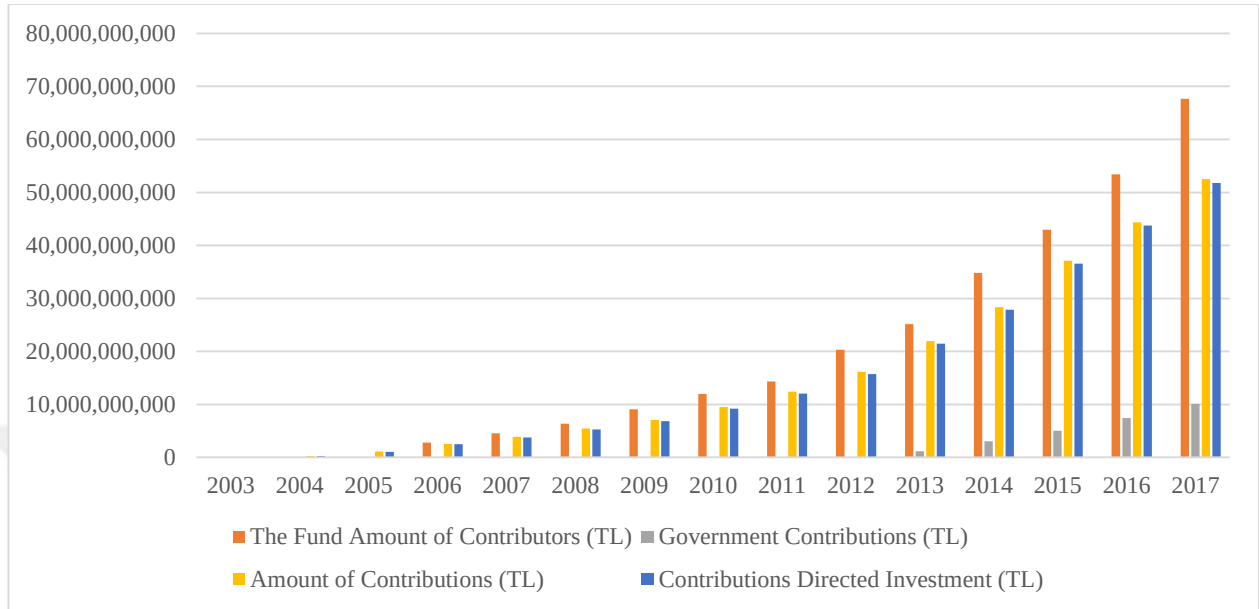
	Number of Contributors	The Fund Amount of Contributors (TL)	Government Contributions (TL)	Amount of Contributions (TL)	Contributions Directed Investment (TL)
2003	15,245			5,866,764	5,692,556
2004	314,257			288,325,706	276,287,104
2005	672,696			1,117,233,826	1,078,630,423
2006	1,073,650	2,814,938,925		2,592,508,977	2,512,373,823
2007	1,457,704	4,566,383,316		3,917,061,211	3,786,517,089
2008	1,745,354	6,372,756,623		5,467,695,761	5,284,206,740
2009	1,987,940	9,097,436,467		7,102,007,561	6,869,992,691
2010	2,281,478	12,011,986,651		9,515,230,234	9,221,131,447
2011	2,641,843	14,329,771,986		12,393,688,644	12,028,485,722
2012	3,128,130	20,346,290,278		16,177,757,755	15,741,037,013
2013	4,153,055	25,145,718,418	1,151,765,932	21,921,860,114	21,455,900,238
2014	5,092,871	34,793,077,808	3,019,076,239	28,346,503,495	27,842,765,911
2015	6,038,432	42,979,056,589	5,020,000,071	37,119,095,559	36,549,379,287
2016	6,627,025	53,409,391,715	7,438,179,620	44,363,955,590	43,733,162,043
2017	6,922,615	67,681,433,293	10,141,204,873	52,539,176,257	51,774,665,816

Source: Pension Monitoring Center, Summary IPS Data, (Online)
http://web2.egm.org.tr/webegm2/chart/besgosterge/wg_sirketview_tablolu.asp?raportar1=29.12.2017&raportar2=31.12.2003&sirketlist=100&raportip=10&yayin=W, 2 November 2018

The figure 7 shows the fundamental data on the individual pension system. All variables in the table have increased in all years. Although there is no significant difference between the amount directed to the investment and the contribution amounts, the contribution amount has always been higher than the amount directed to investment. The amount of funds has increased in all years. When the individual retirement contracts are examined in terms of type, the figure 8 shows that 74.73% of the contracts made up of individual pension contracts, group individual contracts have %17,76 and noncontributory contracts contain %7,51 in total. Individual pension contracts are dominant in the private pension system. The figure 9 shows the distribution of fund amount according to their professions. The datasets in the figure shows that self-employed participants are majority with 26%. Housewives have the second highest share with 16.6%. The housewives are followed by workers and public

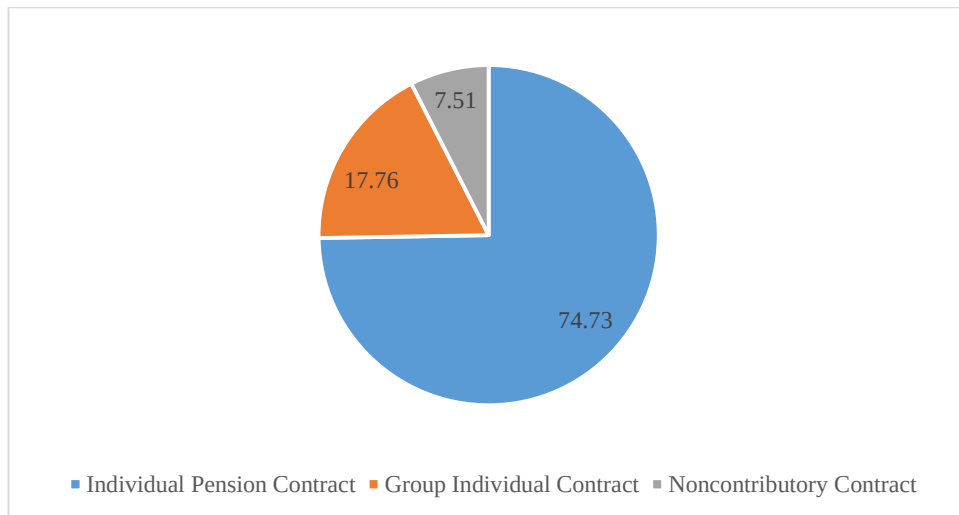
officers . The most important point here is that housewives have a relatively high rate. Increasing participation of housewives who benefit from the social security system through their spouses to the individual retirement system will reduce the burden of the social security system and will provide a positive contribution to the individual retirement system by providing funds to the individual retirement system from the non-working population. Another noteworthy issue is that the relative participation of public sector employees is low. For example, Public Officers have a ratio of 9.5% and teachers have a ratio of 7%. Considering that public sector employees benefit from the social security system without exception, the participation of public sector employees in the individual retirement system should be encouraged. When the amount of funds of the occupational groups is examined, the ranking in the number of participants does not change in general and Self-employed people come first with 26.1%, followed by housewives. In terms of the amount of funds, it is observed that the public sector employees represent also a proportionately low proportion. Fund amount proportion of doctors and engineers have approximately 2.5 times more funds than their participant rates. As a result, both the participation of housewives and public sector employees in the individual retirement system and an increase in their fund amounts should be encouraged.

Figure 7: Contributions in Individual Retirement System in Turkey



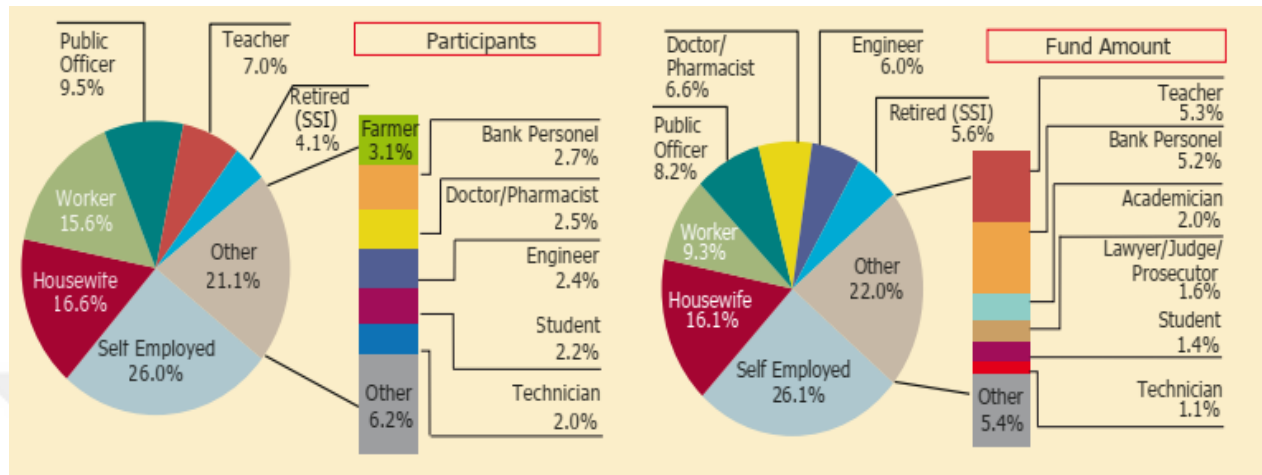
Source: Pension Monitoring Center, Summary IPS Data, (Online)
http://web2.egm.org.tr/webegm2/chart/besgosterge/wg_sirketview_tablolu.asp?raportar1=29.12.2017&raportar2=31.12.2003&sirketlist=100&raportip=10&yayin=W, 2 November 2018

Figure 8: Distribution of Participants' Fund Amount and Contracts according to their Types in Individual Retirement System in Turkey (02.11.2018)



Source: Pension Monitoring Center, Summary IPS Data, (Online)
http://web2.egm.org.tr/webegm2/chart/besgosterge/wg_sirketview_tablolu.asp?raportar1=29.12.2017&raportar2=31.12.2003&sirketlist=100&raportip=10&yayin=W, 2 November 2018

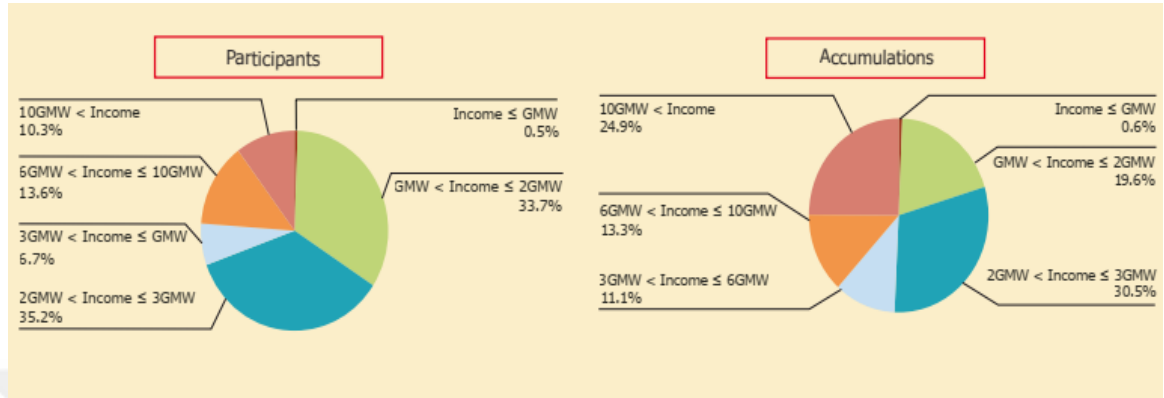
Figure 9: Distribution of Fund Amount according to Participants' Profession in Individual Retirement System in Turkey in 2016



Source: Pension Monitoring Center, “Individual Pension System Progress Report 2016”, 3 July 2017, (Online) https://www.egm.org.tr/bes2016gr/English/IPS%20Progress%20Report%202016/E-Book/files/downloads/IPS2016_EN.pdf, 10 November 2018, p. 20.

In the figure 10, participants were analyzed according to their income levels. In the figure, when the participants are classified according to their income status, those with less income than the gross minimum wage are 0.5% of the total number of participants, the highest rate is 35.2% in the income group, which is between twice the minimum wage and three times the minimum wage. Then there is the gross minimum wage and the participants in the income group up to 2 times the gross minimum wage. When income groups are analyzed for accumulation, the first order is the income group which is between twice the gross minimum income and three times the minimum wage, while the second one is 24.9% for the ones with more than 10 times the gross minimum wage. This shows that participants with more than 10 times the gross minimum wage contributed more than all income groups per participant. At the same time, participants with gross minimum wage and income up to twice the gross minimum wage are the least contributing income group. As a result, as the income level increases, the contribution amount per participant increases. In addition, the participation of participants with lower income levels in the individual retirement system should be increased by creating incentives and awareness, as to decreases the burden of social security.

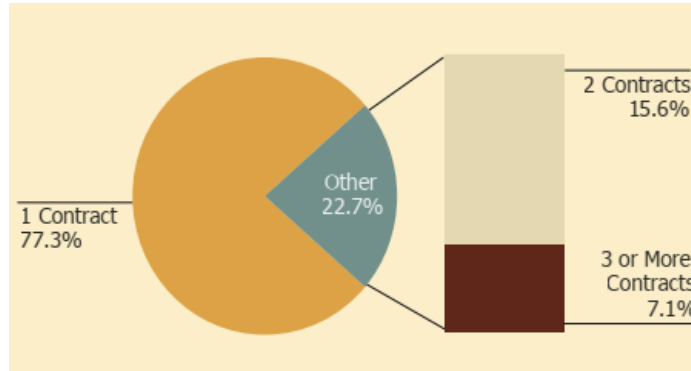
Figure 10: Distribution of Participants and Participants' Fund Amount According to Income Levels (%)in Individual Retirement System in Turkey in 2016



Source: Pension Monitoring Center, “Individual Pension System Progress Report 2016”, 3 July 2017, (Online) https://www.egm.org.tr/bes2016gr/English/IPS%20Progress%20Report%202016/E-Book/files/downloads/IPS2016_EN.pdf, 10 November 2018, p. 26.

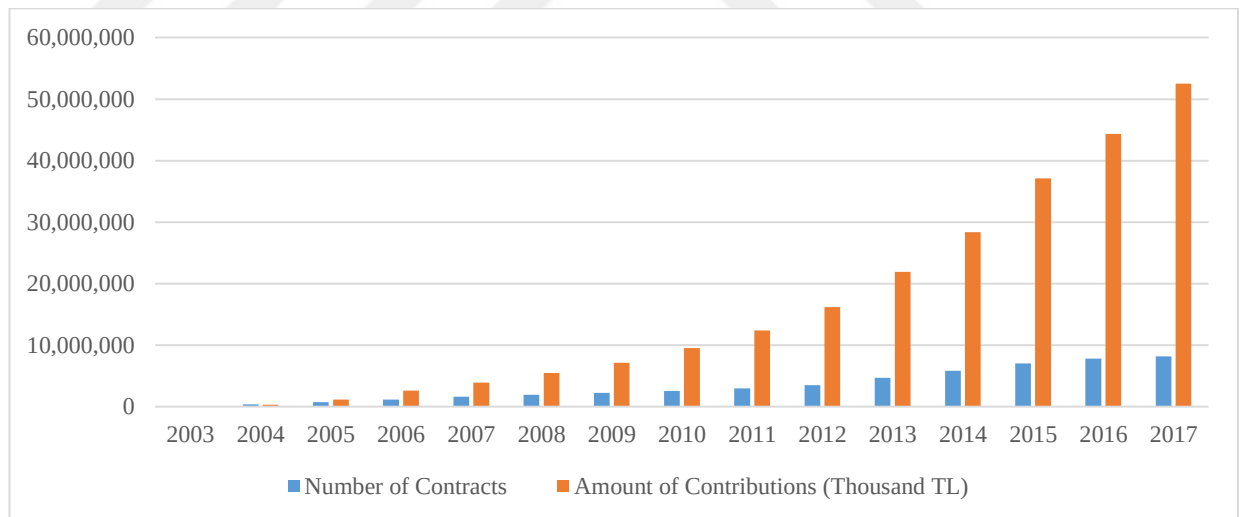
The figure 11 shows the number of individual retirement contracts per participant. 77.3% of the participants have one pension contract. The number of participants with two contracts remained at 15.6%. The rate of participants with three or more contracts is 7.1%. As contract per participant increases, fund accumulation increases, thus, increasing the number of contract per participant in Turkey is important. As can be seen in the figure 12, individual retirement contracts and contribution amounts have increased every year. At the same time, the contribution amount per contract increased steadily each year due to the fact that the amount of contributions collected increased more than the number of contracts. In the figure 13, the total amount of investment made by private pension funds and the amount of participants' funds were compared. The difference between the total investment amount made by private pension funds and the total fund amount of the participants is not significant compared to the fund volume. This shows that the amount of contributions is converted into investment in a short period of time.

Figure 11: Distribution of Participants according to Number of Contracts Owned in Individual Retirement System in Turkey in 2016



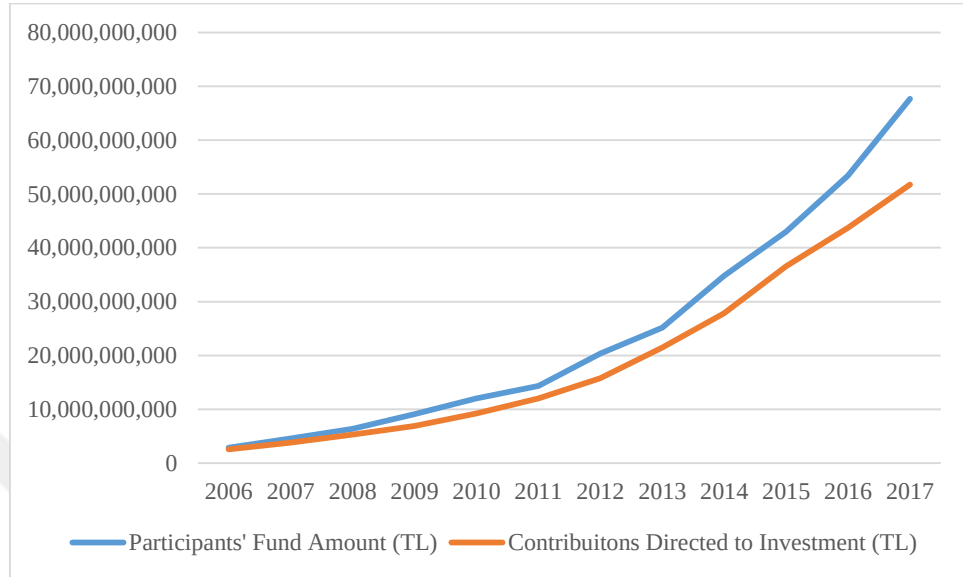
Source: Pension Monitoring Center, “Individual Pension System Progress Report 2016”, 3 July 2017, (Online) https://www.egm.org.tr/bes2016gr/English/IPS%20Progress%20Report%202016/E-Book/files/downloads/IPS2016_EN.pdf, 10 November 2018, p. 27.

Figure 12: Development of Number of Contracts and Amount of Contributions in Individual Retirement System in Turkey



Source: Pension Monitoring Center, Summary IPS Data, (Online) http://web2.egm.org.tr/webegm2/chart/besgosterge/wg_sirketview_tablolu.asp?raportar1=29.12.2017&raportar2=31.12.2003&sirketlist=100&raportip=10&yayin=W, 2 November 2018

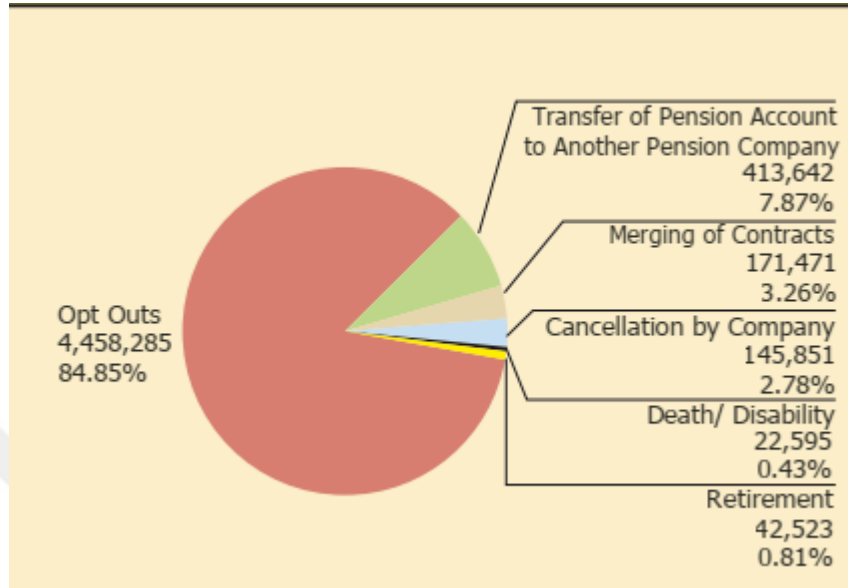
Figure 13: Comparison of Total Invested Amount and Participants' Fund Amount in Individual Retirement System in Turkey (TL)



Source: Pension Monitoring Center, Summary IPS Data, (Online)
http://web2.egm.org.tr/webegm2/chart/besgosterge/wg_sirketview_tablolu.asp?raportar1=29.12.2017&raportar2=31.12.2003&sirketlist=100&raportip=10&yayin=W, 2 November 2018

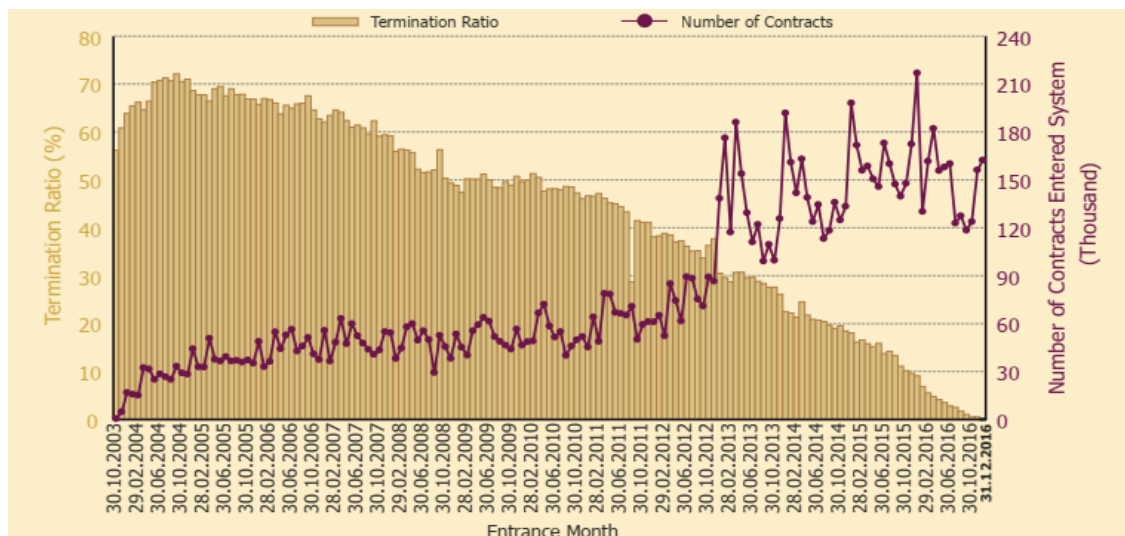
When the reasons for the termination of individual retirement contracts in the figure 14 are examined, 84.85% in total are terminated by opting out. The transfer to another pension company's retirement account is second with 7,87%. As a result, the main reason for the termination of contracts is opting out and the reduction of opting out in individual retirement contracts is important in terms of continuity in the individual pension system. When the figure 15 is examined, the contract termination rate tends to decrease in the examined periods. In 2004, the contract termination rate was in the seventies, whereas in 2016, this rate fell below 5%. The number of contracts entered into the system showed an upward trend but showed fluctuations. In summary, the decrease in contract termination rate and the increase in the number of contracts positively affect individual pension funds. Based on the data in the figure 16, the change in the annual contribution amount of the individual retirement system is positive every year, but every year there is a higher increase compared to the previous year. The changes that were calculated according to the inflation rate were higher than the nominal change amounts and they increased every year.

Figure 14: Distribution of Terminated Contracts According to Termination Reason in Individual Retirement System in Turkey



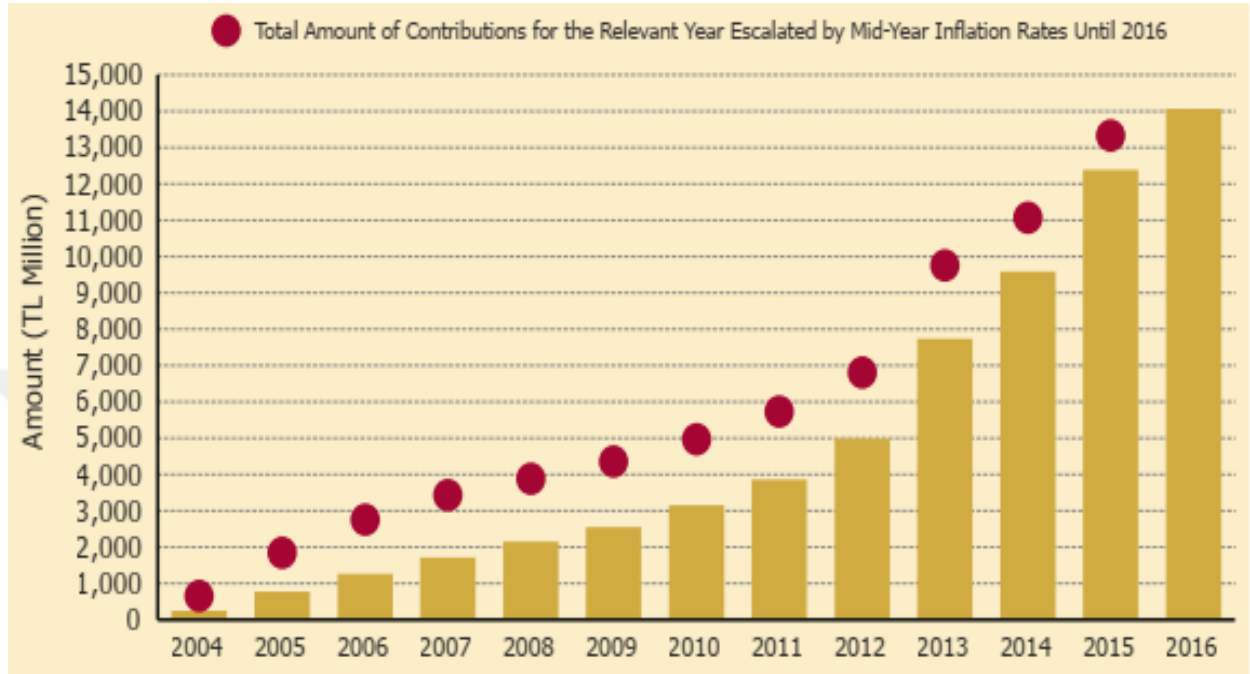
Source: Pension Monitoring Center, “Individual Pension System Progress Report 2016”, 3 July 2017, (Online) https://www.egm.org.tr/bes2016gr/English/IPS%20Progress%20Report%202016/E-Book/files/downloads/IPS2016_EN.pdf, 10 November 2018, p. 14.

Figure 15: Termination Ratio of Contracts According to the Month of Enforcement in Individual Retirement System in Turkey



Source: Pension Monitoring Center, “Individual Pension System Progress Report 2016”, 3 July 2017, (Online) https://www.egm.org.tr/bes2016gr/English/IPS%20Progress%20Report%202016/E-Book/files/downloads/IPS2016_EN.pdf, 10 November 2018, p. 17.

Figure 16: Change in Contributions Paid for Contracts in Force According to Years in Individual Retirement System in Turkey



Source: Pension Monitoring Center, “Individual Pension System Progress Report 2016”, 3 July 2017, (Online) https://www.egm.org.tr/bes2016gr/English/IPS%20Progress%20Report%202016/E-Book/files/downloads/IPS2016_EN.pdf, 10 November 2018, p. 34.

1.4.2 General Indicators of Automatic Enrollment System in Turkey

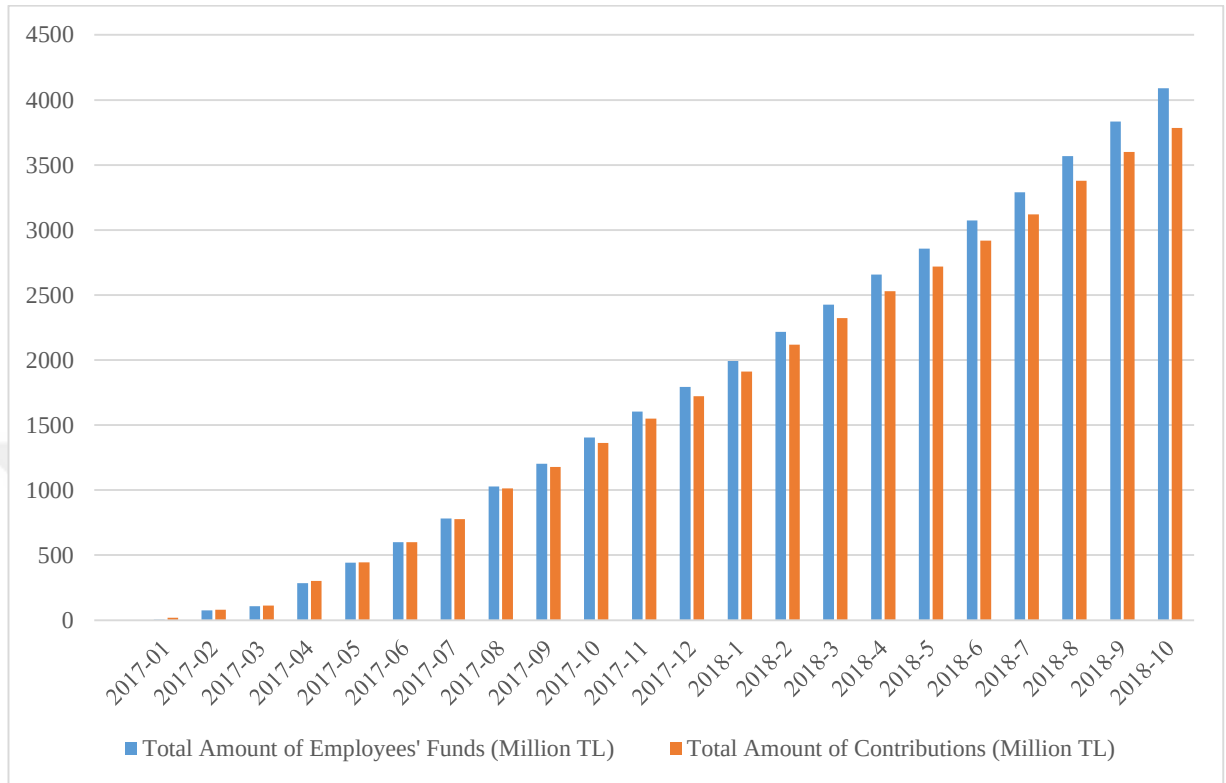
The Automatic Enrollment System is a pension system established to reduce the burden of social security system, to contribute to the development of the country and to increase the welfare level of pensioners by using the Individual Retirement System infrastructure. In order to see the effect of the Automatic Enrollment System, it is necessary to analyze its general indicators. As can be seen in the table 12, the total amount of contribution and the total amount of funds of employees in the Automatic Enrollment System (AES) increased steadily each month. At the beginning, the total contribution amount is greater than the total fund amount of the employees and in the following months total fund amount exceeds the total contribution amount. The difference between the total amount of funds and the total contribution amount increases year-over-year.

Table 12: Total Amount of Employee Funds and Contributions in AES in Turkey

	Total Amount of Employees' Funds (Million TL)	Total Amount of Contributions (Million TL)
2017-01	4,400,515.00	18,703,167.00
2017-02	75,542,278.00	79,999,964.00
2017-03	106,908,996.00	111,965,093.00
2017-04	284,963,556.00	301,927,038.00
2017-05	441,858,988.00	444,513,484.00
2017-06	600,136,238.00	598,912,877.00
2017-07	781,070,852.00	777,891,234.00
2017-08	1,029,027,189.00	1,012,791,879.00
2017-09	1,203,298,320.00	1,179,092,988.00
2017-10	1,404,691,189.00	1,363,510,899.00
2017-11	1,604,614,352.00	1,550,752,154.00
2017-12	1,793,068,070.00	1,722,891,787.00
2018-01	1,992,635,852.00	1,911,755,757.00
2018-02	2,216,154,205.00	2,118,601,256.00
2018-03	2,427,149,445.00	2,321,467,282.00
2018-04	2,657,362,877.00	2,528,711,006.00
2018-05	2,856,717,374.00	2,719,592,521.00
2018-06	3,073,960,425.00	2,919,198,329.00
2018-07	3,289,831,744.00	3,120,766,548.00
2018-08	3,569,052,398.00	3,378,829,969.00
2018-09	3,833,476,885.00	3,600,122,329.00
2018-10	4,089,813,241.00	3,784,068,283.00

Source: Pension Monitoring Center, AES Statistics, (Online)
http://web2.egm.org.tr/webegm2/chart/besgosterge/wg_sirketview_oto_tablolu.asp?raportar1=13.01.2017&raportar2=31.10.2018&sirketlist=100&raportip=25&yayin=T, 10 November 2018

Figure 17: Total Amount of Employee Funds and Contributions in AES in Turkey



Source: Pension Monitoring Center, AES Statistics, (Online)
http://web2.egm.org.tr/webegm2/chart/besgosterge/wg_sirketview_oto_tablolu.asp?raportar1=13.01.2017&raportar2=31.10.2018&sirketlist=100&raportip=25&yayin=T, 10 November 2018

When the percentage contribution of the Automatic Enrollment System (AES) in the table 13 is analyzed, significant increase and decrease rates are observed. In the first months, the number of contributions per employee showed significant reductions in percentage. One of the most important reasons for these percentage reductions is probably that due to the mandatory participation in the Automatic Enrollment System (AES), employees who are reluctantly involved in the system to leave the Automatic Enrollment System. In the first months, decreasing rates in the amount of contribution per employee were followed by high rates of increase, and in the following months, increase rate was significantly reduced. When the percentage change of the contribution per participant in the Individual Retirement System is examined, although there is no decreasing trend, the rate of increase is low compared to the Automatic Enrollment System. When the total change rate in the period is analyzed, the percentage increase in the amount of contributions per employee in the Automatic

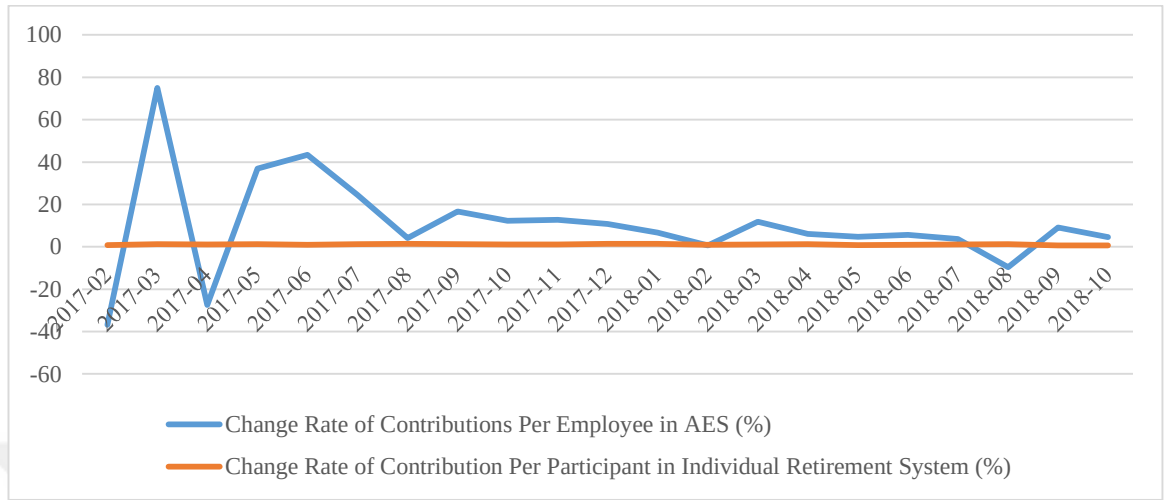
Enrollment System (AES) is% 401,08 while the amount of contribution per participant in the Individual Retirement System is 24,83%.These change rates indicate that AES is more efficient than the the Individual Retirement System when based on the amount of contribution per capita.

Table 13: Change Rates of Contributions Per Capita in AES and IRS in Turkey

	Change Rate of Contributions Per Employee in AES (%)	Change Rate of Contribution Per Participant in Individual Retirement System (%)
2017-02	-36.89	0.73
2017-03	74.97	1.2
2017-04	-27.49	1.12
2017-05	36.88	1.19
2017-06	43.35	0.92
2017-07	24.47	1.18
2017-08	4.08	1.47
2017-09	16.7	1.22
2017-10	12.28	1.06
2017-11	12.68	1.12
2017-12	10.74	1.34
2018-01	6.7	1.39
2018-02	0.58	0.89
2018-03	11.84	1.04
2018-04	6.02	1.21
2018-05	4.76	0.78
2018-06	5.61	0.88
2018-07	3.69	1.1
2018-08	-9.6	1.22
2018-09	9.11	0.67
2018-10	4.59	0.58
Total	401.08	24.83

Source: Pension Monitoring Center, Summary IPS Data, (Online) http://web2.egm.org.tr/webegm2/chart/besgosterge/wg_sirketview_tablolu.asp?raportar1=29.12.2017&raportar2=31.12.2003&sirketlist=100&raportip=10&yayin=W, 2 November 2018 and Pension Monitoring Center, AES Statistics, (Online) http://web2.egm.org.tr/webegm2/chart/besgosterge/wg_sirketview_oto_tablolu.asp?raportar1=13.01.2017&raportar2=31.10.2018&sirketlist=100&raportip=25&yayin=T, 10 November 2018

Figure 18: Change Rates of Contributions Per Capita in AES and IRS in Turkey

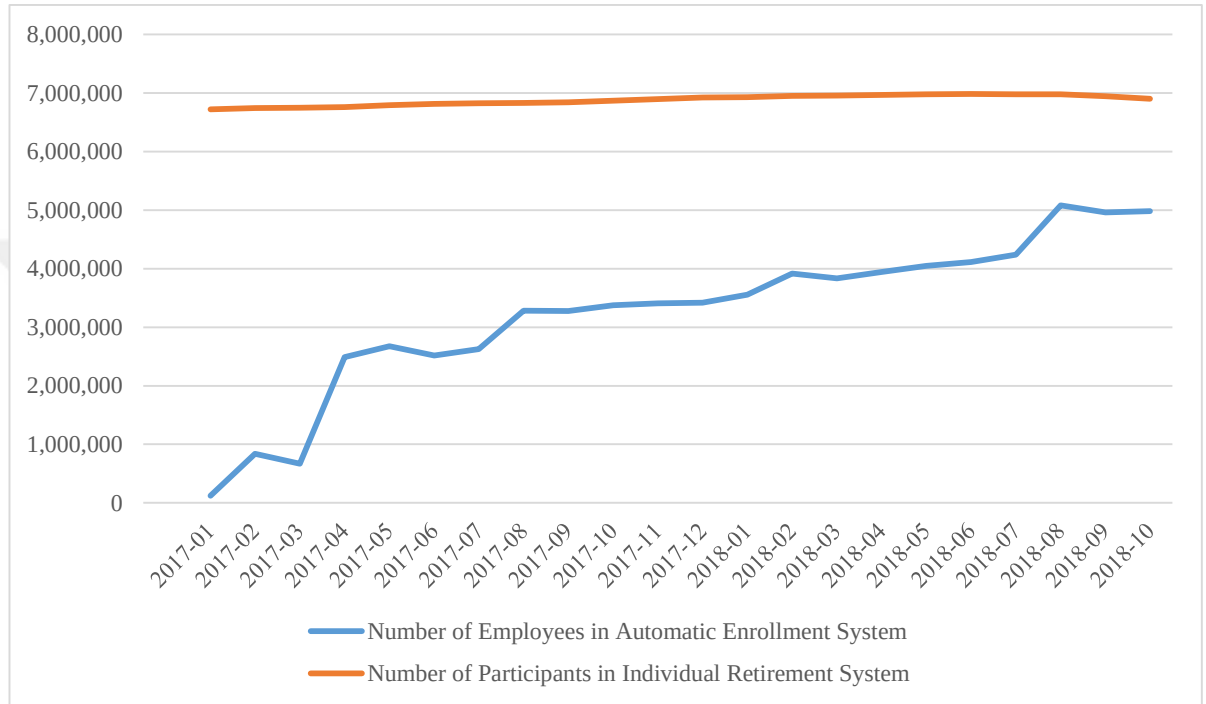


Source: Pension Monitoring Center, Summary IPS Data, (Online) http://web2.egm.org.tr/webegm2/chart/besgosterge/wg_sirketview_tablolu.asp?raportar1=29.12.2017&raportar2=31.12.2003&sirketlist=100&raportip=10&yayin=W, 2 November 2018 and Pension Monitoring Center, AES Statistics, (Online) http://web2.egm.org.tr/webegm2/chart/besgosterge/wg_sirketview_oto_tablolu.asp?raportar1=13.01.2017&raportar2=31.10.2018&sirketlist=100&raportip=25&yayin=T, 10 November 2018

As it can be seen in the figure 19, the number of employees in the Automatic Enrollment System decreases significantly in the first months, but increases in general. The reason for the decreases in the first months is that the employees included mandatorily in the Automatic Enrollment System are likely to be out of the system in the first months. In the Individual Retirement System, not a significant amount of increases are observed. When the table 14 is analyzed, there is a high rate of increase and decrease in participation of the Automatic Enrollment System and a low proportional change in participation of the Individual Retirement System. While there are close proportional changes in the Individual Retirement System in each month, there are very different proportional changes in each month in the Automatic Enrollment System. Especially in the first months of the automatic participation system, there is a high percentage change. In this case, the employees who enter mandatorily the AES using withdrawal right and entrance the system of new employees into the AES have a great effect. When the total changes rates are considered, the Automatic Participation System reaches a very high increase rate in number of employees and Individual Retirement System has a significantly lower

increase rate in number of participants. As a result, it can be said that the Automatic Participation System has a positive effect both on the number of people involved and on the effectiveness of the contributions collected.

Figure 19: Number of Employee and Participants in AES and IRS in Turkey



Source: Pension Monitoring Center, Summary IPS Data, (Online) http://web2.egm.org.tr/webegm2/chart/besgosterge/wg_sirketview_tablolu.asp?raportar1=29.12.2017&raportar2=31.12.2003&sirketlist=100&raportip=10&yayin=W, 2 November 2018 and Pension Monitoring Center, AES Statistics, (Online) http://web2.egm.org.tr/webegm2/chart/besgosterge/wg_sirketview_oto_tablolu.asp?raportar1=13.01.2017&raportar2=31.10.2018&sirketlist=100&raportip=25&yayin=T, 10 November 2018

Table 14: Changes in Number of Employee and Participants in AES and IRS in Turkey

	Changes in Number of Employees in Automatic Enrollment System (%)	Number of Participants in Individual Retirement System (%)
2017-02	577.76	0.36
2017-03	-20.01	0.07
2017-04	271.91	0.2
2017-05	7.55	0.44
2017-06	-6.01	0.3
2017-07	4.35	0.2
2017-08	25.1	0.09
2017-09	-0.24	0.15
2017-10	3	0.38
2017-11	0.94	0.44
2017-12	0.33	0.36
2018-1	4	0.05
2018-2	10.18	0.33
2018-3	-2.03	0.1
2018-4	2.74	0.15
2018-5	2.67	0.16
2018-6	1.64	0.1
2018-7	3.1	-0.13
2018-8	19.76	0
2018-9	-2.34	-0.41
2018-10	0.49	-0.62
Total	3937.73	2.74

Source: Pension Monitoring Center, Summary IPS Data, (Online) http://web2.egm.org.tr/webegm2/chart/besgosterge/wg_sirketview_tablolu.asp?raportar1=29.12.2017&raportar2=31.12.2003&sirketlist=100&raportip=10&yayin=W, 2 November 2018 and Pension Monitoring Center, AES Statistics, (Online) http://web2.egm.org.tr/webegm2/chart/besgosterge/wg_sirketview_oto_tablolu.asp?raportar1=13.01.2017&raportar2=31.10.2018&sirketlist=100&raportip=25&yayin=T, 10 November 2018

1.4.3 Pension Mutual Funds in Turkey

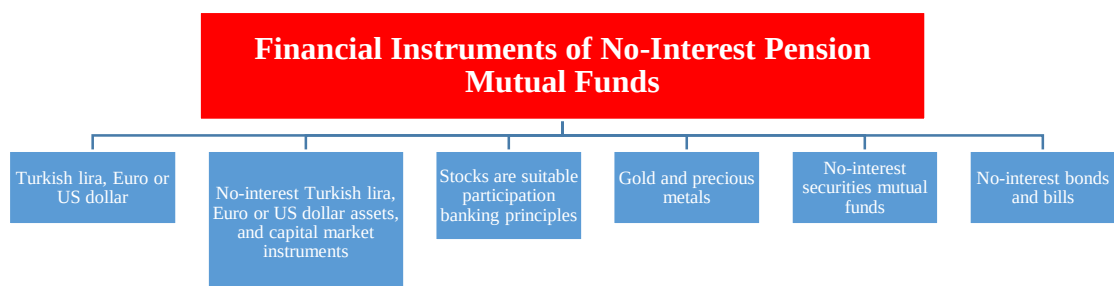
Pension mutual funds are an investment fund that is created in order to direct the amount of contributions collected from the participants to the investment within the legal framework drawn by the individual pension firms. Pension mutual funds separated as non-interest pension mutual funds and a interest return pension mutual funds, when classified a return basis. Pension investment funds are established by pension companies and do not have legal entity. The funds collected are managed by portfolio management companies. The type of the pension mutual funds is determined based on the investment instruments they contain; e.g. government bonds and bills, stocks, deposits, and so on. Pension mutual funds may be purchased only by those entering the IPS. Withholding tax shall not apply to the returns from pension mutual funds. These funds are managed with long-term investment strategies (egm.org.tr, 2018). Pension mutual funds could invest in preferred funds without any minimum and maximum limits. In addition, among the funds offered within the scope of the plan and it could be preferred to share the rates within the defined limits. In line with the risk-return expectations of the target participants in the pension plans, investment restrictions may be in line with the strategy of the fund. The accumulation in individual pension account, and paid contributions' distribution ratios and amounts between funds may be changed a maximum of six times per year (egm.org.tr, 2018). If selection among the private pension funds don't make, accumulations in individual pension account will be invested in the Standard Fund. Group Pension Mutual Fund is a type of fund that is created for certain businesses, occupations and industries, and on the condition of approval by the Capital Markets Board, to allocate the funds to certain persons or groups (egm.org.tr, 2018).

The private pension system provides pension investment funds that are based on Islamic finance rules and participation banking principles. These funds invest in non-interest-bearing instruments for interest-sensitive participants. These no-interest funds; has been approved by the advisory board of the related pension company, and it is decided that it is permissible according to the Islamic religion, and invests in the instruments that are considered to be in line with the principles of no-interest and participation banking.

Financial instruments of no-interest pension mutual funds may briefly contain the following(egm.org.tr, 2018):

- Participation accounts in Turkish lira, Euro or US dollar opened in participation banks,
- No-interest Turkish lira, Euro or US dollar assets, and capital market instruments that do contain precious metals such as gold and silver,
- Stocks that are suitable for the participation index and participation banking principles,
- Gold and precious metals,
- No-interest securities mutual funds (e.g., venture capital investment funds, real estate mutual investment, etc.),
- No-interest bonds and bills such as sukuks (lease certificates) that are issued in Turkey or abroad.

Figure 20: Financial Instruments of No-Interest Pension Mutual Funds



Source: www.egm.org.tr

According to the assets invested, the types of funds are defined as follows (Pension Mutual Funds Guide, 2018: 6):

-Stocks Fund: At least 80 percent of the fund portfolio continuously consists of domestic and/or foreign issuers.

-Bonds and Bills Fund: The reverse repo fund with at least 80 percent of the fund portfolio continuously consisting of domestic and/or foreign government and/or private sector bonds and bills, and government bonds and bills.

-Participation Fund: The fund with a fund portfolio continuously consisting of rent certificates, participation accounts, partnership shares, gold and other precious metals, and the non-interest monetary and capital market instruments approved by the Board.

-Composite Fund: The fund with at least 80 percent of the fund portfolio consisting of at least two of the partnership shares, bonds and bills, gold and other precious metals, and rent certificates, provided that each value is not below 20 percent of the fund portfolio.

-Money Market Fund: The fund with a fund portfolio that continuously consists of high-liquidity monetary and capital market instruments that have maximum 184 days to maturity and have a daily-calculated maximum weighted-average maturity of 45 days.

-Precious Metals Fund: The fund with at least 80 percent of the fund portfolio continuously consisting of gold and other precious metals, and monetary and capital market instruments based on them.

-Index Fund: The fund that at least 80 percent of the fund portfolio consisting of all, or a part selected through sampling, of the assets from a Board-approved index, and that aims to achieve at least 0.9 coefficient of correlation between the basis index and the fund's unit share value and yield a return that equals the increase in the index.

Fund shall meet the following conditions (Pension Mutual Funds Guide, 2018: 6):

a) The index that is made up of the shares of the issuers it follows and the fund portfolio that follows this index shall consist of at least six issuer's shares, and the weight of shares of each issuer in the index/fund portfolio shall not exceed 30 percent in the total index/fund value,

b) The index that is made up of the government bonds and bills or private bonds and bills which it follows, and each of the government bonds and bills in the fund portfolio that follows this index shall have a weight of no more than 35 percent in the index/fund portfolio value,

c) The index that is made up of the real estate certificates or private sector real estate certificates which it follows and the fund portfolio that follows this index shall consist of at least four real estate certificates, and each of the real estate certificates or private sector real estate certificates in the index/fund portfolio shall have a weight of no more than 35 percent in the index/portfolio value.

-Fund Basket Fund: The repo fund with at least 80 percent of the portfolio consisting of mutual funds and stock market mutual funds. The 80-percent calculation shall be made by taking into account the investment made in the stock market mutual fund participation shares traded in foreign stock markets and in the foreign fund participation shares of which the prospectus on participation share sale has been approved by the Board. Fund Basket Fund bylaw shall contain strategies for the planned mutual fund and stock market mutual fund investments.

-Contribution Fund: This fund is created pursuant to the Regulation on State Contribution in the Individual Pension System to invest the contributions paid on behalf of the participants.

-Flexible Fund: This fund does not fall within the description of any of the aforementioned types in terms of portfolio limitations.

-Standard Fund: This fund is managed according to the principles set forth in article 2 in the Provisions on the Pension Plan section of the Circular on the Private Pension System No. 2016/39.

-Life-Cycle / Target Fund: This fund is created with an investment strategy by taking into account the participant's retirement date, risk perception, age, and other specifications.

1.4.3.1 General Indicators of Types of Pension Mutual Funds in Turkey

Each type of pension mutual fund invested in different rates to different assets. Therefore, They offer different returns to participants who choose different fund groups and also affects finance and capital markets in this way. Thus, it is necessary to examine the net asset amount, annual return and asset distribution of pension mutual fund groups. As can be seen in the table 15, the pension mutual fund group, whose net asset value increased the most in 2016, was the precious metal group and the government bonds and bills (FX). On the basis of return, precious metals fund group has the highest rate of return. In the ranking of funds with the highest return, the precious metals fund group is followed by government bonds and bonds (FX). As seen in the table 16, the fund group that has the most funds among the funds offered by the private pension companies is the flexible fund group. Flexible fund group is followed by stock and state contribution funds as number of funds. It can be considered that private pension companies offer more flexible fund plan to participants as they are subject to less restriction than other funds. From this point of view, it is seen that less restricted groups of funds have more funds than the funds subject to further restriction. Based on the statistics between 2017 and 31.10.2018, While the fund group with the largest increase in the total net asset value is the precious metal fund group, the largest decrease in the total net asset value is in the initial fund group. In terms of the increase in net asset values, the precious metals are followed by bonds and bills (FX) funds and composite funds, respectively. In terms of total net asset value, the largest total net asset value of 31.10.2018 is in the flexible fund group followed by bonds and bills (TL) and bonds and bills (FX). When the annual rate of return in 2018 (up to 31.10.2018) is analyzed, the precious metals group has the highest returns with 35,65%, bonds and bills (FX) became the second fund group with the highest return with a ratio of 29.58%. Fund groups which have return loss are Bonds and Bills (TL) -%2,84, Fund Basket -%3,85, Index -%16, Stocks -%16,13, State contribution -%7,46, Flexible (AES) -%0,28 . in total, the total net asset value and annual return are positive. The figure 21 shows the annual changes in the net asset values of the fund groups between 2004 and 2016. As seen in the figure, within the time interval, the standard

fund group was able to maintain the amount of change in a stable manner, and government bonds and bonds (TL) funds could not maintain the amount of change after 2012 and the flexible fund group increased the amount of change and achieved the highest net asset change. In this case, the decision to include balanced and international funds in flexible funds in 2013 has a great effect. In the last three years, the amount of government bonds and bonds funds (FX) has increased significantly. The precious metals fund, which was able to operate for 4 years until 2016, increased the change in net asset value every year.

Table 15: Total Net Asset Values and Average Returns of Fund Groups in Individual Retirement System in Turkey

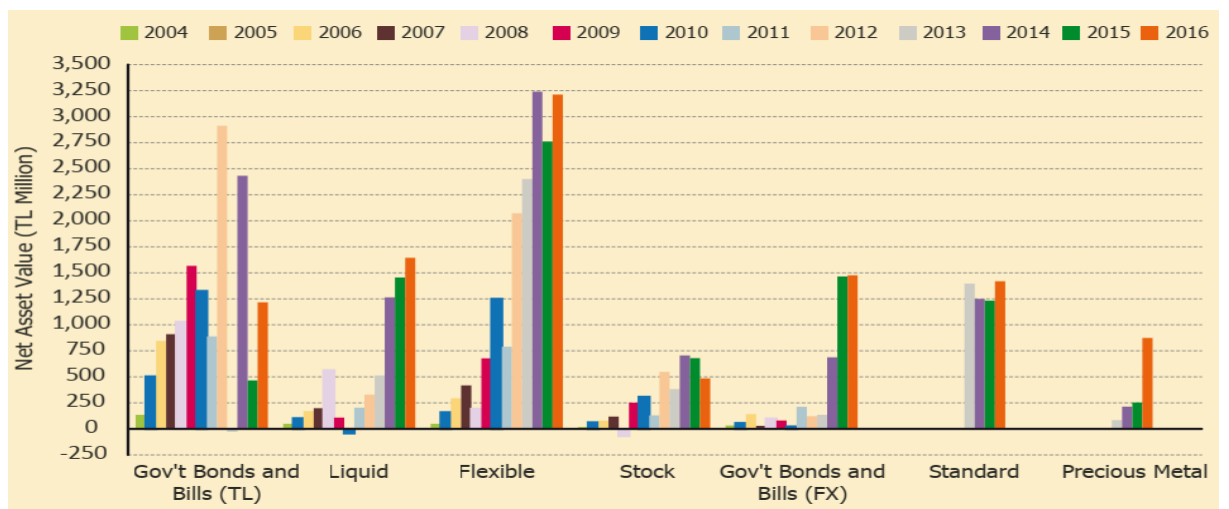
	Number of Funds	Net Asset Value (TL)		Change (%)	The Share of Fund Group Net Asset Value in the Total	Annual Returns of 2016
Fund Group	31.12.2016	31.12.2015	31.12.2016	2016/2015	31.12.2016 (%)	(%)
Gov. Bonds and Bills (TL)	29	12,988,901,813	14,205,419,673	9.37	26.66	8.31
Flexible	88	14,312,739,948	17,524,369,617	22.44	32.89	11.26
Liquid	23	4,921,273,721	6,565,622,056	33.41	12.32	9.42
Stocks	29	3,217,354,509	3,703,810,913	15.12	6.95	12.07
Standard	24	3,878,519,049	5,297,899,591	36.60	9.94	8.50
Gov. Bonds and Bills (FX)	23	3,088,339,367	4,565,447,083	47.83	8.57	16.95
Precious Metals	12	552,056,716	1,425,462,888	158.21	2.68	29.18
Total	228	42,959,185,123	53,288,031,822	24.04	100	10.79

Source: Pension Monitoring Center, “Individual Pension System Progress Report 2016”, 3 July 2017, (Online) https://www.egm.org.tr/bes2016gr/English/IPS%20Progress%20Report%202016/E-Book/files/downloads/IPS2016_EN.pdf, 10 November 2018, p. 68.

Table 16: General Appearance of Types of Pension Mutual Funds in Turkey

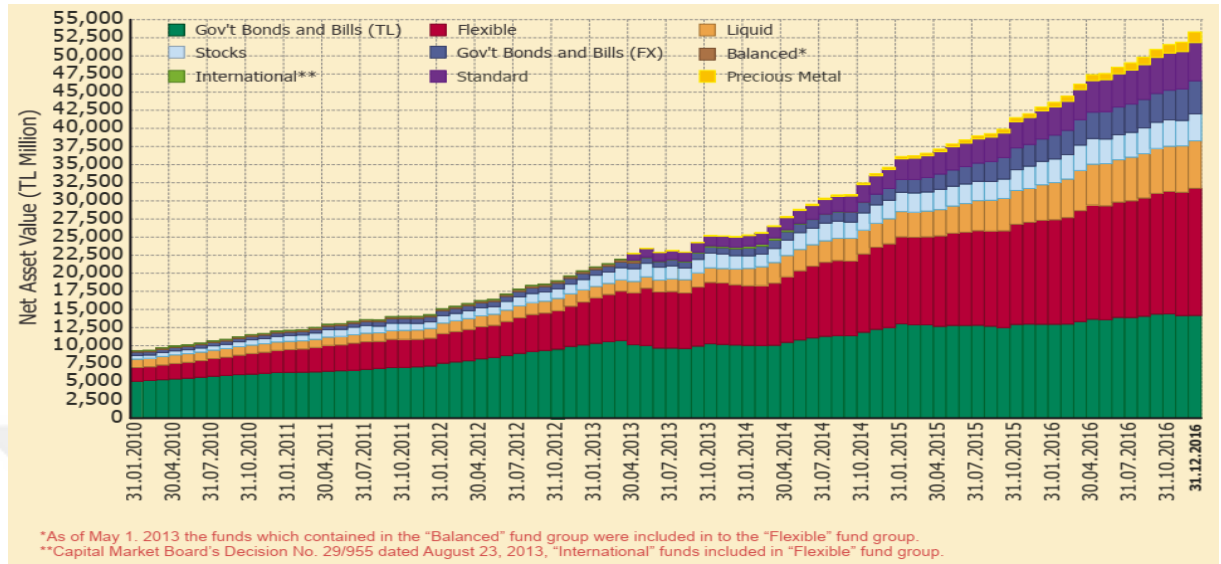
	Number of Funds	Total Net Asset Value (Million TL)		Rate of Change (%)	The Proportion of Fund Group Net Asset value in the Total (%)	Annual Return of 2018
Fund Group	31.10.2018	31.12.2017	31.10.2018	2018 / 2017	31.10.2018	(%)
Bonds and Bills (TL)	25	13,976	11,570	-17.21	13	-2.84
Bonds and Bills (FX)	22	7,273	10,408	43.11	11.69	29.58
Bonds and Bills (PS)	3	463	562	21.44	0.63	11.07
Liquid	21	7,405	8,944	20.77	10.05	13.63
Standard	26	6,584	6,702	1.79	7.53	2.55
Flexible	87	21,988	23,030	4.74	25.87	6.14
Composite	7	1,381	1,804	30.62	2.03	16.93
Fund Basket	2	18	19	1.7	0.02	-3.85
Index	3	558	460	-17.69	0.52	-16
Precious Metals	14	3,289	6,997	112.72	7.86	35.65
Stocks	27	4,469	4,075	-8.81	4.58	-16.13
State Contribution	27	9,781	10,349	5.81	11.63	-7.46
Initial	28	1,789	991	-44.61	1.11	12.68
Flexible (AES)	86	0	70	0	0.08	-0.28
Standard (AES)	28	0	3,028	0	3.4	8.89
TOTAL	406	78,976	89,010	12.7	100	7.37

Source: Pension Monitoring Center, Fund Group Sizes and Average Returns , (Online) <https://www.egm.org.tr/data-center/statistics/ips-statistics/fund-group-sizes-and-average-returns/>, 12 November 2018

Figure 21: Change of Net Asset Values of Fund Groups by Years (Increases and Decreases in Annual) in Individual Retirement System in Turkey

Source: Pension Monitoring Center, “Individual Pension System Progress Report 2016”, 3 July 2017, (Online) https://www.egm.org.tr/bes2016gr/English/IPS%20Progress%20Report%202016/E-Book/files/downloads/IPS2016_EN.pdf, 10 November 2018, p. 68.

Figure 22: Variation of Pension Mutual Funds' Net Asset Values in Turkey

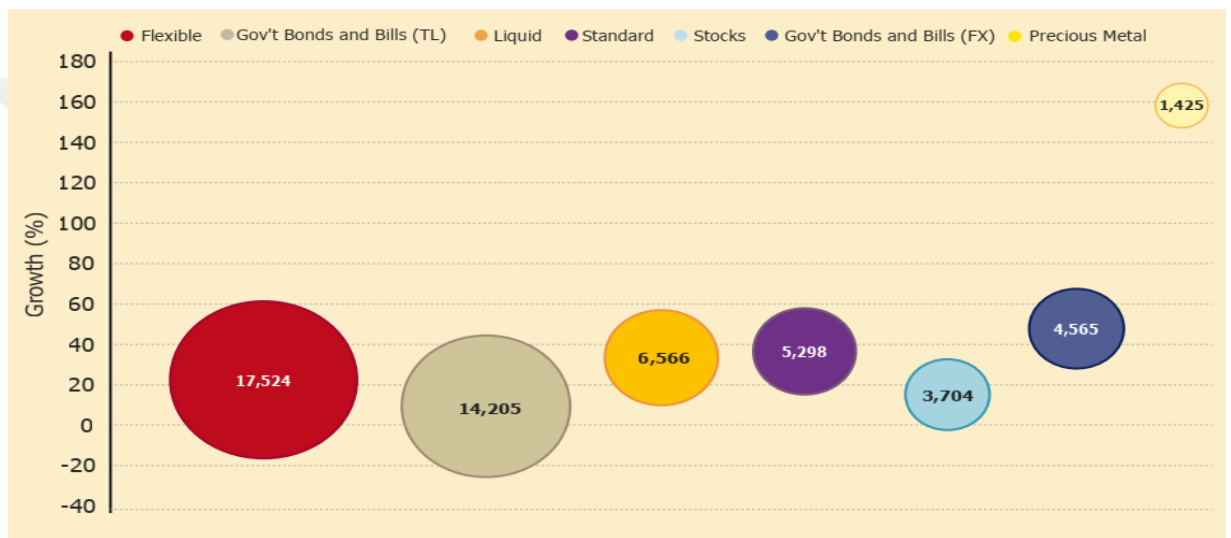


Source: Pension Monitoring Center, “Individual Pension System Progress Report 2016”, 3 July 2017, (Online) https://www.egm.org.tr/bes2016gr/English/IPS%20Progress%20Report%202016/E-Book/files/downloads/IPS2016_EN.pdf, 10 November 2018, p. 65.

When the figure 22 is analyzed, the highest increase in net asset value is seen in the flexible fund group. Cause of this situation is that Flexible Funds are not subject to any financial assets restriction. Thus, the combination of financial assets that participants will invest in through Private Pension Mutual Funds, and the possibility of gaining more risk with more risk. Due to fact that the decision taken by Capital Markets Board of Turkey on March 13, 2013, new financial assets that private pension funds can invest are added, Capital Markets Board of Turkey's 23.08.2013 dated and 29/955 numbered decision has been made to regulate the types of private pension mutual funds. Therefore, Balanced and International funds were included in flexible funds and the net asset value of flexible funds increased enormously. Standard funds are second in terms of increase amount. Looking at the figure 23, as of 2016, it is seen that government bonds and bills funds have the highest net asset value after flexible funds. Considering the net asset value growth rates, it is seen that the precious metal fund group has the highest growth rate. Fund groups other than precious metal funds have close growth rates. The figure 24 shows the asset allocation of the flexible fund group in 2016, which has the largest net asset value among the pension mutual fund groups.

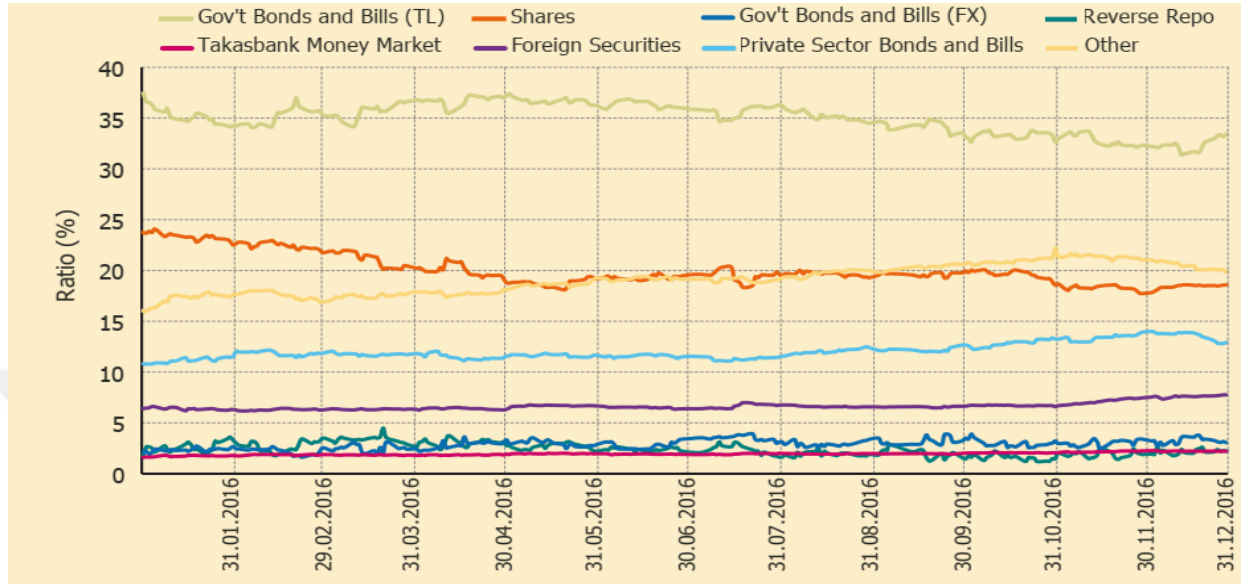
Government bonds and bills are the most invested assets in flexible investment funds, which are subject to less asset restriction than other fund groups. The stocks are the second most invested investment. It is important that government bonds and bills are the most invested assets even in flexible funds with the least asset restrictions and with the highest net asset value.

Figure 23: Net Asset Value of Pension Mutual Funds according to Fund Groups and Their Growth Rate in Turkey in 2016



Source: Pension Monitoring Center, “Individual Pension System Progress Report 2016”, 3 July 2017, (Online) https://www.egm.org.tr/bes2016gr/English/IPS%20Progress%20Report%202016/E-Book/files/downloads/IPS2016_EN.pdf, 10 November 2018, p. 65.

Figure 24: Asset Allocation of Flexible Funds in Individual Retirement System in Turkey



Source: Pension Monitoring Center, “Individual Pension System Progress Report 2016”, 3 July 2017, (Online) https://www.egm.org.tr/bes2016gr/English/IPS%20Progress%20Report%202016/E-Book/files/downloads/IPS2016_EN.pdf, 10 November 2018, p. 66.

1.4.4 Portfolio Distribution Private Pension Plans of in Turkey

Many assets are bought by collected private pension funds. The returns of the funds are determined by the returns from the assets and these returns determine the earnings of the private pension plan participants. At the same time, portfolio distributions are very important financially. The assets in which the portfolio distribution is concentrated have financial consequences and thus affect the economy in terms of macroeconomic aspects.

Table 17: Portfolio Distribution of All Private Pension Plans in Turkey (June 2018)

S (%)	TB (%)	RR (%)	MM (%)	FS (%)	CB (%)	TD (%)	Other (%)
12,84	35,26	3,37	3,01	12,87	13,44	12,74	6,47
S % : Proportion of Stocks in the Portfolio							
TB % : Proportion of T-Bills & Gov. Bonds in the Portfolio							
CB % : Proportion of Corporate Bonds in the Portfolio							
RR % : Proportion of Reverse Repo in the Portfolio							
FS % : Proportion of Foreign Securities in the Portfolio							
MM % : Proportion of Money Market Instruments in the Portfolio							
TD % : Proportion of Time Deposit in the Portfolio							

Source: Capital Markets Board of Turkey, “Monthly Statistical Bulletin”, September 2018, (Online), <http://spk.gov.tr/SiteApps/Yayin/AylikIstatistikBulteniDosya/149>, 10 October 2018

When analyzed in Table 17, it is seen that private pension funds are mostly concentrated on the purchase of treasury bills and government bonds. After, corporate bonds, foreign securities and stocks follow it respectively. As it can be seen, while private pension funds are mostly used for public finance and provides a significant flow of funds to foreign securities and time deposits, the capital markets cannot benefit from these funds adequately. However, the Capital Markets directs funds to more productive areas than the public sector, provides funds at a lower cost to the people in need of funds compared to the banking sector and does not cause capital outflows in contrast to foreign securities.

1.4.5 Private Pension Plans in Turkey and Other Countries

Comparing Individual Retirement Systems in Turkey and in other countries, the total volume of private pension funds of the countries and the ratio of their private pension funds to GDP and total private pension funds are needed to be analyzed. At the same time, years in which individual retirement system in countries set up, should be examined.

Table 18: The Volume of Private Pension Funds in Oecd Countries in 2016

Country	Million USD	Share in Total (%)	Country	Million USD	Share in Total (%)
Australia	1,483,720.16	5.98	Netherlands	1,335,227.42	5.38
Austria	21,980.46	0.089	New Zealand	45,109.44	0.18
Belgium	30,612.23	0.12	Norway	36,898.97	0.15
Canada	1,289,361.73	5.19	Poland	36,930.22	0.15
Czech Rep.	15,683.88	0.06	Portugal	19,467.16	0.08
Denmark	138,345.17	0.56	Slovak Rep.	9,522.57	0.04
Finland	116,075.32	0.47	Spain	112,021.35	0.45
France	14,757.40	0.06	Sweden	20,129.00	0.08
Germany	223,905.60	0.9	Switzerland	808,631.83	3.26
Greece	1,254.12	0.005	Turkey	35,216.58	0.14
Hungary	5,105.46	0.02	UK	2,273,713.46	9.16
Iceland	30,524.31	0.12	USA	14,877,121.00	59.94
Ireland	112,224.76	0.45	Chile	174,479.80	0.7
Italy	130,334.20	0.52	Estonia	3,263.81	0.01
Japan	967,680.19	3.9	Israel	175,958.33	0.71
South Korea	122,620.26	0.49	Latvia	402.76	0.001
Luxembourg	1,659.00	0.0067	Slovenia	2,436.37	0.01
Mexico	145,819.63	0.59	Lithuania	2,713.30	0.011

Source: OECD, Pension Funds' Assets, (Online) <https://data.oecd.org/pension/pension-funds-assets.htm>, 8 July 2018

When Table 18 is analyzed, the ratio of Australia's, Canada's, Iceland's, Netherlands's Switzerland's, UK's, USA's and Chile's private pension funds to GDP are quite higher than the ratio of Turkey's private pension funds (4.78%). On the other hand, as far as the total volume of the private pension funds in OECD countries are based on, it is generally seen Turkey to have % 0.14 of the total volume of private pension funds. The causes of the low level of private pension funds volume in Turkey is a failure to provide adequate funds accumulation, due to the late establishment of Individual Retirement System. USA is compared in detail with Turkey, due to having the dominant position of the total volume of private pension funds.

1.4.5.1 Types of Private Pension Plans in USA

Private Pension Plans which are generally invested in USA, are separated into two main groups as Defined Benefit Plans (DB) and Defined Contribution Plans (DC).

Moreover, IRAs, which are examined in DC plans, may also be added a third group. DB plans generally consist of Private Sector DB plans, State (and Local) Government DB plans and Federal DB plans. DC Plans divided as 401(k) plans, A 403(b) plan, 457 plans, Federal Thrifts Saving Plans and IRAs. IRAs are classified two main groups as Employer Sponsored IRAs and Non-Employer Sponsored IRAs.

401(k) plan is a DC plan that enables employees to determine contribution as a proportion of their salaries. DC plan postpones income taxes on the amounts of contribution. The collected amount is taxed after distribution, like Traditional IRAs. An employee is able to determine investment options in many 401(k) plans. A 403(b) plan is a pension plan having tax incentives and, established for employees of the public education sector. Tax-exempt and nonprofit organizations could set up A 403(b) plan. A 457 plan is pension plan having tax incentives and, established for employee of the public, municipality and nonprofit organization. Federal Thrifts Saving Plans established for public employees. The collected amount is taxed after distribution, like a 401(k) plan. “A tax-deferred or tax- free retirement account that allows contributions of a limited yearly sum. Congress initially designed IRAs to have two roles: (1) to give individuals not covered by a retirement plan at work a tax-advantaged retirement savings plan, and (2) to complement the employer-sponsored retirement system by preserving rollover assets at job separation or retirement (Investment Company Institute, December 2017: 33).”

Employer Sponsored IRAs contains two different plans. These retirement plans are SEP IRA (simplified employee pension) and SIMPLE IRA (savings incentive match plan for employees). SEP IRA is an employer contributes to a pension plan for own employees. A salary reduction SEP (or SAR-SEP) IRA is a pension plan that an employee contributes to IRAs together with employer. SIMPLE IRA (savings incentive match plan for employees) is a pension plan having tax-incentive that employers having small scale are established for employees. It be able to contribute by an employee and an employer with together in a SIMPLE IRA plan. (Investment Company Institute, December 2017: 33). Non-Employer Sponsored IRAs consist of Traditional IRAs and Roth IRAs. Traditional IRAs is a pension plan that an employee contributes to IRAs. It may be tax-deductible. “Among the benefits of traditional IRAs,

two are (1) pre-tax contributions, which provide larger bases for accumulating investment earnings and, thus, provide larger account balances at retirement than if the money had been placed in taxable accounts; and (2) taxes are paid when funds are distributed. Since income tax rates in retirement are often lower than during working life, traditional IRA holders are likely to pay less in taxes when contributions are withdrawn than when the income was earned (Topoleski, 2016: 7).” The main differences from Traditional IRAs and Roth IRAs are that contributions of Roth IRAs are received after taxation and qualified distributions do not contain in taxable income. Therefore, investment earnings increase free of taxes.

1.4.5.2 Portfolio Distribution Private Pension Plans and Private Pension Assets by Types of Private Pension Plans

In many countries, different pension plans are invested in different ratios of assets. Undoubtedly, The most important reasons for the different pension plans among the countries and the investment of the same assets through these pension plans are the preferences of the individuals in the country, the legal regulations made by the state and the return of assets.

Table 19: Private Pension Assets by Types of Private Pension Plans in USA in 2016

	IRAs	DC plans	Private-sector DB plans	State and local government DB plans	Federal DB plans	Other	Total
Share (%)	31.9	27.11	11.5	15.06	6.3	8.13	100

Source: Investment Company Institute, “The US Retirement Market Second Quarter 2018”, (Online) https://www.ici.org/info/ret_18_q2_data.xls, 10 September 2018

Table 20: IRA Assets by Types of IRA in USA in 2016

	Traditional IRAs	SEP and SAR-SEP IRAs	Roth IRAs	SIMPLE IRAs
Share (%)	85	5	9	1

Source: Investment Company Institute, “The US Retirement Market Second Quarter 2018”, (Online) https://www.ici.org/info/ret_18_q2_data.xls, 10 September 2018

Table 19 shows the percentage weights of pension plans in the total pension fund volume in the United States of America. When the results in the table are analyzed, it

is seen that the IRAs which is in the DC and (Normal) DC plans is weighted and then the DB plans are coming. DB plans are mainly seen in Private Sector DB plans, State and Local government DB plans, and Federal DB plans. Compared with Turkey, in the main distinction, there is a wide variety of private pension plans in the United States. The results in Table 20 show that Traditional IRAs have the highest proportion of funds collected in IRAs. Following the Traditional IRAs, Roth IRAs come with 9% of the fund size. Employer Sponsored IRAs represent a very small minority. This shows that the Employer-Sponsored IRAs are not sufficiently developed. Nonetheless, non- Employer Sponsored IRA types accounted for 94% of the total IRA's fund size.

Table 21: Defined Contribution Plan Assets by Type of Plan in USA in 2016

	Other private-sector				
	401(k) plans	DC plans	403(b) plans	TSP	457 plans
Share (%)	68.13	7.27	13.3	7.2	4.1

Source: Investment Company Institute, “The US Retirement Market Second Quarter 2018”, (Online) https://www.ici.org/info/ret_18_q2_data.xls, 10 September 2018

Table 22: Portfolio Distribution of Private Pension Plans in 2016 in USA

	Cash and Deposits	Bills and bonds issued by public sector	Bills and bonds issued by private sector	Loans	Shares	Land and Buildings	Mutual funds (CIS)	Unallocated insurance contracts	Other investments	Total
Share(%)	2.8	12.94	10.78	1.26	31.22	0.7	32.7	2.6	5	100

Source: OECD, “Pension Markets in Focus No.14”, 2017, (Online) <http://www.oecd.org/pensions/private-pensions/Pension-Markets-in-Focus-2017.xlsx>, 24 September 2018

When we look at Table 21, it is seen that 401 (k) plans are weighted in terms of the total fund size. Then it is seen that 403 (b) plans come as a percentage. As it is seen, the majority of the funds collected in the Defined Contribution plans are concentrated in 401 (k) plans. One of the private pension plans of comparison criteria in Turkey and USA is the distribution of these funds portfolio. The portfolio distribution of pension funds is important both for the return of individual pension schemes and for influencing the macroeconomic balances of countries through invested assets. Since the assets invested by pension funds are generally long-term funds, they are important

funds in terms of the long-term borrowable fund requirement necessary for the country's growth. When analyzed in Table 22, funds collected in private pension plans are distributed among mutual funds, shares, public sector bonds and private sector bonds. Public sector financing is very low weight compared with Turkey.

Table 23: DC Plan Holdings of Mutual Funds by Type of Fund in USA in 2016

	Domestic equity	World equity	Hybrid	Bond	Money market
Share (%)	46	13	26	11	3

Source: Investment Company Institute, “The US Retirement Market Second Quarter 2018”, (Online) https://www.ici.org/info/ret_18_q2_data.xls, 10 September 2018

Table 24: IRA Holdings of Mutual Funds by Type of Fund in USA in 2016

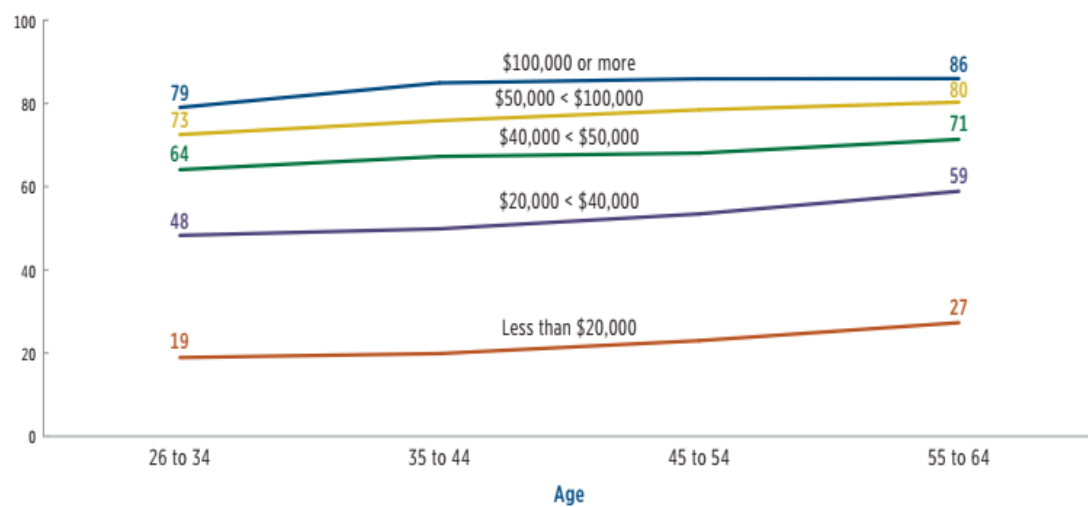
	Domestic equity	World equity	Hybrid	Bond	Money market
Share(%)	42	12	22	17	7

Source: Investment Company Institute, “The US Retirement Market Second Quarter 2018”, (Online) https://www.ici.org/info/ret_18_q2_data.xls, 10 September 2018

When the portfolio distribution of mutual funds invested in the defined benefit contribution plans in Table 23 is analyzed, it is observed that these funds invest heavily in domestic equity. Within the assets invested, the ratio of bonds is only 11%. When portfolio distribution of mutual funds of IRAs in Table 24 is analyzed, it is seen that most of mutual funds are invested in domestic equity. As a result, when the portfolio distribution of private pension funds is analyzed, In contrast to Turkey, It is observed that pension funds are concentrated on investing domestic equity instead of public financing. The figure 25 shows data on participation of workers in pension plans according to age and income level. As the data in the figure, age and income level increase, the participation of workers in pension plans is increasing. When the highest income level and age range is reached, participation in pension plans reaches the maximum level. The figure 26 shows the participation rate of workers in retirement plans according to age and income level in 2013. When the workers with the lowest income level, both age and income level, are excluded, the rate of non-participation in

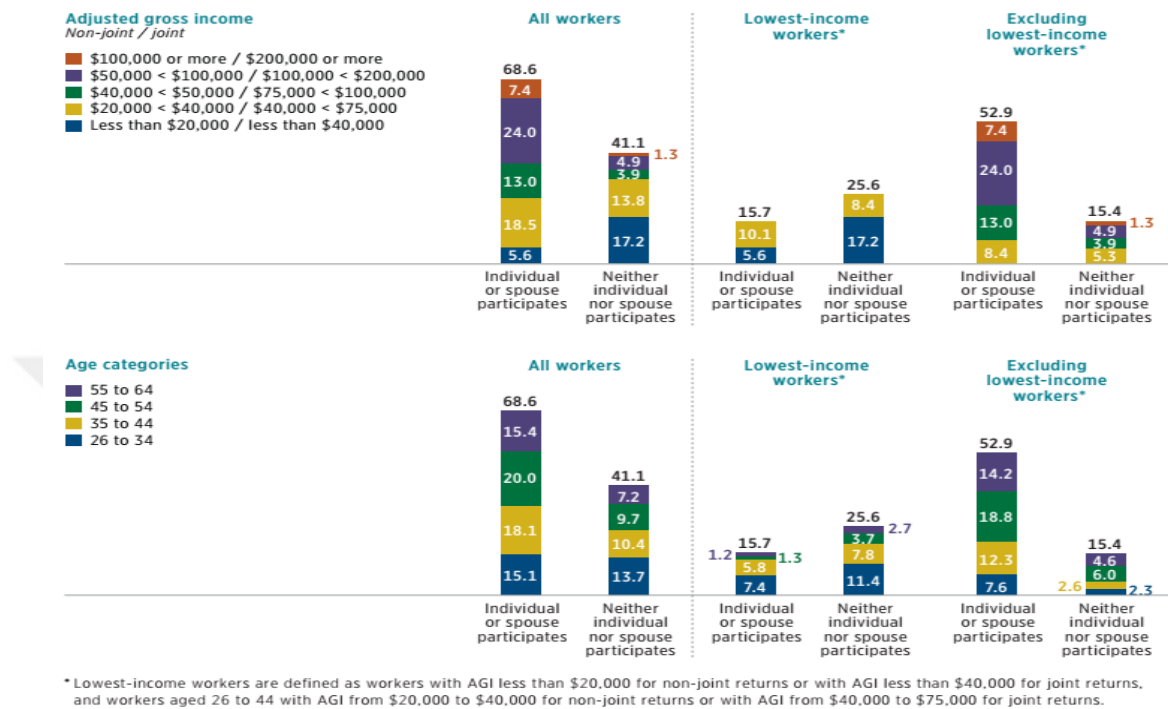
retirement plans falls considerably. This shows that workers with the lowest income level have a tendency not to participate in high-level pension plans.

Figure 25: Percentage of Workers Paying Tax Aged 26 to 64 with a Form W-2 who are Active Participants in a Pension Plan by Age and Wage and Salary Income in USA in 2013



Source: Investment Company Institute, “Who Participates in Retirement Plans”, **ICI Research Perspective**, July 2017, (Online) <https://www.ici.org/pdf/per23-05.pdf>, 20 November 2018, p. 16.

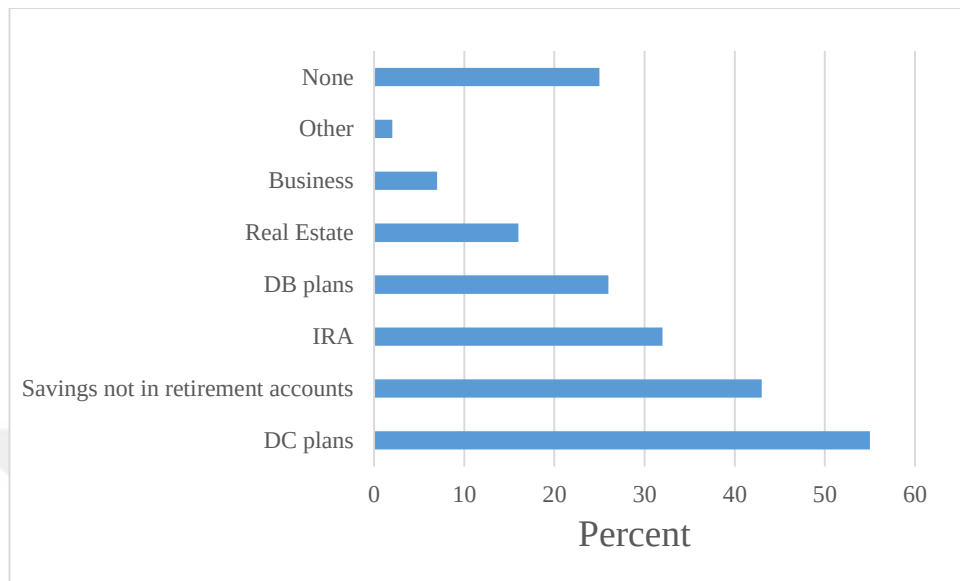
Figure 26: Millions of Worker Paying Tax Aged 26 to 64 with a Form W-2 by Age and Wage and Salary Income in USA in 2013



Source: Investment Company Institute, “Who Participates in Retirement Plans”, **ICI Research Perspective**, July 2017, (Online) <https://www.ici.org/pdf/per23-05.pdf>, 20 November 2018, p. 20.

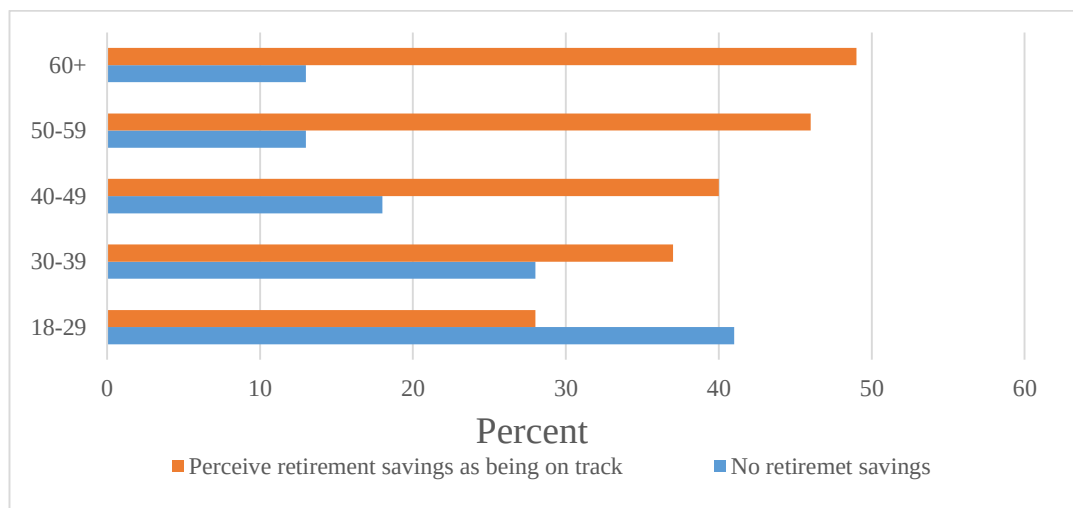
When figure 27, figure 28 and figure 29 formed by report named “Report on the Economic Well-Being of U.S. Households in 2017” prepared by the Federal Reserve, are examined, It is seen that the Americans are mostly evaluating their retirement savings on pension plans. The most common retirement plans are DC, IRAs, respectively. In the USA, it is low to have pension savings in the lower age group, whereas the proportion of people who do not have retirement savings decreases as the age group rises. The percentage of people who think positive about retirement savings increases as the age group increases. In the USA, the maximum number of people in all age groups is \$ 500,000 or more. The number of people with high retirement savings in all age groups is high. As the age increases, the proportion of people with higher retirement savings increases and the proportion of people with lower retirement savings increases as the age decreases.

Figure 27: Forms of Retirement Savings among Non-Retirees in USA in 2017



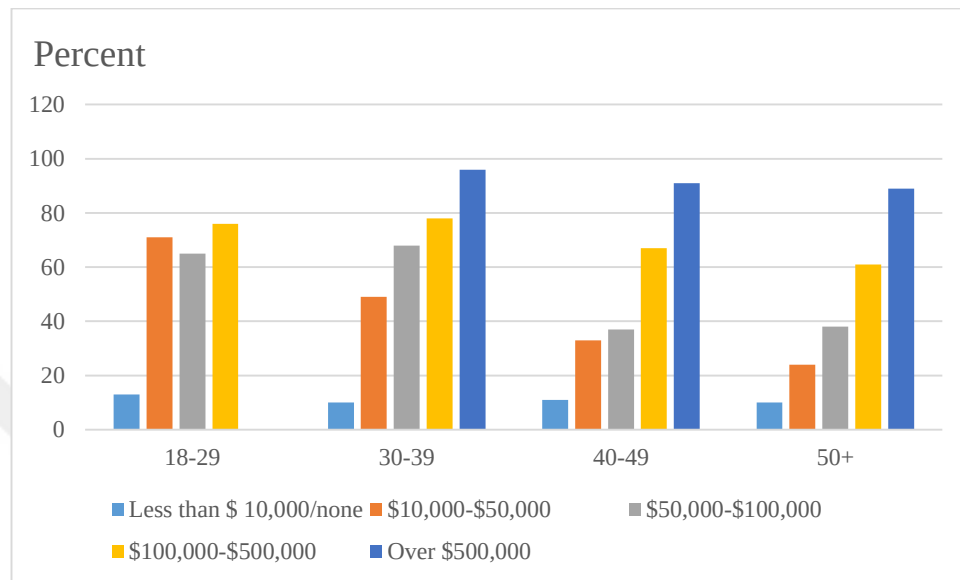
Source: Board of Governors of The Federal Reserve System, “Report on the Economic Well-Being of U.S. Households in 2017”, May 2018, (Online) <https://www.federalreserve.gov/publications/files/2017-report-economic-well-being-us-households-201805.pdf>, 28 October 2018, p.47.

Figure 28: Lack of Retirement Savings and Perception of Preparedness (by Age) in USA in 2017



Source: Board of Governors of The Federal Reserve System, “Report on the Economic Well-Being of U.S. Households in 2017”, May 2018, (Online) <https://www.federalreserve.gov/publications/files/2017-report-economic-well-being-us-households-201805.pdf>, 28 October 2018

Figure 29: Retirement Savings are on Track (by Age and Amount of Savings for Retirement) in USA in 2017

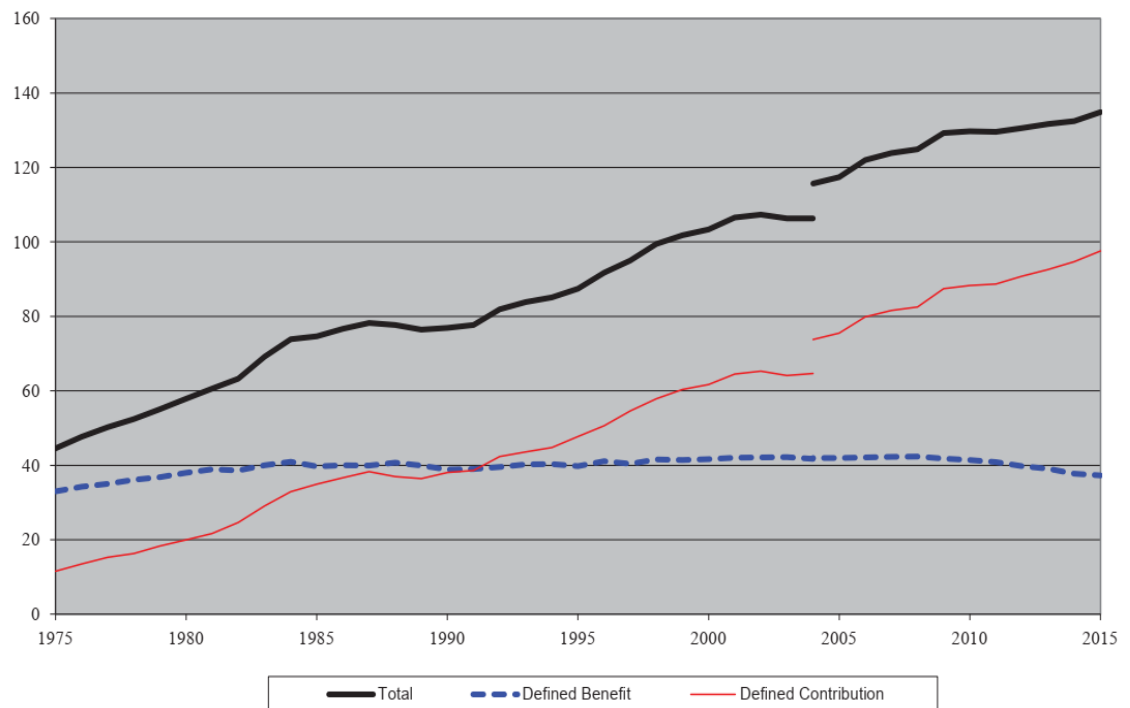


Source: Board of Governors of The Federal Reserve System, “Report on the Economic Well-Being of U.S. Households in 2017”, May 2018, (Online) <https://www.federalreserve.gov/publications/files/2017-report-economic-well-being-us-households-201805.pdf>, 28 October 2018, p. 48.

When figure 30 is analyzed, in 1975 and 2015, the number of people who participated in the pension plans in the USA has generally increased. When the number of participants is examined according to the pension plans, the number of people participating in the DB plans is generally at the same level, while the DC plans have increased continuously and have increased by 11 times the number of participants in 2015. Therefore, the reason for the continuous increase in the number of people participating in pension plans is the increase in DC plans. The figure 31 shows the contribution amounts of participants in pension plans between 1975 and 2015. The total amount of contributions has increased continuously. The reasons why DC plans have more participants than DB plans are that they have more retirement plan than DC plans and therefore DC plans offer more advantages to participants. In addition, the returns of DC plans are not certain, but the returns of the DB plans are constant. For this reason, some participants may prefer DC plans because they can have more returns than DB plans. Interpreting figure 30 on the basis of the pension plan, the DB plans

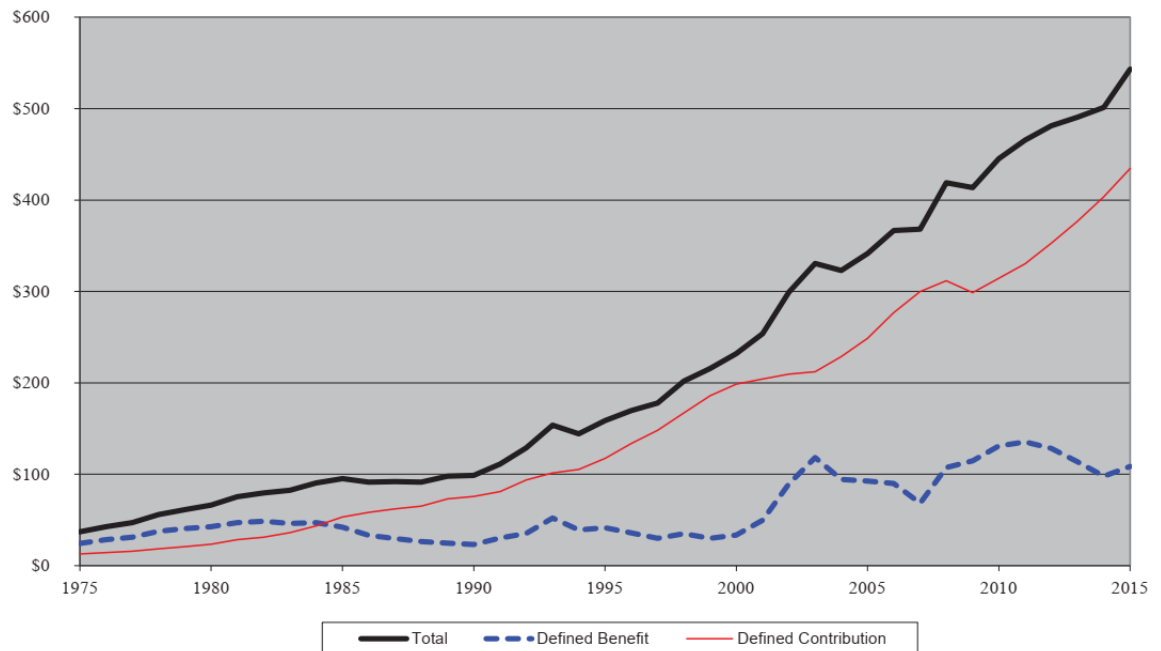
have not high increase as the DC plans. So, the DC plans are the most important factor in the increase in the total contribution amount.

Figure 30: Number of Participants in Pension Plans by Type of Plan in USA, 1975-2015 (numbers in millions)



Source: United States Department of Labor, “Private Pension Plan Bulletin Historical Tables and Graphs 1975-2015”, Version 1.0, February 2018, (Online) <https://www.dol.gov/sites/default/files/ebsa/researchers/statistics/retirement-bulletins/private-pension-plan-bulletin-historical-tables-and-graphs.pdf>, 11 November 2018, p. 6.

Figure 31: Pension Plan Contributions by Type of Plan in USA, 1975-2015

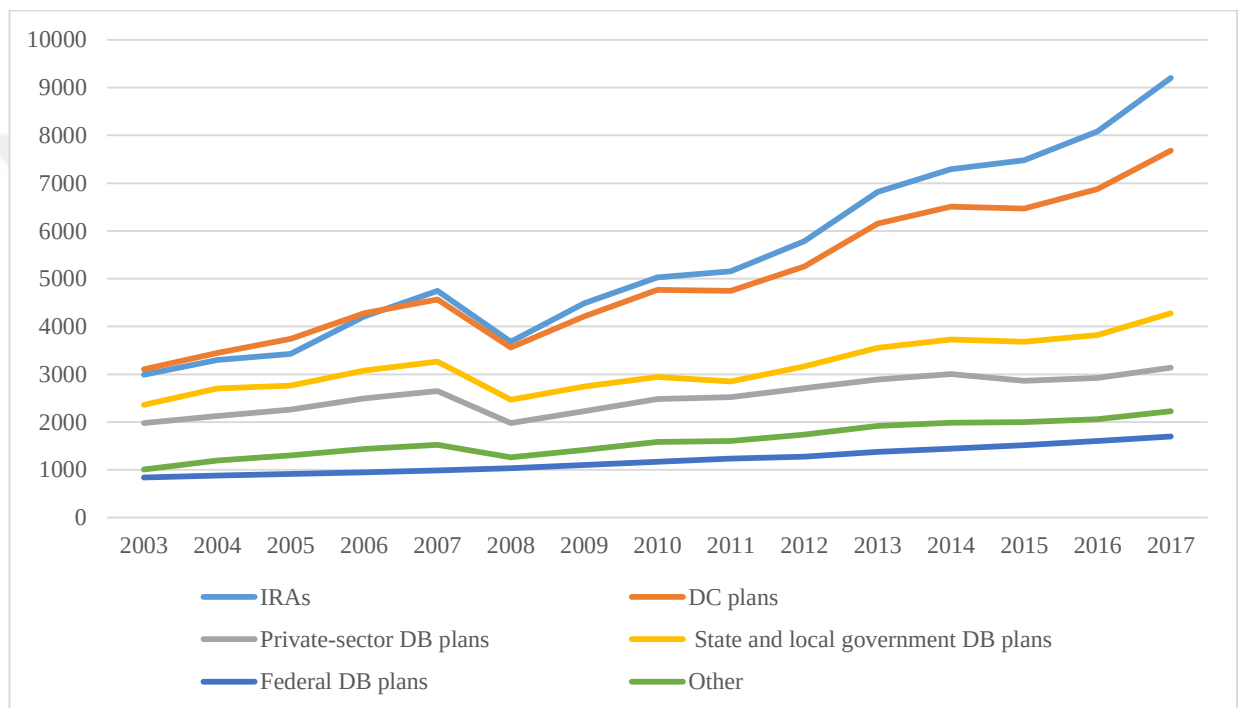


Source: United States Department of Labor, “Private Pension Plan Bulletin Historical Tables and Graphs 1975-2015”, Version 1.0, February 2018, (Online) <https://www.dol.gov/sites/default/files/ebsa/researchers/statistics/retirement-bulletins/private-pension-plan-bulletin-historical-tables-and-graphs.pdf>, 11 November 2018, p. 18.

When figure 32 is analyzed, the pension plan having the most assets is Individual Retirement Accounts (IRAs). The pension plan with the largest asset after IRAs is DC plans. DC plans are followed by DB plans. Considering the year-to-year changes in retirement plans, DC plans were more than the IRAs as retirement assets up to 2006, however, after 2006, IRAs were more than DC plans. As seen in the figure 33, among the defined contribution plans in the USA, 401 (k) plans have the most assets. The second DC plan with the most assets is the 403 (b) plans. Between 2003 and 2017, DC plans with the most assets did not change in ranking. In 2008, there were decreases in the total assets amount due to the decreases in the assets of all pension plans, and in the following years the amount of funds of DC plans increased. The most important factor in the decrease in the assets of the DC plans in 2008 is the negative effects created by the 2008 global crisis. In general, the year-to-year increases in the assets of the DC plans were observed. When the ratio of total pension assets to the financial assets of the household in figure 34 is analyzed, it is seen that the pension plans of the

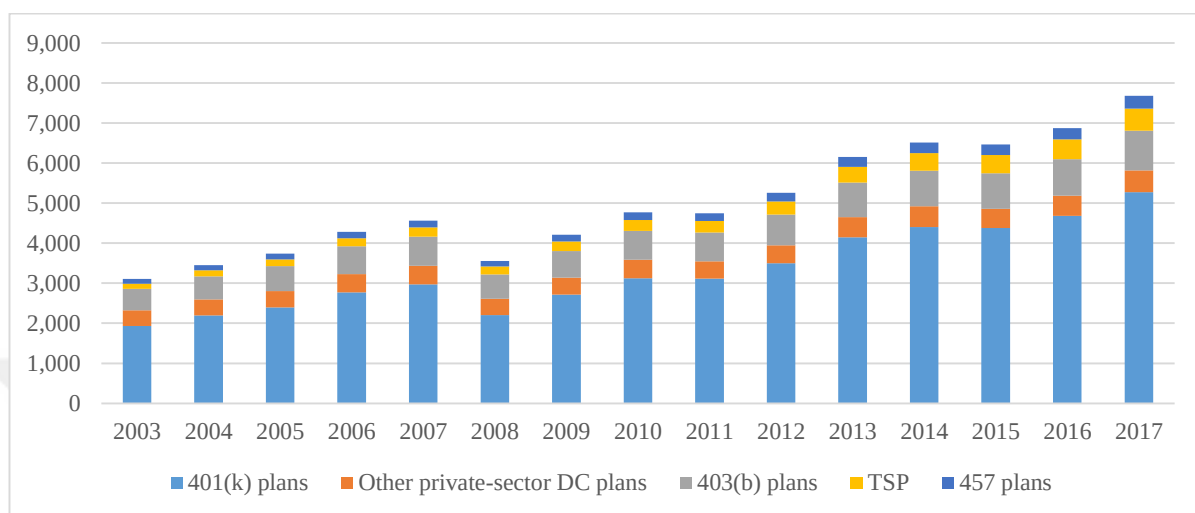
households in the financial assets are quite high. When analyzed on a year basis, the pension plan holding rate of households generally remained within a certain range. With the impact of the crisis in 2008, the pension plan holding rate of households has sharply declined and in the following years this rate has reached to a higher level than previous years.

Figure 32: USA Total Pension Assets (Billion Dollar)



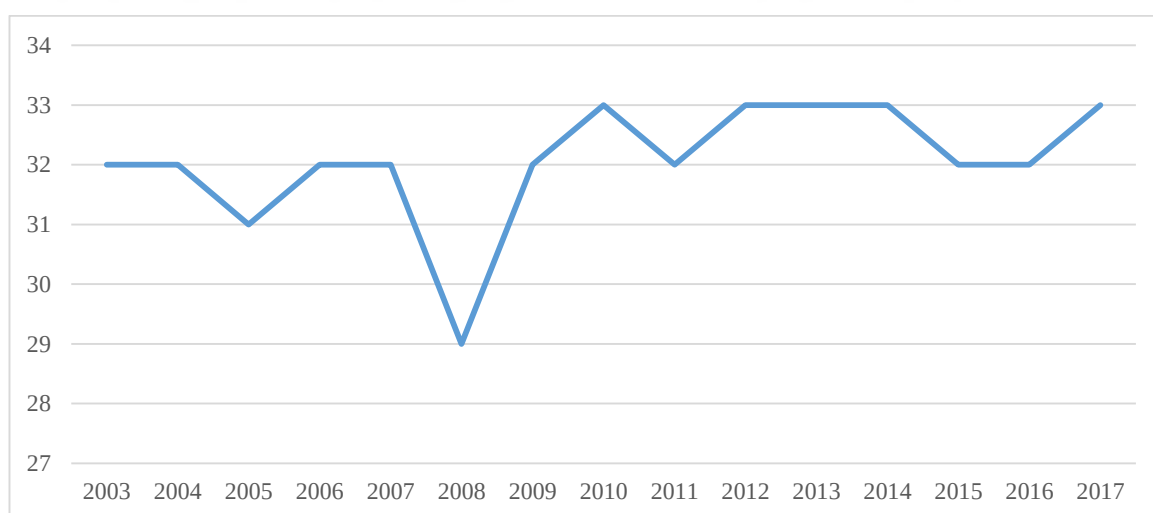
Source: Investment Company Institute, “The US Retirement Market Second Quarter 2018”, (Online)
https://www.ici.org/info/ret_18_q2_data.xls, 10 September 2018

Figure 33: Defined Contribution Plan Assets by Type of Plan in USA (Billion Dollar)



Source: Investment Company Institute, “The US Retirement Market Second Quarter 2018”, (Online)
https://www.ici.org/info/ret_18_q2_data.xls, 10 September 2018

Figure 34: Total Pension Assets' Share of Household Financial Assets in USA (%)



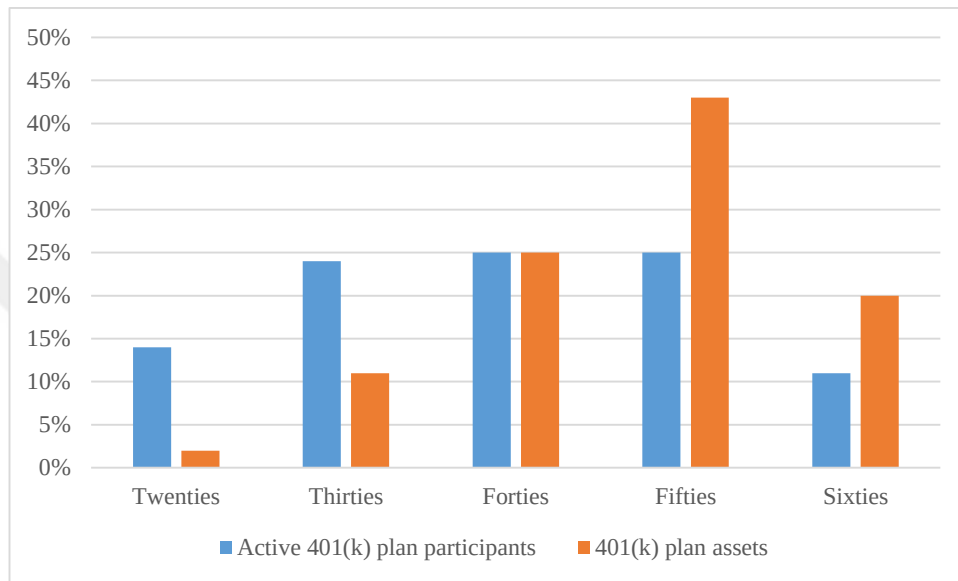
Source: Investment Company Institute, “The US Retirement Market Second Quarter 2018”, (Online)
https://www.ici.org/info/ret_18_q2_data.xls, 10 September 2018

Figure 35, figure 36, figure 37, figure 38 and figure 39 contain statistical data of 27.1 million 401 (k) participants in the publication of 401 (k) Plan Asset Allocation, Account Balances, and Loan Activity in 2016, ICI Research Perspective, which is the research publication of the Investment Company Institute (ICI). In figure 35, In 2016,

according to the number of assets and participants, 401 (k) pension plan was analyzed. In the 401 (k) plan, the maximum number of participants is 40s and 50s with 25%. Forties and Fifties are followed by thirties. When the distribution of the assets of the 401 (k) plan, according to age, is examined, it is seen that 50s has the highest asset with 43%. The 50s is followed by 40s with 25%. When the assets and the number of participants are examined together, the largest amount of assets per participant belongs to the 60s and then to the 50s. As a result, when the age distribution of the participants is examined, the majority of 401 (k) participants in the United States are over 40 years old. In addition, as the age increases, the assets of the participants increase. In figure 36, in 2016, the account balance of the participants in the 401 (k) plan was shown. The range in which the participants in the 401 (k) plan are most concentrated in percentage is the range of participants who has a balance less than \$ 10,000 with 41%. Then, the balance of account balance between \$ 10,000 and \$ 20,000 follow it with 12.1%. It is important that the balance of account balance greater than \$ 200,000 is the third largest segment among the participants with 10.5%. In general, the majority of participants in 401(k) plan have a low level of account balance. In the figure 37, account balance amounts of the 401 (k) plan according to the age groups in 2016 is shown as percentage. The age group with the highest percentage ratio among the participants with less than 10000 \$ balance is the 20s and 30s with the ratio of 27%. Age groups having account balance between \$ 40000 and \$ 50000 are 40s and 50s the with highest rates respectively. As a result, the balance of account increases as the age level increases. Figure 38 shows the account balance of the participants in the 401 (k) plan according to the contract period in 2016. In general, participants with short contract duration have a lower balance of account balance, while longer term participants have more account balance. In the figure 39, there are fund distribution rates of 401 (k) plan assets according to years. Among the 401 (k) funds, equity funds has highest percentage by years. Equity funds are followed by balanced funds. When fund types are analyzed according to the years, equity funds have close percentage levels in total 401 (k) funds, while company stock funds have decreased proportionally from year to year. Balanced funds have increased the ratio by approximately twice. As a result, in asset allocation of 401 (k) plans, funds containing private sector capital market instruments are predominant. Compared with private pension plans in Turkey, asset of

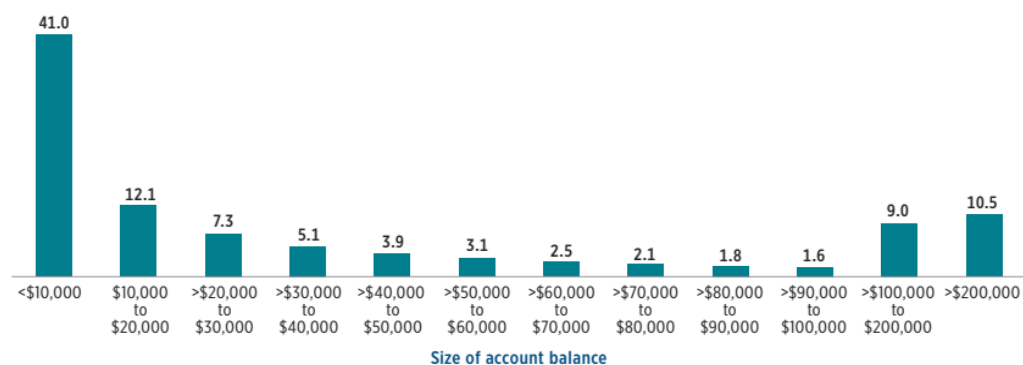
401 (k) plan concentrating on the capital markets tools rather than government debt instruments is important.

Figure 35: Percentage of Active 401(k) Plan Participants and 401(k) Plan Assets by Participant Age in USA in 2016



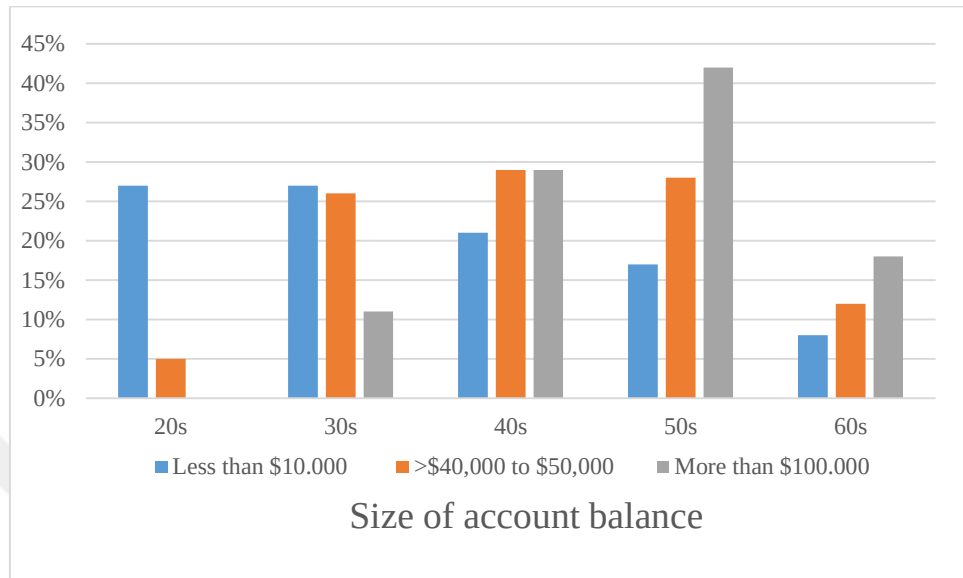
Source: Investment Company Institute, “401(k) Plan Asset Allocation, Account Balances, and Loan Activity in 2016”, **ICI Research Perspective**, September 2018 (Online) <https://www.ici.org/pdf/per24-06.pdf>, 20 November 2018, p. 8.

Figure 36: Percentage of Participants with Account Balances in 401(k) Plan in Specified Ranges in USA in 2016



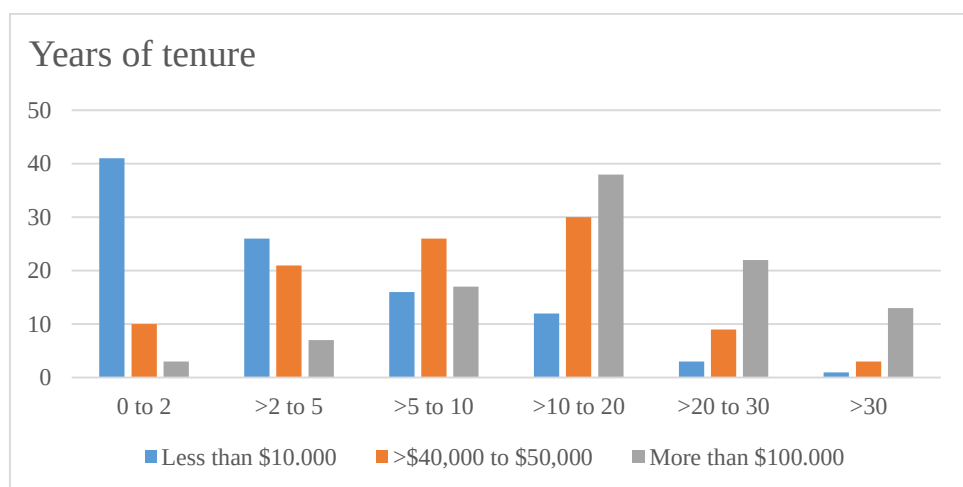
Source: Investment Company Institute, “401(k) Plan Asset Allocation, Account Balances, and Loan Activity in 2016”, **ICI Research Perspective**, September 2018 (Online) <https://www.ici.org/pdf/per24-06.pdf>, 20 November 2018, p. 13.

Figure 37: Percentage of Participants with Account Balances in 401(k) Plan in Specified Ranges by Participant Age in USA in 2016



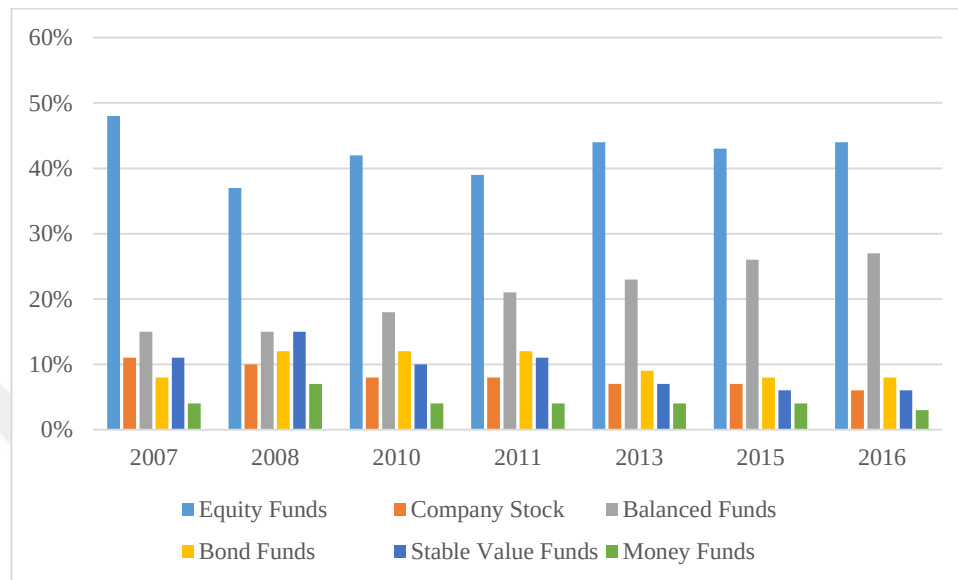
Source: Investment Company Institute, “401(k) Plan Asset Allocation, Account Balances, and Loan Activity in 2016”, **ICI Research Perspective**, September 2018 (Online) <https://www.ici.org/pdf/per24-06.pdf>, 20 November 2018, p.14.

Figure 38: Percentage of Participants with Account Balances in 401(k) Plan in Specified Ranges by Years of Tenure in USA in 2016



Source: Investment Company Institute, “401(k) Plan Asset Allocation, Account Balances, and Loan Activity in 2016”, **ICI Research Perspective**, September 2018 (Online) <https://www.ici.org/pdf/per24-06.pdf>, 20 November 2018, p. 15.

Figure 39: 401(k) Plan Asset Allocation (Percentage of Total Assets) in USA in Selected Years

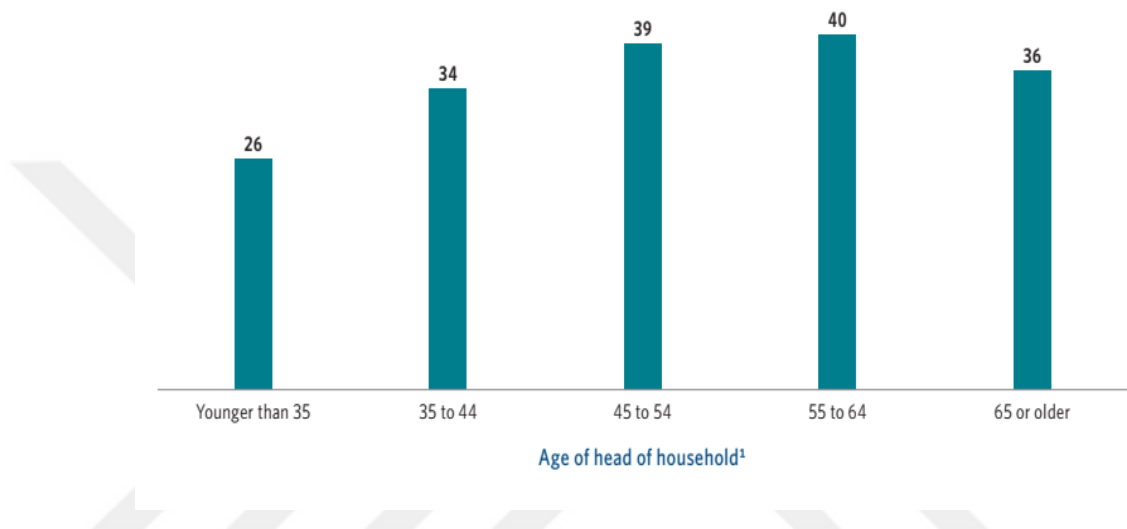


Source: Investment Company Institute, “401(k) Plan Asset Allocation, Account Balances, and Loan Activity in 2016”, **ICI Research Perspective**, September 2018 (Online) <https://www.ici.org/pdf/per24-06.pdf>, 20 November 2018, p. 20.

Figure 40, figure 41 and figure 42 contain statistical data on the retirement survey named “Ten Important Facts About IRAs” published by the Investment Company Institution (ICI). Figure 40 shows the percentage data for the distribution of IRAs ownership by age groups in 2017. Except for 65 years and older, the ratio of IRAs ownership of the household head increases as the age range increases. age range having highest IRAs ownership is age range between 55 and 64. When, in figure 41, the distribution of IRAs owners by income level is examined in 2017, Generally, the rate of IRAs ownership increases as income level increases and decreases as income level decreases. Income level between 100000\$ and 199000\$ reaches the highest level of IRAs ownership with %34. It is important that the rate of IRAs ownership with an income level \$ 200,000 and over has a relatively high ratio of 13% Compared distribution of participants according to income level in Turkey in figure 10, similar to Turkey, it is important to have a low participation of low-income families. The Figure 42 shows the fund distribution of traditional IRAs assets having highest asset in the IRAs in 2016. Traditional IRAs assets are distributed to Equity funds with 53%. Equity

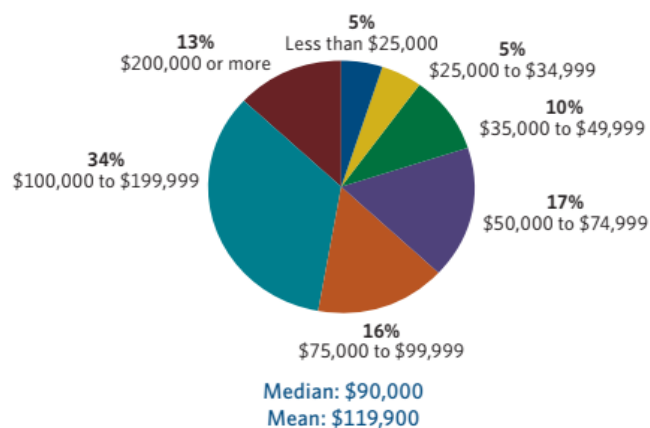
Funds are followed by bond funds with 17%. Compared with private pension plans in Turkey, asset of IRAs concentrating on the private sector capital markets tools is important.

Figure 40: Percentage of USA Households within Each Age Group that Own IRAs in 2017



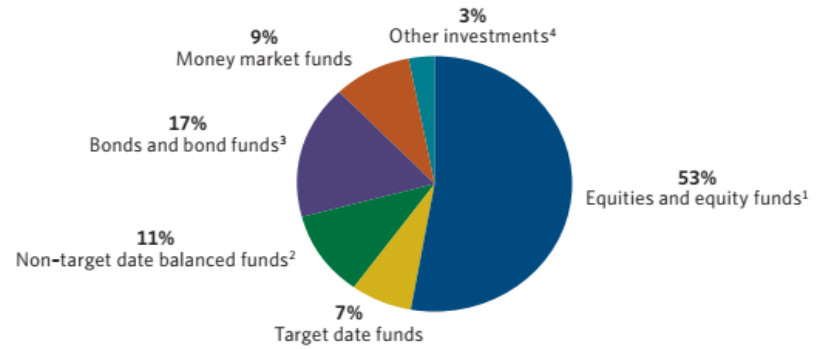
Source: Investment Company Institute, “Ten Important Facts About IRAs”, October 2018, (Online) www.ici.org/pdf/ten_facts_iras.pdf, 20 November 2018, p. 3.

Figure 41: Percent Distribution of Households Owning IRAs by Household Income in USA in 2017



Source: Investment Company Institute, “Ten Important Facts About IRAs”, October 2018, (Online) www.ici.org/pdf/ten_facts_iras.pdf, 20 November 2018, p. 4.

Figure 42: Percentage of Traditional IRA Balances in USA in 2016



Source: Investment Company Institute, “Ten Important Facts About IRAs”, October 2018, (Online) www.ici.org/pdf/ten_facts_iras.pdf, 20 November 2018, p. 6.

CHAPTER TWO

CAPITAL MARKETS AND SAVINGS IN TURKEY

2.1 Capital Markets

Capital markets are the markets that long term financial assets are bought or sold. Government and private sector lend or borrow long term funds by capital markets. Due to this function, capital markets are important macroeconomic equilibrium because it is necessity for long term investment and high growth, which are necessity for developing countries.

Capital markets are classified as primary market and secondary market. Primary market is defined that the market that lender can directly provide borrower. In contrast, secondary market is the market that lender can indirectly provide borrower and fund flows are realised among financial asset investors. By secondary market, financial asset investors convert their assets to money. In terms of macroeconomic framework, primary market is the most important market owing to directly providing savings for firms. But secondary market does not have this function.

With globalization, capital and labor mobility which accelerated and because of diversifying requirements this led to the development of new financial instruments. Thus, new capital market instruments have begun to be used by investors. Nowadays, they are examined under three main category as bonds, stocks and derivatives. Governments in many countries have budget deficits. Therefore, government bonds are issued for financing government budget deficits. Local governments or municipality also issues bonds. “Corporate borrowers issue bonds both to raise finance for major projects and to cover ongoing and operational expenses. “Corporate finance is a mixture of debt and equity, and a specific capital project will often be financed by a mixture of both (Choudhry, Joannas, Landuyt, Pereira and Pienaar, 2010: 46).”

Stocks enable that a share of stock in a firm gained ownership. Investors can return from stock in two ways, which are either the price of the stock increasing or the firm

paying dividends. Stocks are divided into two groups as common and preferred. Common stocks give an ownership right in a firm. Common stockholders have voting, dividends earnings. Common stock, usually defined type A, type B. Preferred stock is a structure of equity from a legal and tax framework. However, it has differences from common stock. First, preferred stockholders get a fixed profit share that does not change, so, preferred stock is as much similar to a bond. Second, because of the fixed dividend, the price of preferred stock is more stable. Third, preferred stockholders do not usually have voting rights in a firm. Finally, preferred stockholders own a claim on assets that has more priority than the claims of common shareholders. A derivative is an investment tool whose value is based on underlying assets. Financial derivatives are contracts that are written about financial assets. There are four instruments in the derivatives market: forward, futures, swap and options. A forward contract is a instrument agreed today for expiry at a point in the future. “A forward requires an exchange of an another asset for a asset. The price for the exchange is reached by an agreement when the contract is written. For all parties, a forward is compelled to realize the terms of the contract when it arrives maturity. Futures contracts are exchange-traded instruments and they are standardised contracts. this is the basic difference between future and forward contracts. That means each contract indicates the same quantity and sort of underlying asset. Futures are standardised contracts. But forwards are tailor-made. This means that they expire on set days of the year, and other is none. Secondly, futures are used to trade on an exchange. Thirdly, Future has clearinghouse, which gives guarantee the other party to everytransaction. Swap contracts are derivatives that exchange one set of currency for another. The most extensive swaps are interest rate swaps. They exchange fixed-interest rate payments for floating-rate payments. The basic definition of options contracts is well known. A call option entitles its holder to buy the underlying asset at a price and time specified in the contract terms, the price specified being known as the strike or exercise price, while a put option entitles its holder to sell the underlying asset (Choudhry, Joannas, Landuyt, Pereira and Pienaar, 2010: 9).”

2.2 Savings

2.2.1 Importance of Savings

Savings can be defined as the difference between current income and current consumption expenditures of an economic unit (whether it is a household, an enterprise, or a country). As it is known, national savings consists of the sum of private savings and public savings. Public savings are made up of the difference between publicly available income and return. Private sector savings consist of savings made by households and companies. Household savings are calculated by deducting household consumption expenditures from household disposable income in national income calculations. Company savings are the sum of the undistributed profits of businesses and the depreciation of fixed capital.

Savings are necessary to ensure an increase in capital goods. Investment is required for the increase in the physical capital stock. Investments are also fundamentally dependent on domestic savings. A low level of domestic savings is an important problem in some countries. Decreasing savings means increasing consumption, which means increasing national income. Governments attach importance to new investments, new capital goods, to sustain GDP growth and raise living standards.

Domestic investments in an economically closed economy can only be financed by domestic savings. A country that is financially liberalized can finance its investments with foreign financing. In this case, investments are more than savings. Thus, savings deficit takes a place. Low domestic saving rates mean that investments for a developing country are financed by more external financing, which creates significant risks for the sustainability of the growing economy.

If there is not enough money to finance the investment, foreign capital inflow is necessary. Foreign capital outflows cause the local currency to appreciate thus upset balance of payments. Due to this, the economies in the long term should cover their investments with domestic savings.

Developing countries with saving surplus have positive relationship between saving investment gap and economic growth and increase in saving-investment gap leads to

decrease in economic growth (Gocer, Akın and Alatas, 2016: 170). Thus, saving rates are important in developing countries. Because of the low savings, investments and the low production, this leads to insufficient employment. This inconvenient situation creates financial difficulties for countries to improve their economic performance.

2.2.2 Savings in Theory

Classical economists have assumed an important role in savings in the sustainability of economic growth and claimed that savings-investment equality will always be realized on the basis of the assumption that full employment exists in the economy. In Keynesian theory, savings are explained as the non-consumable part of the income and it is claimed that consumption will increase as household disposable income increases, but the increase in consumption will be smaller than the increase in income. Solow, who is neoclassical economists, based on the assumptions put forward in his model, stated that savings rates affected only economic growth in the short term, that stable growth was possible in full employment, one-time changes in the average saving rate did not lead to an acceleration of real output increases, and hence the implementations of policies aimed at increasing the saving rates of the state are not necessary and meaningful (Sancak and Demirci, 2012: 162,163).

Milton Friedman's permanent income hypothesis is important both as an alternative approach to Keynes's absolute income hypothesis, and as one of the fundamental theoretical foundations of the monetarist approach to explaining consumption and saving behavior. The permanent income hypothesis is based on a principle of inter-period optimization such as the relative income hypothesis. Because the permanent income is the main determinant of consumption (savings), the age structure of the population has a dominant role on the level of national consumption and savings. In addition, the human capital and wealth owned by the individual have a significant impact on the savings decision by determining the level of permanent income and development in time. Because it is assumed that there is no relationship between the permanent consumption of the individual and his temporary income, it is concluded that the individual makes a consumption flattening and that therefore continuous savings are a proportion of continuous income, the marginal and average saving

tendency are the same. One of the main inferences of the permanent income hypothesis regarding national income is that high growth rate will reduce savings. Another important deduction of the hypothesis related to national savings is that the reduction of the total consumption and saving behavior decreasing to depth of business cycle fluctuations. Accordingly, the average tendency to increase in the economic expansion periods and to decrease in the periods of economic contraction, consumption spending that is a variable moving in the opposite direction of the conjuncture, is to mean a stabilizer. Within the framework of this hypothesis, the income distribution and the age structure of the population will be an important determinant of the national level of savings, as they will affect the consumption behavior by changing the permanent income on an individual level (Çolak and Öztürkler, 2012: 4).

With the absolute income theory put up by Keynes, it claims that real consumption is a stable function of real income. In theory, it has been suggested that people often tend to increase their consumption as their income increases, but that the increase in consumption is lower than the increase in income (Özer, Akan and Çalmaşur, 2010: 233).

According to Pigou's real wealth effect, the change in the amount of real wealth directly affects the economic activity without changing the expenditures of individuals and the interest rate. Price changes affect the real value of the wealth of individuals and reduce the severity of the effect of price changes due to the reaction of individuals who want to maintain the real value of their wealth. According to the real wealth effect channel, consumption expenditures depend on income as well as wealth. Pigou acknowledges that consumption is a function of wealth, not disposable income. Real wealth consists of capital stock and real financial assets. The decrease in the general price level or the increase in the nominal amount of money will increase the real wealth and thus the expenditures of the individuals. On the contrary, the increase in the general level of prices decreases real wealth and consumption expenditures. The monetary policy, which increases the money supply and therefore increases the general level of prices, creates a real wealth effect and prevent that reducing the consumption expenditures and increasing the general level of prices. With the fall in prices, individuals who increase their real wealth will reduce their savings and increase their

consumption expenditures. This is called Pigou effect, wealth effect or real balance effect (Bakan and Akçacı, 2015: 70).

The second income-based contribution to savings theory is the relative income hypothesis of James S. Duesenberry. According to James Duesenberry, the consumption decision of a household is determined by the relative income, ie when compared to other households, rather than the absolute income or a standard of living that is the main determinant of absolute income. However, Duesenberry's main contribution to the theory of savings is that through this impact channel, income distribution is an important determinant of savings. Another important contribution of Duesenberry's relative income hypothesis is that the current level of consumption (and therefore the current level of savings) also depends on the previous consumption. According to this effect, the increase in consumption of income growth is greater than the effect of decreasing the consumption of income reduction. Thus, when income increases, savings are slower than consumption, whereas when income decreases, savings decrease faster than consumption (Çolak and Öztürkler, 2012: 3).

Irwing Fisher is the first economist to analyze the optimal distribution of consumption between periods, where there is no ambiguity and a consumer lives for two periods. The solution of the problem of optimum distribution of consumption in a two-period analysis also means the solution of the problem of how much savings will be in the first period. According to the optimization between periods, the savings level has two determinants: the first is the marginal utility of consumption in different periods and the second is the interest rate (Çolak and Öztürkler, 2012: 2).

Friedrich August von Hayek represents one of the first breaks in the mainstream economics literature. Hayek's main proposition is that it is difficult to achieve the optimal level of savings in a free market economy. Hayek's theory of savings is an important part of the conjuncture theory. Accordingly, the demand for consumer goods and investment goods cannot be increased at the same time under the assumption that production factors are in full employment. Therefore, less effort to save and consume more will be prevented by shifting resources from consumer goods to investment goods (forced savings). Compulsory savings are the real resources required for capital

goods investments that are encouraged by new bank loans (Çolak and Öztürkler, 2012: 3).

Robert Barro emphasized that high savings rates would increase the per-worker output level, which would increase the level of domestic investment and finally the growth rate. According to Barro, public and private savings are substitutes for each other. According to this hypothesis called Ricardian Equality, the decrease in public savings will be perceived by the private sector as a tax increase in the future and the private sector will save their increased income by tax deduction. On the other hand, according to McKinnon-Shaw Hypothesis, the increase in the interest rate affects the savings positively. Another variable affecting private savings is foreign trade levels. According to Harberger-Laursen-Metzler effect, improvement in trade levels leads to an increase in savings and positively affects the current account balance. Inflation, foreign savings, increase in productivity, financial variables affect private savings (Düzgün, 2009: 174).

Philippe Aghion and others emphasized that the impact of domestic savings on economic growth is positive in developing countries rather than in developed countries. Foreign technological developments need to be taken in order to achieve economic growth in underdeveloped and developing countries and therefore domestic savings are important. According to them, insufficient domestic savings will have a deterrent effect on joint investments between foreign investors and domestic investors. This will result in the increase in investments and economic growth at the desired level (Sancak and Demirci, 2012: 163).

One of the milestones of the development of the theory of savings is the lifelong income hypothesis by Franco Modigliani and his student Richard Brumberg. The hypothesis is based on the assumption, which excludes their income at that time, individuals make informed choices about how much they spend on each age (how much they save) under the constraint of lifelong revenues. This hypothesis represents a break from Keynes's absolute income hypothesis. On the other hand, the hypothesis can be seen as a generalization of Fisher's principle of life optimization. The hypothesis has three main consequences for national saving behavior. The first is that national

savings depend on the growth rate, not on the level of national income. The second is that the wealth level in the economy is one of the key determinants of the retirement time plan and thus the national savings. This second result means that the capital markets, in particular the wealth taxes, which is an important determinant of the social security system and the level of wealth in a country, determine the level of national savings and development and fluctuations in time. The third important consequence of the lifelong income hypothesis in terms of national savings is that the demographic structure of the population is another important factor determining national savings (Çolak and Öztürkler, 2012: 3).

The hypothesis developed by Robert E. Hall, which suggests that changes in consumption (changes in savings) and is independent of expected changes in income, is called the random walking hypothesis of consumption (saving) in the literature. The random walking hypothesis represents a break from both the adaptive expectations approach of the life-long income hypothesis and the permanent income hypothesis. Whereas the reason for this is that the expected income of the lifetime income and the permanent income hypothesis associates with the past income, the random walking hypothesis is the explanation of future expectations on the basis of rational behavior. This means that according to the random walking hypothesis of saving, the economic decision-makers correctly predict their future income and that they make their savings decisions based on this accurate income estimate. Therefore, there will be no change in the savings decisions unless there is an unexpected change in income. For economic decision-making units to change their savings decisions, there should be changes that they do not expect in their incomes. An unexpected change in income means an unexpected change in savings, meaning that savings are randomly walking (Çolak and Öztürkler, 2012: 3).

David Laibson based his studies on consumer preferences to explain the behavior of savings and analyzed how consumers have a hyperbolic reduction in their future income expectations that will affect their savings behavior. According to Laibson, if consumers have a hyperbolic reduction process related to their future income expectations, the optimal level of savings at the beginning of the period will always be below the optimal value at the end of the period. We can call this hypothesis the

“hyperbolic reduction hypothesis” for the determination of saving behavior. According to this hypothesis, the consumer always regrets his decision to save at the end of the term. To prevent this situation, the consumer chooses a “contracting instrument such as mortgage. This kind of commitment helps the consumer to realize the level of savings he desires at the end of the period (Çolak and Öztürkler, 2012: 6).

Junmin Wan tries to explain the behavior of saving with a model which is called “foam saving theory”. The main objective of this approach is to explain why countries such as the United States and Greece have low savings rates during the periods when foam prices in the housing prices have occurred and countries such as China and Japan have high savings rates. Wan concludes that a household with a speculative savings pattern can make lack or excessive savings, depending on distortion in financial markets and housing policies. Distortion is measured by variables such as human capital owned by households, expected increases in housing prices, prepayment rates of housing purchases and level of indebtedness. According to Wan's speculative saving hypothesis, the availability of access to financial markets and speculative saving motives lead to savings above or below the optimal savings level. According to this hypothesis, the increase in the indebtedness of households and foam of house price significantly, after taking into account the life-long savings hypothesis and other predicted hypotheses, increases the savings, especially in the cities and thus at the national level. In this context, we can associate this hypothesis with the Pigou effect and suggest that changes in the prices of the elements of the household wealth will affect the saving behavior depending on the households' saving motives (Çolak and Öztürkler, 2012: 7).

B.Yeager Leland's precautionary motive and saving hypothesis are based on the principle of inter-period optimization and the principle that consumption (and therefore savings) can be substituted between periods. The main proposition of the hypothesis is that increasing uncertainty about the future income will increase savings in the current period. Problems of financial markets are not sufficiently developed and access to financial investment tools, especially the insurance market is not fully operational and disruptions in the social security system lead individuals to save money with the precaution motive (Çolak and Öztürkler, 2012: 4).

2.3 Capital Markets In Turkey

For examining the condition of the capital markets in Turkey and touching upon the importance of pension funds for capital markets, it is needed to examine in detail the structural appearance of the financial sector and the weight of the capital markets in the financial sector, the market value of companies in stock markets and outstanding securities.

Table 25 shows the structural appearance of the finance sector in 2017. When the data in the table are analyzed, it is seen that the banking sector has a dominant position in the financial sector with a ratio of 68.54%. Capital markets sector, on the other hand, is seen to fall behind proportionally the banking sector. The share of pension funds in the total is as small as 1.67%. due to the low tendency to create long-term loanable funds and at the same time providing more costly loanable funds than the capital markets sector, The banking sector leads to a higher cost of private sector borrowing, lower level of investments and lower growth rates. Nevertheless, capital markets provide longer-term and lower-cost funding to private sector. For all these reasons, the share of capital markets in the financial sector should be increased for a better macroeconomic balance. When interpreted in terms of private pension funds, Increasing the share of individual pension funds in the financial sector is important both to increase the share of the capital markets sector in finance sector and to achieve a better macroeconomic balance through the creation of long-term and low-cost funds.

Table 25: Structural Appearance of Finance Sector in Turkey in 2017

	Share in Total (%)
Banks	68.54
Leasing Companies	1.22
Factoring Companies	0.92
Finance Companies	0.82
Insurance Companies	3.13
Pension Funds	1.67
Investment Trusts	0.01
Mutual Funds	1.14
Real Estate Investment Trusts	0.57
Reinsurance Companies	0.075
Bist100	18.52
Venture Capital Investment Trusts	0.055
Portfolio Management Companies	3.33
Total	100

Source: BRSA, Non-Bank Financial Institutions Data, (Online) <https://www.bddk.org.tr/BultenBdmk/en>, 20 November 2018, Insurance Association of Turkey, Balance Sheet Statistics, (Online) [https://www.tsb.org.tr/Document/istatistikler/Consolidated%20Balance%20Sheet%20of%20Insurance%20Companies%202018-1%20\(22100Quarter12018\).xlsx](https://www.tsb.org.tr/Document/istatistikler/Consolidated%20Balance%20Sheet%20of%20Insurance%20Companies%202018-1%20(22100Quarter12018).xlsx), 20 November 2018 and Insurance Association of Turkey: Balance Sheet Statistics, (Online) [https://www.tsb.org.tr/Document/istatistikler/Consolidated%20Balance%20Sheet%20of%20Reinsura%20Companies%202018-1%20\(22200Quarter12018\).xlsx](https://www.tsb.org.tr/Document/istatistikler/Consolidated%20Balance%20Sheet%20of%20Reinsura%20Companies%202018-1%20(22200Quarter12018).xlsx), 20 November 2018

Table 26: Outstanding Securities in Turkey

Year	Public Sector Securities		Private Sector Securities	
	Million TL	Share in Total (%)	Million TL	Share in Total (%)
2008	274,827.30	81.14	63,859.6	18.9
2009	330,004.58	82.38	70,576.8	17.6
2010	352,841.14	80.83	83,707.2	19.2
2011	368,778.43	78.02	103,898.2	22.0
2012	386,541.68	75.36	126,406.4	24.6
2013	403,006.95	76.48	142,702.3	23.5
2014	414,648.5	73.0	153,020.2	26.9
2015	440,124.0	74.0	154,567.5	26.0
2016	468,644.3	74.0	164,359.3	26.0
2017	535,447.6	74.0	183,152.8	26.0

Source: Capital Markets Board of Turkey, “Monthly Statistical Bulletin”, September 2018, (Online), <http://spk.gov.tr/SiteApps/Yayin/AylikIstatistikBulteniDosya/149>, 10 October 2018

When outstanding securities in Table 26 were analyzed, the share of public sector outstanding securities in total outstanding securities decreased from %81.14 in 2008 to %74 in 2017. At the same time, the share of public sector outstanding securities in GDP decreased from %27,63 in 2008 to %17,23 in 2017. If we examine the private sector outstanding securities, the ratio of the private sector outstanding securities in the total outstanding securities was %18.9 in 2008 and this rate increased to %24 in 2017 and a significant proportional change was not observed in the ratio of private sector outstanding securities to GDP (2008: %6,42 and 2017: %5,9). According to these data, it is observed that the share of the public sector outstanding securities in the total outstanding securities decreased and the share of the private sector outstanding securities increased. If we interpret this situation in terms of pension funds, there is need for more funds, as it shows an upward trend within the total outstanding securities, directing pension funds to more private sector securities will have better macroeconomic results.

Table 27: Total Market Capitalization of BIST Companies

Year	Million TL	Changes(%)	% of GDP
2,008.00	182,025.00	-45.84	18.30
2,009.00	350,761.00	92.70	35.10
2,010.00	472,553.00	34.72	40.73
2,011.00	381,152.22	-19.34	27.33
2,012.00	552,897.00	45.06	35.22
2,013.00	505,914.00	-8.50	27.95
2,014.00	627,365.00	24.00	30.68
2,015.00	554,884.00	-11.55	23.72
2,016.00	614,069.00	10.66	23.54
2,017.00	880,241.00	43.34	28.33

Source: Capital Markets Board of Turkey, “Monthly Statistical Bulletin”, September 2018, (Online), <http://spk.gov.tr/SiteApps/Yayin/AylikIstatistikBulteniDosya/149>, 10 October 2018

The general indicators of BIST100 index is important to examine the situation of the capital markets in Turkey. The general indicators of the BIST100 index consist of total transaction volume, total transaction amount and total market capitalization of BIST100 companies. The total transaction volume of the BIST100 index expresses the total monetary value of all purchases and sales across the stock exchange, and the total transactions amount of BIST100 index refers to the amount of all purchases and sales transactions across the stock exchange. If we look at the total market values of BIST companies in Table 27, While the ratio of total market value of BIST companies to GDP was 18.3% in 2008, this ratio increased to %28,33 in 2017. At the same time, there are significant fluctuations in the percentage change in the total market values of BIST companies and their ratio of GDP. When the percentage changes in the total market value of BIST companies are examined, When there is a large increase in one year, there is a high rate of decrease in the other year or when there is a large decrease in one year, there is a high rate of increase in the other year. For example, while the total market value of BIST companies decreased in 2008 %45,84 in 2009, it increased %92.7 in 2009, while the total market value of BIST companies in 2011 decreased %19,34 in 2010, whereas in 2012, compared to 2011 %45,06 gained value. The ratio of the total market value of the BIST companies to GDP varies widely from year to year. For example, while the ratio of BIST companies to GDP in 2010 is %40,73, it

declined to %27,33 in 2011 and rise up %35,22 in 2012. As a result, the large-scale increase and decrease in the total market value of BIST companies show that BIST companies are open to speculative movements and attacks which can transform these companies into a financially fragile structure through their total market values. From this perspective, by increasing the volume of individual pension funds and directing them to the stocks could prevent speculative movements and attacks by achieving a stable structure of stock markets and by avoiding large-scale increases and decreases in market values of BIST companies. Thus, these companies can be moved away from a financially fragile structure. Table 28 shows that the total amount of transaction and the total transaction volume, which are the main indicators of the BIST100 index, have fluctuated due to the high change rates. In these indicators, the effects of the 2008 crisis are seen through the increase in the amount and volume of transactions after 2008. However, this high increase ended in 2011 with a significant decline. In 2017, a very high increase is observed in both transaction amount and transaction volume. Table 29 shows the number of companies in BIST100 on an annual basis. Although the number of companies has increased steadily between 2009 and 2014, it has decreased since 2015. In this case, the negative impact of the fluctuations in the market values and other indicators of BIST100 index may be effective.

Table 28: General Indicators of BIST100 Index

	Total Transaction Volume (Thousands TL)	Total Transaction Amount (Thousand)
2008	972,079.38	634,321.27
2009	2,617,335.53	961,375.37
2010	2,261,763.56	736,287.44
2011	977,207.19	362,302.56
2012	1,969,196.52	497,907.91
2013	2,782,550.38	985,311.24
2014	2,264,038.39	450,265.68
2015	2,385,854.10	577,088.97
2016	2,190,989.30	646,596.72
2017	6,614,704.39	1,405,786.15

Source: Turkish Central Bank Electronic Data Delivery System, Borsa Istanbul (BIST) Trading Volume, (Online) <https://evds2.tcmb.gov.tr/index.php?/evds/serieMarket>, 10 November 2018

Table 29: Number of Companies in BIST100

Number of Companies in Bist100	
2008	326
2009	325
2010	350
2011	375
2012	422
2013	438
2014	437
2015	428
2016	414
2017	411

Source: Borsa İstanbul, Consolidated Data, (Online)
<http://www.borsaistanbul.com/en/data/data/consolidated-data>, 10 November 2018

2.4 Savings in Turkey and Oecd Countries

In theory, domestic savings rates are important for a country to achieve high investment, high growth rates and loanable funds having lower cost. When domestic savings rates are insufficient, higher cost funds are obtained from foreign savings. In addition, macroeconomic indicators are negatively affected when large amounts of foreign capital outflows are realized through sudden capital outflows. In countries with high domestic savings, a slightly negative impact of sudden capital outflows is observed.

Developments in saving rate are especially important for developing countries. Because the greatest obstacle to developing countries is the lack of adequate savings. The high savings for the countries are of great importance in terms of providing investments. When we examine table 30, while total investments in Turkey increased, domestic savings decreased. That is, the share of foreign resources has increased in the financing of the total investment, the share of domestic savings has decreased. Domestic savings in Turkey decreased from % 29,1 in 1988 to %13,6 in 2010. In 2015, it increased to %14,3, an inadequate level. Due to lack of savings, Turkish investors have resorted to foreign sources. So, Turkey has investment-saving imbalance. In other

words, national savings cannot be enough for investments. Therefore, the foreign resources used is a risk to the sustainability of economic growth.

National savings rate in Turkey in recent years have shown large declines. There are decreases in public and private sector savings. Especially the decline in private sector savings is noteworthy. In 1980, Turkey opened more international markets experience with financial liberalization and export-oriented industrialization has experienced in the 1980s. There has been a decline in domestic savings due to the 1978-80 debt crisis (Değirmen and Şengönül, 2012: 3). National savings tended to decrease from 1988 until today after a sharp increase due to policy uncertainties and high inflation between 1980 and 1988. The decline in national savings began in 1988 and accelerated in 2000s.

After the 1989 decision of the financial liberalization Turkey was expected to increase savings in the liberalization of interest rates in this period. However, the rise in interest rates has affected the public and private sector savings in a different direction. Turkey's public debt was high on the public debt, increasing interest rates decreased public savings, while the private sector has made upward effect on savings due to having increasing share in Turkish economy. Therefore, the average saving rate of the society has not increased. Faced with public savings deficit and high inflation, the country has had to pay huge amounts of foreign debt. From 1989 to 2001, after the liberalization of the economy, which started in 1989, the public savings in 1989 was 3.6% and in 2001 it was -7.1%. So in 1989 there was a public savings, while in 2001 there was a public deficit. In the period 1989-2001, the public savings deficit was compensated by the private sector savings surplus.

In domestic saving in Turkey has experienced a significant decline in the 2000s. After a temporary rise in the 1990s, when the economy was in a transition period and the inflation was high, the savings rate has decreased significantly over the last decade. Although Turkey has a robust GDP growth, that this increase was associated with a traditional savings, there has been a sharp decline in the savings rate. The main reason for this is the decrease in household savings. Since 2001, the increase in credit opportunities and the acceleration of private consumption due to the delayed

consumption have been the determinants of the positive effect of income growth on savings.

Total domestic savings, which are the sum of public savings and private savings, have generally tended to decrease since 1988. In the previous period (1988-2001), the public sector was the main factor behind the reduction in savings rate. During the 1990s, public budget deficits in the consolidated budget began to rise. In the following period (2001-2010), contrary to the previous period, the main factor of the decline in savings was the decrease in private savings. The reduction in private savings has not even compensated the increase in public sector savings.

In Table 32, the average savings rate in Turkey and other countries between 2008 and 2017 is shown. Turkey's average savings rate is above average savings rate of European Union and Central Europe and the Baltics. Compared to a lot of countries, China with high rates of growth rate has more 2 times average savings rate than Turkey with %49,26. In addition, India with high rates of growth has a high average saving rate of 34.13%. Indonesia, which has %30.82, Malaysia, which has %31,4, stands out with their average savings rates. Germany, Netherlands, Norway, Switzerland and Denmark, which are developed European Countries has high savings rate, when compared to Turkey. As a result, developing countries with high growth rates, compared to Turkey, have used proportionally more domestic savings to finance their investments, due to their higher savings rate. In Turkey, it is necessary to increase the current savings rates for bigger growth rates and for stability in the financial sector.

Table 31 shows the data for the Consumption Expenditure of Domestic Non-Profit Institutions. As it can be seen from the table, the consumption expenditures of households and non-profit institutions are generally around 60% and they are the highest among GDP components. These data indicate that the resident household has a high consumption trend and as a result of the conversion of a certain portion of the high consumption volume into savings through the private pension system, the saving trend will increase and thus a significant increase in the saving rates. Therefore, individual pension plans have an important role in eliminating the households' high consumption tendency and increasing the savings rates.

Table 30: The Share of Investment and Savings to GDP in Turkey

	Public Saving (%)	Private Saving (%)	Total Domestic Saving (%)	Public Investment (%)	Private Investment (%)	Gross Fixed Investment (%)
1975	4.6	17.7	22.4	6.1	14.8	20.9
1976	4.5	20.9	25.4	6.7	16.7	23.5
1977	3.5	17.8	21.3	7.5	17.5	25.0
1978	5.4	14.2	19.5	6.3	15.8	22.1
1979	2.5	17.2	19.7	6.0	13.7	19.6
1980	3.4	9.4	12.8	6.6	13.7	20.3
1981	5.6	11.8	17.4	6.8	12.3	19.2
1982	5.2	8.9	14.1	6.2	12.1	18.2
1983	4.8	9.2	14.0	6.5	12.5	19.0
1984	4.5	9.3	13.8	6.0	12.2	18.2
1985	5.8	14.7	20.5	6.9	12.4	19.3
1986	6.1	19.0	25.1	7.6	14.1	21.7
1987	4.9	21.2	26.2	7.4	15.5	22.9
1988	5.1	24.0	29.1	6.6	17.6	24.2
1989	3.6	20.8	24.4	5.7	15.5	21.1
1990	2.6	22.1	24.7	5.2	16.0	21.2
1991	0.7	23.9	24.6	5.6	16.5	22.1
1992	-0.6	24.6	24.0	5.5	16.4	21.9
1993	-0.7	25.8	25.1	5.4	19.2	24.6
1994	-0.1	25.0	24.9	3.7	19.1	22.8
1995	-0.1	24.6	24.6	3.1	19.6	22.8
1996	-1.1	23.4	22.3	3.8	20.0	23.8
1997	0.8	22.6	23.4	4.6	20.5	25.1
1998	-1.4	25.7	24.3	5.2	17.2	22.4
1999	-5.0	25.1	20.1	5.0	14.5	19.5
2000	-3.4	21.8	18.4	5.2	16.0	21.2
2001	-7.1	25.5	18.4	4.1	11.4	15.5
2002	-4.8	23.4	18.6	4.9	13.1	18.0
2003	-4.1	19.6	15.5	3.7	14.3	18.0
2004	-1.0	16.9	16.0	3.2	16.6	19.8
2005	2.8	13.2	16.0	4.0	16.4	20.4
2006	4.2	12.5	16.7	3.7	18.7	22.4
2007	2.4	13.2	15.6	3.9	17.5	21.4
2008	1.7	15.2	16.9	4.3	17.8	22.1
2009	-0.8	14.2	13.3	4.4	10.9	15.3
2010	1.5	12.1	13.6	4.1	15.8	19.8
2011	3.7	10.8	14.4	4.1	19.7	23.8
2012	2.9	11.7	14.6	4.4	16.0	20.4
2013	3.4	10.1	13.5	4.9	16.0	20.9
2014	3.1	12.1	15.2	4.4	15.9	20.3
2015	4.4	10.0	14.3	5.0	13.4	18.4

Source: T.C. Cumhurbaşkanlığı Strateji ve Bütçe Başkanlığı, Temel Ekonomik Göstergeler, (Online) <http://www.sbb.gov.tr/wp-content/uploads/2018/10/Tab-2-5-Yurti%C3%A7i-Tasarruflar%C4%B1n-ve-SSYnin-GSYH-%C4%B0%C3%A7indeki-Pay%C4%B1-1975-2015.xls>, 10 November 2018

Table 31: The Ratio of Final Consumption Expenditure of Resident Households and Consumption of Non-Profit Institutions Serving Households to GDP in Turkey

Year Consumption/GDP(%)	
2008	61.61
2009	62
2010	63.05
2011	63.1
2012	62.37
2013	61.9
2014	60.76
2015	60.36
2016	59.82
2017	59.04

Source: Turkish Central Bank Electronic Data Delivery System, GDP by Expenditure Approach-Current Prices, (Online) <https://evds2.tcmb.gov.tr/index.php?/evds/serieMarket>, 10 November 2018

Table 32: Average Savings Rate of OECD Countries Between 2008 and 2017

Country Name	Average Saving Rate (%)
Turkey	23.42
European Union	21.23
Central Europe and the Baltics	21.05
Germany	26.52
Malaysia	31.4
Netherlands	28.48
Norway	37.02
Singapore	47.55
Switzerland	34.02
Korea, Rep.	34.6
Indonesia	30.82
Denmark	26.79
India	34.13
China	49.26

Source: World Development Indicators, Gross Savings (% of GDP), (Online) <http://api.worldbank.org/v2/en/indicator/NY.GNS.ICTR.ZS?downloadformat=excel>, 8 September 2018

2.5 2008 Global Crisis

2.5.1 2008 Global Crisis in the World

Until the crisis emerged in 2007, it was seen that the strong economic performance period in the world could not be sustained for three reasons. First, real estate values have increased at a high rate in many countries, including the USA and economically the major countries of the world. Secondly, balance of payment deficits increased at a high rate and reached a threatening level including including the USA and economically the major countries of the world. Third, the ratio of financial assets and debt to equity in many sectors and many countries in the global scale has increased extraordinarily (Öztürk, Sözdemir and Ülger, 2012: 299). In an environment in which unsustainable macroeconomic imbalances are seen, which will prepare the ground for the 2008 Crisis, The easy money period, which began with the US national bank (FED) lowering interest rates to %1, the lowest level in the last 45 years, has led to a rapid rise in housing loans. With the fall in interest rates, the finance sector started to offer mortgage loans called subprime to people with low payment power. In addition, the credit risk has spread to the entire financial sector due to making bond sales by used loans shown as the collaterals and by these credits are used by investment banks and hedge funds. As FED increased interest rates, the balloon in the housing loan declined. Due to increasing interest rates, problems arose in the payment of housing loans. A major decline has started at housing prices, with debtors getting their houses to sell in order to repay their loans. This has led to further increasing problems in the housing market. Reducing the credit rating of investment instruments based on risk-based housing loans and the financial institutions that invested in them led to a rapid decline in the value of these investments and firms. The markets were dragged towards the liquidity crisis due to the difficulties in converting the products into cash and the willingness of investors to recover their money. In 2007, more than %25 of subprime credit institutions went bankrupt due to the recession in financial markets. When the Lehman Brothers, one of the world's leading investment banks, announced bankruptcy of 600 billion \$, the mortgage crisis turned into a global financial crisis. This crisis became the largest global financial crisis after the 1929 Crisis. Against the global

crisis, the Fed and European central banks realized the largest monetary intervention in the world's history by injecting 2.5 trillion \$ in liquidity into the markets and committing \$ 1.5 trillion in direct stock investment (Karabulut, 2009: 408).

There are a number of characteristics that differentiate the 2008 global crisis from others. These are:

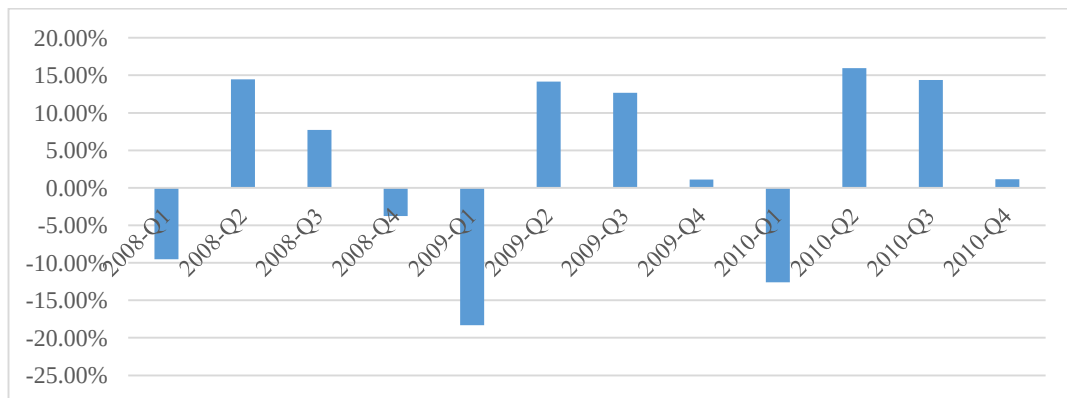
- Formation is contrary to known. The problem here is not a liquidity shortage, but rather an abundance of liquidity in the market. The problem here is that the money holders do not want to give the money because of the risk of not paying back.
- Income level did not effect the demand level. On the contrary, debt level affected the demand
- The most important point separating the 2008 Global Crisis from past crises is that, beyond the classical banking crises, there are complex and high volume derivative products on its basis and the problems related to these products spread rapidly in the globalized world.

The impact of the global crisis on Turkish economy in the last quarter of 2008 seems to occur markedly on both domestic and foreign demand. The global slowdown in economic activity seen, have a negative impact on Turkey's export markets and export growth in the last quarter of 2008 showed a significant slowdown in both price and quantity basis. risks to financial stability in the current conjuncture in terms of Turkey, rapidly rising current account deficit due to the result of increased short-term capital inflows became more evident. the rapid expansion in loans, the decomposition in domestic and foreign demand growth widened the current account deficit and this led to concerns about financial stability extraordinary (Öztürk, Sözdemir and Ülger, 2012: 300). In addition, Turkey's commercial and financial ties with the countries directly affected by the crisis and the contraction in demand by the negative expectations for the future and the crisis of confidence, increase the negative effect of the crisis.

2.5.2 General Macroeconomic Indicators in Turkey During 2008 Crisis

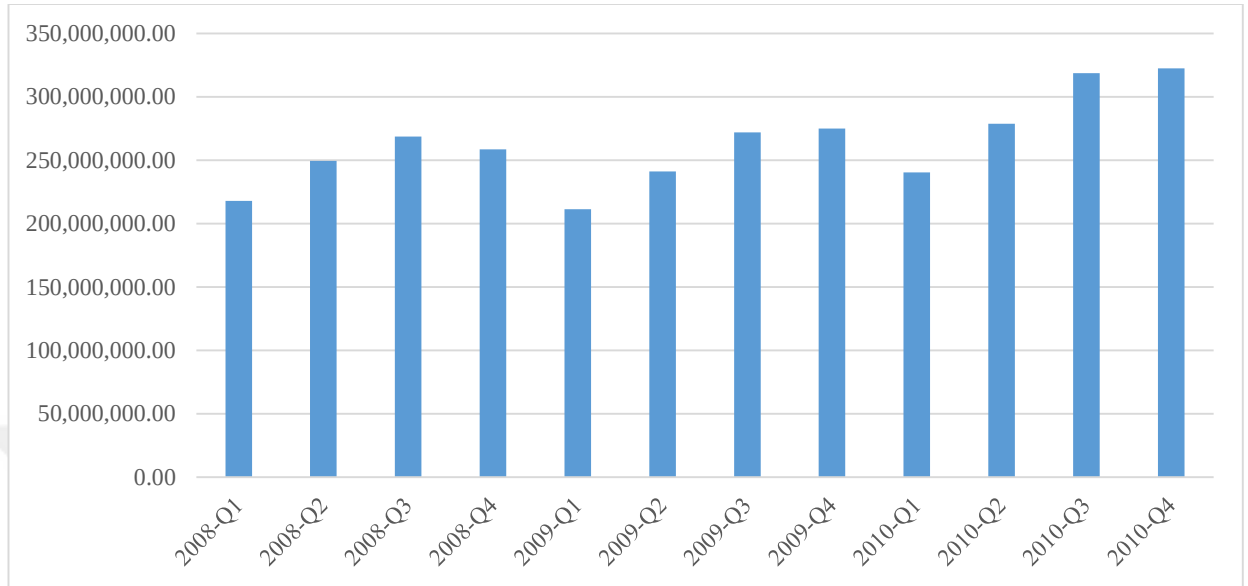
To better understand the effects of the 2008 crisis, on Turkish economy it is necessary to examine the general macroeconomic indicators. The most important variables among the general macroeconomic variables are Gross Domestic Product (GDP), GDP growth rate, unemployment rate and balance of current account. An analysis of the data in the figure 44 shows that, up to the third quarter of 2008, GDP has increased. After the third quarter of 2008 while GDP has started to fall, it started to feel the effects of the crisis and the economy began to shrink in Turkey. As of the second quarter of 2009, the economy started to recover and GDP increased. Despite this, GDP decreased in the first quarter of 2010. After the first quarter of 2010, GDP increased continuously and the negative impact of the crisis was overcome. When we look at the growth rates of GDP in Figure 43, we see that Turkey's economy has shrunk significantly in quarterly periods in the 2008 crisis. Although there were shrinkage rates seen in quarters in 2008, 12.98% growth was observed in 2008 as high growth rates were observed. In the first quarter of 2009, there was a contraction of 18.32% and economic growth was realized in other quarters. Nevertheless, the growth rate slowed down extremely in 2009, due to the 2008 crisis, and became 0.44%. In 2010, except for the contraction in the first quarter, there were high growth rates in other quarters, but in 2010 the growth rate was limited to 1.14 due to the negative effects of the crisis.

Figure 43: GDP Growth Rate (%) in Turkey



Source: Turkish Central Bank Electronic Data Delivery System, GDP by Expenditure Approach-Current Prices, (Online) <https://evds2.tcmb.gov.tr/index.php?/evds/serieMarket>, 10 November 2018

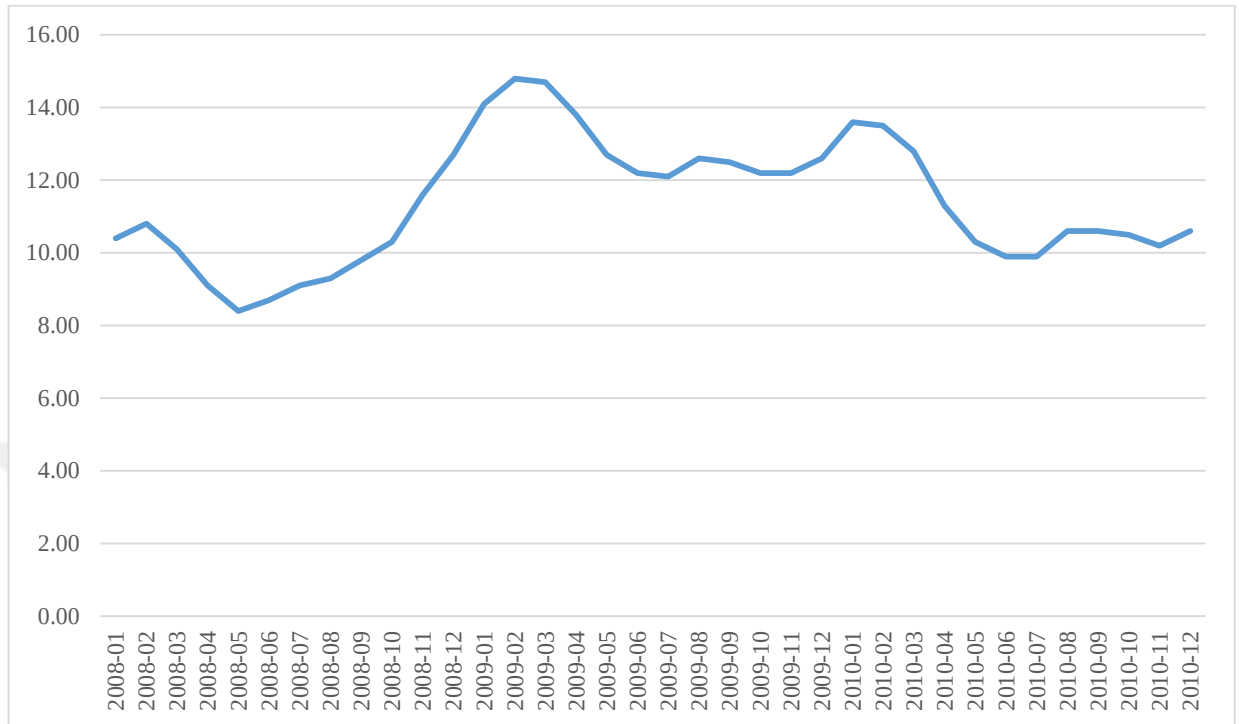
Figure 44: Gross Domestic Product (Thousand TL) in Turkey



Source: Turkish Central Bank Electronic Data Delivery System, GDP by Expenditure Approach-Current Prices, (Online) <https://evds2.tcmb.gov.tr/index.php?/evds/serieMarket>, 10 November 2018

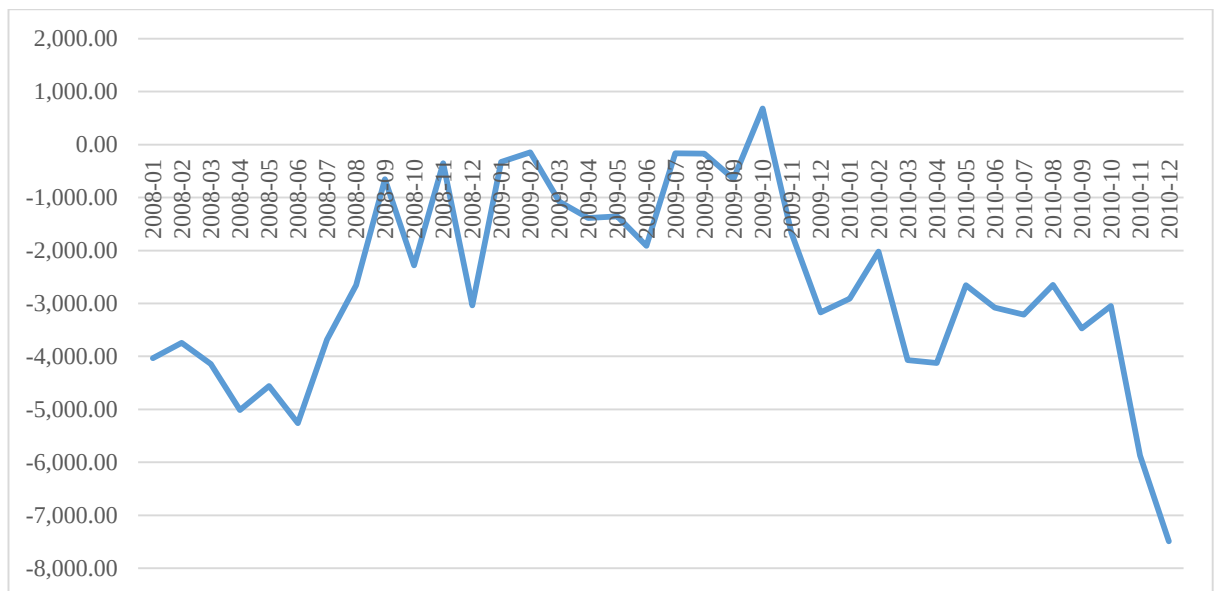
When figure 45 is examined, the unemployment rate generally showed a downward trend in the first five months of 2008. However, since the 6th month of 2008, the effects of the crisis have started to be seen in the labor market and unemployment rates have increased continuously. Since 2009, there has been a decline in unemployment. In 2010, unemployment declined, and by the end of 2010, the unemployment rate returned to the level of 2008 due to the economic recovery. When examined the figure 46, during the 2008 crisis, due to the negative impact of countries trading with turkey, the current account balance had sharp fluctuations. The current account deficit, which increased during the first six months of 2008, decreased in the following months. In some months, current account surplus is seen. As of the end of 2010, the current account deficit, which was rapidly increasing since the last months of 2009, nearly doubled in the first month of 2008.

Figure 45: Unemployment Rate in Turkey (%)



Source: Turkish Central Bank Electronic Data Delivery System, Basic Labour Force Indicators, (Online) <https://evds2.tcmb.gov.tr/index.php?/evds/serieMarket>, 10 October 2018

Figure 46: Balance of Current Account (Million Dolar) in Turkey



Source: Turkish Central Bank Electronic Data Delivery System, Balance of Payments Detailed Presentation (BPM6), (Online) <https://evds2.tcmb.gov.tr/index.php?/evds/serieMarket>, 10 October 2018

2.5.3 2008 Global Crisis and Individual Retirement System in Turkey

In order to interpret the situation of the Private Pension System in 2008 Global Crisis, it is necessary to examine the general indicators of Individual Retirement System in the period during which the 2008 Crisis continues. The general indicators of Individual Retirement System are the increase in the number of contributors, the increase in the amount of contributions, the contributions directed to the investment and the fund amount of the contributors. The contributions directed to the investment are the amount of investment in financial assets. The fund amounts of the contributors are the amount of funds obtained as a result of the investments and contributions made.

The data in Table 33 shows the overall status of the Individual Retirement System in Turkey during the 2008 crisis. Based on the data in the table, the number of contributors continued to increase during the crisis, but in the first and second years of the crisis, decrease in increase rate was observed in certain months. When the total contributions are examined, although the amount of total contributions increase every month, there are fluctuations in increase rate. Similar to previous indicators, an increase was observed in the amount directed to investment each month and the increase rates have fluctuated. When the fund amount of the contributors is examined, excessive fluctuations are observed and only the total fund value decreased in October 2008. In this case, undoubtedly, the value of financial assets having fluctuations and high losses in 2008 Global Crisis have a significant role. As a result, the number of contributors increased in the Individual Retirement System during the 2008 Global Crisis, and in the Individual Retirement System, in general, although no financial problems were encountered, the adverse effects of the crisis led to decreases and fluctuations in the growth rate and at the same time, the value of pension funds were affected by the value of financial assets.

Table 33: General Indicators of Individual Retirement System in Turkey During 2008 Global Crisis

Month	Increase in the Number of Contributors (%)	Increase in The Amount of Contributions (%)	Contributions Directed Investment (%)	Increase in The Fund Amount of Contributors (%)
2008-1	1.62	3.28	3.26	0.75
2008-2	1.12	2.33	2.33	3.04
2008-3	2.11	3.18	3.16	1.47
2008-4	2.3	3.01	3	4.1
2008-5	1.65	2.91	2.9	1.87
2008-6	1.92	3.23	3.23	1.29
2008-7	1.64	3.08	3.08	6.69
2008-8	1.01	2.97	2.97	3.19
2008-9	1.45	2.28	2.28	1.82
2008-10	1.51	2.99	2.99	-0.18
2008-11	0.48	2.14	2.15	4.29
2008-12	1.36	2.43	2.45	5.7
2009-1	0.54	1.42	1.43	2.81
2009-2	0.41	1.51	1.52	1.03
2009-3	1.26	2.16	2.17	3.91
2009-4	1.45	2.04	2.05	5.16
2009-5	1.65	2.25	2.26	2.97
2009-6	1.76	2.43	2.44	2.93
2009-7	1.12	2.38	2.39	4.22
2009-8	1.05	2.46	2.47	3.61
2009-9	0.86	2.28	2.28	3
2009-10	0.64	2.16	2.17	1.65
2009-11	1.31	2.35	2.37	1.49
2009-12	1.06	2.98	3	3.42
2010-1	0.79	2.18	2.19	2.44
2010-2	0.91	2.36	2.38	0.64
2010-3	1.92	2.98	3.01	3.69
2010-4	1.92	2.56	2.58	2.45
2010-5	1.39	2.69	2.71	1.39
2010-6	1.05	2.56	2.58	2.44
2010-7	1.18	2.53	2.55	2.96
2010-8	0.77	2.61	2.62	2.31
2010-9	0.91	2.21	2.22	3.08
2010-10	0.84	1.83	1.85	2.44
2010-11	1.53	2.72	2.72	1.54
2010-12	0.64	2.37	2.39	2.78

Source: Pension Monitoring Center, Summary IPS Data, (Online)
http://web2.egm.org.tr/webegm2/chart/besgosterge/wg_sirketview_tablolu.asp?raportar1=29.12.2017&raportar2=31.12.2003&sirketlist=100&raportip=10&yayin=W, 2 November 2018

2.5.4 2008 Crisis and Capital Markets in Turkey

Since the Global Crisis of 2008 is a crisis that arose from the financial market, the Capital Markets and Capital Market instruments were also affected by the crisis. Therefore, the impact of the 2008 crisis on capital markets and capital market instruments should be examined. When the data in the stock market in Table 34 are analyzed, significant losses in the markets values of BIST100 companies are observed. In addition, there was an excessive fluctuation in the market values of BIST100 companies, as significant increases in value are observed in certain periods. When the monthly percentage changes of the BIST100 index are analyzed, there was a significant increase and decrease in BIST100 companies' market values, which is why there is an excessive volatility. The transaction volume of the BIST100 index increased and decreased significantly compared to the index and market values. The percentage change of the BIST100 index was between -%70.69 and %300.43. On a yearly basis, the market value of BIST100 companies decreased %45.84, which is a high rate, in the first year of the crisis, and in 2009 and 2010, the market value of the companies increasing %92.7 and %34.72 entered improvement process. On the other hand, the BIST100 index lost %51.63 in 2008, but improved in 2009 and 2010, with a increase of %96.64 and %24.95. Considering the annual changes in the transaction volume, the transaction volume increased %69 in 2008, the first year of the crisis, following a %169.25 increase in 2009, it decreased % 13.59 in 2010. looked at the treasury bills and bond markets, when the data in Table 35 is taken as a basis, outstanding bonds decreased in the half of 2008 and, in 2009 and 2010 it usually shown an upward trend. On a year to year basis, it increased in 2008, 2009 and 2010. The stock of Treasury bills ranged between -%35.35 and %75.81 monthly. Examined stock of Treasury bills on a yearly basis, there was an increase %127.88 in 2008, but in 2009 the increase rate decreased to 0.41%. In 2010, it decreased % 32.14. As a result, there were high fluctuations in the stock markets in the 2008 Crisis. In the in 2008 which is first year of the crisis, there was shrinkage, and in the next two years, there were improvements through expansion. On the other hand, a significant increase in outstanding is observed in the treasury bills market in 2008 and, two years later, outstanding in treasury bills decreased. In the bond market, although there were frequent decreases in outstanding

on monthly basis in 2008, there was an increase in outstanding yearly basis, while a significant increase is observed in outstanding in 2009, and increase rate in outstanding decreased significantly in 2010. In addition, change rates as monthly have generally increased in a narrow range.



Table 34: General Appearance of Stocks Market in Turkey During 2008 Crisis

Date	Changes in Total Market Capitalization of Bist100 Companies (%)	Changes in Bist100 index (%)	Transaction Volume of Bist100 Index (%)
2008-01	-21.04	-23.12	144.25
2008-02	4.15	4.87	14.00
2008-03	-11.17	-12.87	-21.72
2008-04	9.79	11.41	3.40
2008-05	0.11	-8.05	29.71
2008-06	-12.55	-12.21	-44.89
2008-07	20.48	20.27	193.29
2008-08	-4.27	-5.58	-69.99
2008-09	-10.11	-9.52	-41.53
2008-10	-22.63	-22.80	300.43
2008-11	-6.97	-7.61	-30.00
2008-12	3.43	4.47	-27.25
2009-01	-1.26	-3.46	-8.94
2009-02	-5.75	-7.36	4.82
2009-03	8.51	7.23	19.33
2009-04	19.41	22.85	141.03
2009-05	9.02	10.59	-4.68
2009-06	5.73	5.56	-15.59
2009-07	14.21	15.41	52.63
2009-08	8.43	9.17	-39.85
2009-09	2.5	2.92	35.31
2009-10	-1.5	-1.51	13.34
2009-11	-4.1	-3.89	-70.69
2009-12	15.63	16.48	195.33
2010-01	4.76	3.46	12.86
2010-02	-5.47	-9.05	-6.87
2010-03	11.72	13.75	23.67
2010-04	4.61	4.28	-1.48
2010-05	-7.94	-7.76	-52.08
2010-06	3.82	0.84	10.97
2010-07	7.35	9.17	10.12
2010-08	0.91	0.18	-2.04
2010-09	9.83	9.67	68.10
2010-10	4.18	4.54	-57.74
2010-11	-4.66	-4.96	129.95
2010-12	3.06	1.00	-27.98

Source: Turkish Central Bank Electronic Data Delivery System, Borsa Istanbul (BIST) Trading Volume, (Online) <https://evds2.tcmb.gov.tr/index.php?/evds/serieMarket>, 10 November 2018 and Borsa İstanbul, Consolidated Data, (Online) <http://www.borsaistanbul.com/en/data/data/consolidated-data>, 10 November 2018

Table 35: Public Sector Bonds and Bills Market in Turkey During 2008 Crisis

Date	Change in Outstanding Government Bonds (%)	Change in Outstanding Treasury Bills (%)
2008-01	1.86	-23.98
2008-02	1.35	2.66
2008-03	2.29	-30.08
2008-04	0.64	19.06
2008-05	-2.82	0.01
2008-06	-0.12	0
2008-07	-0.44	32.04
2008-08	-0.38	75.81
2008-09	0.93	-1.93
2008-10	1.93	0
2008-11	-0.3	35.99
2008-12	-0.24	13.29
2009-01	2.66	-18.08
2009-02	3.35	6.25
2009-03	0.06	26.45
2009-04	1.97	0
2009-05	1.45	0
2009-06	1.07	-21.23
2009-07	2.68	-14.2
2009-08	0.79	51.65
2009-09	1.69	0.96
2009-10	2.15	0
2009-11	1.25	-11.84
2009-12	0.26	0
2010-01	1.39	10.49
2010-02	1.25	-2.79
2010-03	0.92	-11.56
2010-04	0.76	0
2010-05	-0.8	0
2010-06	0.44	8.87
2010-07	2.18	-35.35
2010-08	0.77	-4.64
2010-09	0.16	-1.04
2010-10	0.02	0
2010-11	0.69	7.55
2010-12	0.59	0

Source: Capital Markets Board of Turkey, “Monthly Statistical Bulletin”, December 2008, (Online) <http://www.spk.gov.tr/SiteApps/Yayin/AylikIstatistikBulteniDosya/111>, 10 October 2018, Capital Markets Board of Turkey, “Monthly Statistical Bulletin”, December 2009, (Online) <http://www.spk.gov.tr/SiteApps/Yayin/AylikIstatistikBulteniDosya/123>, 10 October 2018 and Capital Markets Board of Turkey, “Monthly Statistical Bulletin”, December 2010, (Online) <http://www.spk.gov.tr/SiteApps/Yayin/AylikIstatistikBulteniDosya/135>, 10 October 2018

CHAPTER THREE

THE EFFECTS OF INDIVIDUAL RETIREMENT SYSTEM ON CAPITAL MARKETS IN TURKEY: EMPIRICAL ANALYSIS

3.1 Previous Empirical Studies

A lot of studies examined effects of Individual Retirement System on markets and macroeconomic variables. Anton, Bustillo and Macios (2014) investigated the effects of tax incentives on consumption. The findings of the study indicate that tax incentives don't increase savings since they don't decrease consumption level. Korkmaz, Uygurtürk and Çevik (2010) studied the factors affecting transaction volumes in Private Pension Funds. The results of the study show that the exchange rate of Euro and İMKB index is related to transaction volume of Private Pension Funds. Attanasio and Deleire (2002) analyzed the effect of Individual Retirement System on household consumption and national saving. Empirical results don't show negative relationships between Individual Retirement System and consumption level. In contrast, non-financial assets of contributors of Individual Retirement System decrease when IRAs increase.

3.2 Dataset, Methodology and Empirical Results

Weekly dataset from 09/10/2015 to 23/11/2018 is selected as observation interval because the ratio of value of stocks assets in net asset value of private pension funds to market value of BIST100 companies are more than one percent. Therefore, effects could be observed very well. Total Amount of Participant's Funds in Individual Retirement System datasets are taken by Pension Monitoring Center. BIST100 index, Weighted Average Interest Rates for Deposits (up to 3 Months), M1 Narrow Money (Thousand TL), Exchange Rate (Euro (Selling)) Market Value of Private Sector Domestic Debt Securities (Million TL), Weighted Average Interest Rates for Deposits (1 Year and More) and Nominal Value of Private Sector Domestic Debt Securities (Million TL) are obtained from Turkish Central Bank Electronic Data Delivery System.

In econometric analysis, The following models are used:

Model I: $\log(\text{BIST100})_t = a_1 + a_2\log(\text{ppf})_t + a_3\log(\text{int})_t + a_4\log(\text{m1})_t + a_5\log(\text{euro})_t + \varepsilon_1$

Model I: $\log(\text{cbond})_t = a_6 + a_7\log(\text{ppf})_t + a_8\log(\text{int1})_t + a_9\log(\text{c1bond})_t + \varepsilon_2$

BIST100: BIST100 Index ppf: Total Amount of Participant's Funds in Individual Retirement System

int: Interest Rates for Deposits (up to 3 Months) m1: M1 Narrow Money (Thousand TL)

euro: Exchange Rate (Euro (Selling))

cbond: Market Value of Private Sector Domestic Debt Securities (Million TL)

int1: Interest Rates for Deposits (1 Year and More)

c1bond: Nominal Value of Private Sector Domestic Debt Securities (Million TL)

ε_1 : Error Term in Model 1 ε_2 : Error Term in Model 2

3.2.1 Unit Root Tests

In this study, Augmented Dickey- Fuller (ADF) and Phillips-Perron (PP) tests are used for testing the stationary of the series in order to prevent spurious regression results. ADF unit root test results in Table 36 and Table 40 show that all variables in Model I and Model II are not stationary in level. In Table 37 and Table 41 according to ADF unit root test results, all variables in Model I and Model II are stationary at %5 significance level in first differences.

Phillips-Perron Unit Root results in Table 38 and Table 42 give that all variables in Model I and Model II are non stationary in level. However, Phillips-Perron Test in Table 39 and Table 43 indicate that all variables in Model I and Model II are stationarity at in first difference. As a result, ADF and Phillips-Perron unit root tests demonstrate that all variables are stationary in first difference. Therefore, the variables are suitable for Johansen Cointegration Model. Because all variables are the integrated order of 1.

Table 36: ADF Unit Root Test in Level for Model I

Level			
Variables	Intercept	Trend and Intercept	None
log(BIST100)	-1.3485 Prob.= 0.6061	-1.5232 Prob.= 0.8178	0.4152 Prob.= 0.8018
log(ppf)	-1.7236 Prob.= 0.4175	-1.3709 Prob.= 0.8659	7.1179 Prob.= 1.0000
log(int)	1.5900 Prob.= 0.9995	-0.5177 Prob.= 0.9819	1.5997 Prob.= 0.9731
log(m1)	-0.8593 Prob.= 0.7988	-3.2810 Prob.= 0.0731	1.8107 Prob.=0.9831
log(euro)	0.2710 Prob.= 0.9761	-2.4789 Prob.= 0.3382	2.1828 Prob.= 0.9932

Table 37: ADF Unit Root Test in First Difference for Model I

First Difference			
Variables	Intercept	Trend and Intercept	None
log(BIST100)	-14.6026 Prob.= 0.0000	-14.5864 Prob.= 0.0000	-14.6260 Prob.= 0.0000
log(ppf)	-13.6962 Prob.= 0.0000	-13.8826 Prob.= 0.0000	-2.5280 Prob.= 0.0115
log(int)	-4.5505 Prob.= 0.0002	-4.9359 Prob.= 0.0004	-4.2618 Prob.= 0.0000
log(m1)	-13.4579 Prob.= 0.0000	-13.4162 Prob.= 0.0000	-13.2242 Prob.= 0.0000
log(euro)	-10.7797 Prob.= 0.0000	-10.8121 Prob.= 0.0000	-10.5468 Prob.= 0.0000

Table 38: Phillips-Perron Unit Root Test in Level for Model I

Level			
Variables	Intercept	Trend and Intercept	None
log(BIST100)	-1.2454 Prob.= 0.6540	-1.3721 Prob.= 0.8656	-0.4758 Prob.= 0.8167
log(ppf)	-1.7913 Prob.= 0.3838	-1.0920 Prob.= 0.9264	7.8254 Prob.= 1.0000
log(int)	1.4057 Prob.= 0.9990	-0.6451 Prob.= 0.9747	1.9875 Prob.= 0.9889
log(m1)	-0.7930 Prob.= 0.8181	-3.4101 Prob.= 0.0535	2.0559 Prob.= 0.9906
log(euro)	-0.0651 Prob.= 0.9502	-2.7988 Prob.= 0.1999	1.6846 Prob.= 0.9776

Table 39: Phillips-Perron Unit Root Test in First Difference for Model I

First Difference			
Variables	Intercept	Trend and Intercept	None
log(BIST100)	-14.6002 Prob.= 0.0000	-14.6216 Prob.= 0.0000	-14.6222 Prob.= 0.0000
log(ppf)	-13.7552 Prob.= 0.0000	-13.8899 Prob.= 0.0000	-11.8464 Prob.= 0.0000
log(int)	-12.3936 Prob.= 0.0000	-12.7576 Prob.= 0.0000	-12.0322 Prob.= 0.0000
log(m1)	-13.5460 Prob.= 0.0000	-13.5013 Prob.= 0.0000	-13.2236 Prob.= 0.0000
log(euro)	-10.9984 Prob.= 0.0000	-11.0218 Prob.= 0.0000	-10.8916 Prob.= 0.0000

Table 40: ADF Unit Root Test in Level for Model II

Level			
Variables	Intercept	Trend and Intercept	None
log(cbond)	-0.1802 Prob.=0.9372	-1.4651 Prob.= 0.8376	2.9440 Prob.= 0.9992
log(ppf)	-1.7236 Prob.= 0.4175	-1.3709 Prob.= 0.8659	7.1179 Prob.= 1.0000
log(int1)	-0.3126 Prob.= 0.9191	-1.8527 Prob.= 0.6742	1.3113 Prob.= 0.9519
log(c1bond)	-0.0944 Prob.= 0.9471	-1.4790 Prob.= 0.8330	3.0493 Prob.=0.9994

Table 41: ADF Unit Root Test in First Difference for Model II

First Difference			
Variables	Intercept	Trend and Intercept	None
log(cbond)	-12.7165 Prob.= 0.0000	-12.6886 Prob.= 0.0000	-12.1327 Prob.= 0.0000
log(ppf)	-13.6962 Prob.= 0.0000	-13.8826 Prob.= 0.0000	-2.5280 Prob.= 0.0115
log(int1)	-19.6690 Prob.= 0.0000	-19.6954 Prob.= 0.0000	-19.5734 Prob.= 0.0000
log(c1bond)	-12.9473 Prob.= 0.0000	-12.9266 Prob.= 0.0000	-12.3014 Prob.=0.0000

Table 42: Phillips-Perron Unit Root Test in Level for Model II

Level			
Variables	Intercept	Trend and Intercept	None
log(cbond)	-0.1556 Prob.= 0.9402	-1.4572 Prob.= 0.8401	3.0532 Prob.= 0.9995
log(ppf)	-1.7913 Prob.= 0.3838	-1.0920 Prob.= 0.9264	7.8254 Prob.= 1.0000
log(int1)	-0.7297 Prob.= 0.8351	-2.9698 Prob.= 0.1440	1.6326 Prob.= 0.9749
log(c1bond)	-0.0562 Prob.= 0.9511	-1.4414 Prob.= 0.8451	3.2086 Prob.= 0.9997

Table 43: Phillips-Perron Unit Root Test in First Difference for Model II

First Difference			
Variables	Intercept	Trend and Intercept	None
log(cbond)	-12.7226 Prob.= 0.0000	-12.6942 Prob.= 0.0000	-12.1881 Prob.= 0.0000
log(ppf)	-13.7552 Prob.= 0.0000	-13.8899 Prob.= 0.0000	-11.8464 Prob.= 0.0000
log(int1)	-20.2067 Prob.= 0.0000	-20.8725 Prob.= 0.0000	-19.9554 Prob.= 0.0000
log(c1bond)	-12.9616 Prob.= 0.0000	-12.9412 Prob.= 0.0000	-12.3785 Prob.= 0.0000

3.2.2 Johansen Cointegration Test

The lag order is selected as 5. Because the average period of conversion to investment of contributions is 5 weeks. Trace Test and the Max-Eigenvalue Test show 1 cointegrating equation at %5 level of significance for Model I in Table 44. According to Trace and the Max-Eigenvalue Tests results for Model II in Table 46, there is 1 cointegrating equation at %5 level of significance. The null hypothesis (no cointegration) in Trace and the Max-Eigenvalue Tests has been rejected for both two models. Thus, there is a long run relationship between all variables in Model I and Model II. In Table 45, the long-run relationship between BIST100 Index and Total Amount of Participant's Funds in Model I are observed. Table 45 show that the coefficient of $\log(\text{ppf})$ is statistically significant and positive. The long run model normalized cointegrating coefficient show that while other factors are constant if Total Amount of Participant's Funds in Individual Retirement System increase, BIST100 index will also increase. The long run elasticity is positive. Long run model normalized cointegrating coefficients for Model II in Table 47 show the long run relationship of between market value of corporate bonds and Total Amount of Participant's Funds in Individual Retirement System. Total amount of contributions in Individual Retirement System influence positively corporate bonds since it has positive coefficient. Long run normalized coefficient of $\log(\text{ppf})$ is statistically significant.

To sum up, the analyzed models have cointegrating equations. So, all variables in these models represent the long term relationship.

Table 44: Johansen Cointegration Test Results for Model I

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Probability
None*	0.250244	79.43901	69.81889	0.0070
At most 1	0.115059	33.93374	47.85613	0.5055
At most 2	0.059152	14.62074	29.79707	0.8040
At most 3	0.029900	4.986941	15.49471	0.8102
At most 4	0.001207	0.190755	3.841466	0.6623
Trace test indicates 1 cointegrating eqn(s) at the 0.05 level				
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Probability
None*	0.250244	45.50527	33.87687	0.0014
At most 1	0.115059	19.31300	27.58434	0.3907
At most 2	0.059152	9.633801	21.13162	0.7782
At most 3	0.029900	4.796186	14.26460	0.7673
At most 4	0.001207	0.190755	3.841466	0.6623
Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level				

Table 45: Long Run Model Normalized Cointegrating Coefficient for Model I

Dependent Variable: log(BIST100)			
Variable	Coefficient	Standard Error	t-statistic
log(ppf)	4.298643	0.43420	9.9001451
log(int)	0.822970	0.22495	3.65845743
log(m1)	-2.574411	0.52678	-4.8870705
log(euro)	-1.784571	0.36356	-4.90860106

Table 46: Johansen Cointegration Test Results for Model II

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Probability
None*	0.2351	67.5914	47.8561	0.0003
At most 1	0.0991	25.2331	29.7970	0.1533
At most 2	0.0362	8.7276	15.4947	0.3912
At most 3	0.0181	2.9014	3.8414	0.0885
Trace test indicates 1 cointegrating eqn(s) at the 0.05 level				
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Probability
None*	0.2351	42.3583	27.5843	0.0003
At most 1	0.0991	16.5054	21.1316	0.1967
At most 2	0.0362	5.82617	14.2646	0.6356
At most 3	0.0181	2.90147	3.8414	0.0885
Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level				

Table 47: Long Run Model Normalized Cointegrating Coefficient for Model II

Dependent Variable: log(cbond)			
Variable	Coefficient	Standard Error	t-statistic
log(ppf)	0.0188	0.0049	3.8239
log(int1)	-0.0274	0.0029	-9.4524
log(c1bond)	0.9966	0.0046	216.1978

3.2.3 VECM Granger Causality Test

Vector Error Correction Model (VECM) Granger Causality Test are also conducted. According to Table 48, there is a unilateral causality from BIST100 Index to Total Amount of Participant's Funds in Individual Retirement System in the short run. Total Amount of Participant's Funds in Individual Retirement System cause BIST100 Index at %5 significance level. According to Table 49, there is a unilateral causality from Market Value of Private Sector Domestic Debt Securities (Million TL) to Total Amount of Participant's Funds in Individual Retirement System in the short run. Total Amount of Participant's Funds in Individual Retirement System cause Market Value of Private Sector Domestic Debt Securities (Million TL) at %5 significance level. Total Amount of Participant's Funds in Individual Retirement System causes Nominal Value of Private Sector Domestic Debt Securities (Million TL) in the short run.

Table 48: VECM Granger Causality Test in The Short Run for Model I

Dependent d(log(BIST100))	Variable: Prob.	Dependent d(log(ppf))	Variable: Prob.	Dependent d(log(int))	Variable: Prob.
Excluded	Prob.	Excluded	Prob.	Excluded	Prob.
d(log(ppf))	0.5475	d(log(BIST100))	0.0289	d(log(BIST100))	0.7730
d(log(int))	0.2900	d(log(int))	0.0041	d(log(ppf))	0.6038
d(log(m1))	0.8824	d(log(m1))	0.7638	d(log(m1))	0.0000
d(log(euro))	0.6554	d(log(euro))	0.2770	d(log(euro))	0.0181
Dependent d(log(m1))	Variable:	Dependent Variable: d(log(euro))			
Excluded	Prob.	Excluded	Prob.		
d(log(BIST100))	0.4538	d(log(BIST100))	0.0000		
d(log(ppf))	0.6536	d(log(ppf))	0.0000		
d(log(int))	0.8206	d(log(int))	0.0031		
d(log(euro))	0.4394	d(log(m1))	0.0378		

Table 49: VECM Granger Causality Test in The Short Run for Model II

Dependent d(log(cbond))	Variable:	Dependent d(log(ppf))	Variable:	Dependent d(log(int))	Variable:
Excluded	Prob.	Excluded	Prob.	Excluded	Prob.
d(log(ppf))	0.0078	d(log(cbond))	0.2765	d(log(cbond))	0.0034
d(log(int1))	0.5595	d(log(int1))	0.9517	d(log(ppf))	0.8492
d(log(c1bond))	0.0031	d(log(c1bond))	0.2780	d(log(c1bond))	0.0021
Dependent d(log(c1bond))	Variable:				
Excluded	Prob.				
d(log(cbond))	0.0022				
d(log(ppf))	0.0048				
d(log(int1))	0.4845				

CONCLUSIONS

Social Security System has a lot of problems that led to unsustainable structure for next periods. Inefficient contribution collecting methods, unregistered workers and decreasing working age population rate prevented more increasing social security contributions. Moreover, According to demographic statistic in Turkey, increase in elderly population is proportionally faster than increase in young population and elderly dependency rate increase quickly. On account of these causes, Social Security System will have a extra burden. On account of increasing elderly population rate, low retirement ages and structural problems, insurance spending shown more increasing trend. Social security budget faced much more increasing deficit year to year because pension spendings rose up more than social security contribution. In economic theory, debt is not sustainable until infinite. So, economic and fiscal conditions of social security system are unsustainable due to problems and budget deficits. Collecting efficient social security contribution, participation in the social security system at the maximum level and at an early age in the the social security system is required for solving social security burden. In addition, Other useful tools are used for these problems. One of other useful tools is Private Pension Plans. With Individual Retirement System, at same time, Private Pension firms realize more efficient expenditure than social security institutions. Thus, they contribute efficiency. Intercalarily, the post-retirement income level of the participants will increase and thus the burden of the social security system will be reduced. By using Private Pension Plans, low expenditure levels will causes equivalent social security budget.

Examined Individual Retirement System in Turkey, number of younger participants should be increased for increasing the cumulative funds and reducing the burden on the social security system. In addition, Automatic Enrollment System(AES) is more efficient than the the Individual Retirement System when analyzed their amount of contribution per capita, and the number of employees in the Automatic Enrollment System decreases significantly in the first months, but increases after periods. The Automatic Participation System has a positive effect in terms of the number of people the effectiveness of the contributions collected. When compared to the private pension

plans in USA and Turkey, USA has a variety private pension plans which differ in terms of returns and advantages/disadvantages. In this case, compared with Turkey, in terms of contribution to the pension systems of households in the United States, it has prepared the ground for the formation of a pension fund market with more elastic conditions. Thus, it increases the ability of employees and individuals to choose the most appropriate and most advantageous private pension plans for them, in other words, it increases the possibility of selecting private pension plans that can individually maximize their own benefit. For these reasons, it can be said that there is an increase in the volume of funds collected after the increase in participation in the private pension system. The causes of the private pension funds in Turkey to have low levels as volume and proportion are failure to provide sufficient funds due to the late establishment of the private pension system, insufficient awareness of the benefits of the private pension system in the society and not to establish an effective incentive mechanism pension plans with flexible conditions and establish pension plans with flexible conditions through legal regulations by the government.

Compared to invest the assets of the funds collected in private pension plans, the funds collected in Turkey is used for most public financing proportionally. In the United States, the funds collected in the private pension plans are concentrated in the private sector capital market instruments. Considering that one of the most important objectives of private pension plans is to accelerate growth by increasing investments, by providing cheaper financing of the private pension funds in Turkey will to channel these funds effective investment, these funds need to be directed private sector capital market instruments more.

When the capital markets in Turkey is analyzed, while the capital markets have a low weight in the financial sector, the banking sector is dominant in the financial sector. Due to the low tendency to create long-term loanable funds and at the same time providing more costly loanable funds than the capital markets sector, the banking sector leads to a higher cost of private sector borrowing, lower level of investments and lower growth rates. Nevertheless, capital markets provide longer-term and lower-cost funding to private sector. For all these reasons, the share of capital markets in the financial sector should be increased for a better macroeconomic balance. When

interpreted in terms of private pension funds, increasing the share of individual pension funds in the financial sector is important both to increase the share of the capital markets sector in finance sector and to achieve a better macroeconomic balance through the creation of long-term and low-cost funds. It is observed that the share of the public sector outstanding securities in the total outstanding securities decreased and the share of the private sector outstanding securities increased. If we interpret this situation in terms of pension funds, the need for more funds, as it shows an upward trend within the total outstanding securities, directing pension funds to more private sector securities will have better macroeconomic results. The large-scale increase and decrease in the total market value of BIST companies show that BIST companies are open to speculative movements and attacks which can transform these companies into a financially fragile structure through their total market values. From this perspective, by increasing the volume of private pension funds and directing them to the stocks could prevent speculative movements and attacks by achieving a stable structure of stock markets by avoiding large-scale increases and decreases in market values of BIST companies. Thus, these companies can be moved away from a financially fragile structure.

The savings rate in Turkey hasn't been a significant change. The consumption expenditures of households and non-profit institutions have the highest share among GDP components. Resident households have a high consumption propensity and that a certain portion of the high consumption volume could be converted into savings by means of private pension system, therefore, the propensity to saving could increase and there could be a significant increase in savings rate. In conclusion, private pension system could play an important role in eliminating the high consumption propensity of households and to increase savings. Developing countries with high growth rates, compared to the Turkey, has used proportionally more domestic savings to finance their investments, due to their higher savings rate. In Turkey, it is necessary to increase the current savings rates for bigger growth rates and for stability in the financial sector.

When examined the impact of the crisis on Turkey's Economy in 2008, the negative impact of the crisis on growth and unemployment rate were observed and that adverse effects decreased over time has been lost. During the crisis in 2008 when the

development of Individual Retirement System in Turkey is analyzed, the negative impact of the crisis has led to a reduction in the growth rate of the its indicators and fluctuations in the Individual Retirement System. In addition, the value of pension funds is influenced by the value of financial assets. When interpreted situation of capital markets in Turkey, there were high fluctuations in the stock markets in the 2008 Crisis. At the first year of the crisis, there was shrinkage, and in the next periods, negative effects of crisis decreased. On the other hand, a significant increase in outstanding is seen in the treasury bills market in 2008 and, after two years, outstanding in treasury bills decreased. In the bond market, there is an increase in outstanding in 2008, while it has significant increase in outstanding in 2009, and increase rate in outstanding decreased significantly in 2010.

The empirical analyses demonstrated us that total amount of participant's funds in Individual Retirement System influenced positively BIST100 index and Corporate Bond Market in the long term. This is meant that Individual Retirement System has positive effect stock and corporate bond markets. Moreover, there is unilateral causality between total amount of participant's funds in Individual Retirement System and total market value of corporate bonds in the short run. However, total amount of participant's funds in Individual Retirement System don't cause BIST100 index in the short run. In contrast, BIST100 index causes total amount of participant's funds in Individual Retirement System in the short run. When the portfolio distribution of the private pension funds in Turkey is examined, the share of public debt instruments is high compared to other assets. Corporate bonds and stocks are assets with the other high share in portfolio distribution of private pension funds. As the contributions collected in the Individual Retirement System have a positive impact on the stock exchange, the share of portfolio distribution of private pension funds should be increased more. Thus, companies will have less costly funding opportunities.

Increases in stocks are more efficient than bonds for causing more productive investment. Whereas, bonds are used mostly financing budget deficit and other public debt. So, portfolio distribution of Private Pension Funds are directed more stock markets by investment In addition, saving rates must increase more rapidly increasing growth and development in Turkey because some developing and developed countries

create high saving rate. Concluding remark is for higher saving rate, Individual Retirement System has to be used more actively and, Private Pension Funds have to be directed to more stock markets for higher level investment and growth rates.



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APPENDIX: Eviews Outputs

Null Hypothesis: LBIST100 has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-1.348566	0.6061
Test critical values:		
1% level	-3.470679	
5% level	-2.879155	
10% level	-2.576241	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LBIST100)
Method: Least Squares
Date: 01/18/19 Time: 12:00
Sample (adjusted): 10/16/2015 11/23/2018
Included observations: 163 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LBIST100(-1)	-0.019887	0.014747	-1.348566	0.1794
C	0.227939	0.168309	1.354293	0.1775
R-squared	0.011170	Mean dependent var		0.000984
Adjusted R-squared	0.005028	S.D. dependent var		0.028998
S.E. of regression	0.028925	Akaike info criterion		-4.236013
Sum squared resid	0.134703	Schwarz criterion		-4.198053
Log likelihood	347.2351	Hannan-Quinn criter.		-4.220602
F-statistic	1.818629	Durbin-Watson stat		2.263856
Prob(F-statistic)	0.179370			

Null Hypothesis: LBIST100 has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	0.415273	0.8018
Test critical values:		
1% level	-2.579226	
5% level	-1.942793	
10% level	-1.615408	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LBIST100)
Method: Least Squares
Date: 01/18/19 Time: 12:00
Sample (adjusted): 10/16/2015 11/23/2018
Included observations: 163 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LBIST100(-1)	8.26E-05	0.000199	0.415273	0.6785
R-squared	-0.000095	Mean dependent var		0.000984
Adjusted R-squared	-0.000095	S.D. dependent var		0.028998
S.E. of regression	0.029000	Akaike info criterion		-4.236955
Sum squared resid	0.136238	Schwarz criterion		-4.217975
Log likelihood	346.3119	Hannan-Quinn criter.		-4.229250
Durbin-Watson stat	2.283567			

Null Hypothesis: LBIST100 has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-1.523282	0.8178
Test critical values: 1% level	-4.015341	
5% level	-3.437629	
10% level	-3.143037	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LBIST100)
Method: Least Squares
Date: 01/18/19 Time: 12:00
Sample (adjusted): 10/16/2015 11/23/2018
Included observations: 163 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LBIST100(-1)	-0.035340	0.023200	-1.523282	0.1297
C	0.398924	0.260006	1.534289	0.1269
@TREND("10/09/2015")	6.54E-05	7.57E-05	0.863269	0.3893
R-squared	0.015754	Mean dependent var		0.000984
Adjusted R-squared	0.003451	S.D. dependent var		0.028998
S.E. of regression	0.028948	Akaike info criterion		-4.228390
Sum squared resid	0.134079	Schwarz criterion		-4.171450
Log likelihood	347.6138	Hannan-Quinn criter.		-4.205273
F-statistic	1.280492	Durbin-Watson stat		2.239408
Prob(F-statistic)	0.280733			

Null Hypothesis: D(LBIST100) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-14.60262	0.0000
Test critical values: 1% level	-3.470934	
5% level	-2.879267	
10% level	-2.576301	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LBIST100,2)
Method: Least Squares
Date: 01/18/19 Time: 12:01
Sample (adjusted): 10/23/2015 11/23/2018
Included observations: 162 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LBIST100(-1))	-1.142457	0.078236	-14.60262	0.0000
C	0.001195	0.002270	0.526377	0.5994
R-squared	0.571318	Mean dependent var		1.67E-05
Adjusted R-squared	0.568638	S.D. dependent var		0.043957
S.E. of regression	0.028870	Akaike info criterion		-4.239763
Sum squared resid	0.133356	Schwarz criterion		-4.201645
Log likelihood	345.4208	Hannan-Quinn criter.		-4.224286
F-statistic	213.2366	Durbin-Watson stat		1.992081
Prob(F-statistic)	0.000000			

Null Hypothesis: D(LBIST100) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-14.58645	0.0000
Test critical values:		
1% level	-4.015700	
5% level	-3.437801	
10% level	-3.143138	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LBIST100,2)
Method: Least Squares
Date: 01/18/19 Time: 12:01
Sample (adjusted): 10/23/2015 11/23/2018
Included observations: 162 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LBIST100(-1))	-1.144181	0.078441	-14.58645	0.0000
C	0.003643	0.004614	0.789568	0.4310
@TREND("10/09/2015")	-2.97E-05	4.86E-05	-0.609865	0.5428
R-squared	0.572318	Mean dependent var		1.67E-05
Adjusted R-squared	0.566938	S.D. dependent var		0.043957
S.E. of regression	0.028927	Akaike info criterion		-4.229754
Sum squared resid	0.133044	Schwarz criterion		-4.172576
Log likelihood	345.6101	Hannan-Quinn criter.		-4.206539
F-statistic	106.3858	Durbin-Watson stat		1.993262
Prob(F-statistic)	0.000000			

Null Hypothesis: D(LBIST100) has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-14.62601	0.0000
Test critical values:		
1% level	-2.579315	
5% level	-1.942805	
10% level	-1.615400	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LBIST100,2)
Method: Least Squares
Date: 01/18/19 Time: 12:01
Sample (adjusted): 10/23/2015 11/23/2018
Included observations: 162 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LBIST100(-1))	-1.140993	0.078011	-14.62601	0.0000
R-squared	0.570575	Mean dependent var		1.67E-05
Adjusted R-squared	0.570575	S.D. dependent var		0.043957
S.E. of regression	0.028805	Akaike info criterion		-4.250379
Sum squared resid	0.133587	Schwarz criterion		-4.231319
Log likelihood	345.2807	Hannan-Quinn criter.		-4.242640
Durbin-Watson stat	1.991582			

Null Hypothesis: LBIST100 has a unit root
Exogenous: Constant
Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-1.245406	0.6540
Test critical values:		
1% level	-3.470679	
5% level	-2.879155	
10% level	-2.576241	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.000826
HAC corrected variance (Bartlett kernel)	0.000668

Phillips-Perron Test Equation
Dependent Variable: D(LBIST100)
Method: Least Squares
Date: 01/18/19 Time: 12:01
Sample (adjusted): 10/16/2015 11/23/2018
Included observations: 163 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LBIST100(-1)	-0.019887	0.014747	-1.348566	0.1794
C	0.227939	0.168309	1.354293	0.1775
R-squared	0.011170	Mean dependent var		0.000984
Adjusted R-squared	0.005028	S.D. dependent var		0.028998
S.E. of regression	0.028925	Akaike info criterion		-4.236013
Sum squared resid	0.134703	Schwarz criterion		-4.198053
Log likelihood	347.2351	Hannan-Quinn criter.		-4.220602
F-statistic	1.818629	Durbin-Watson stat		2.263856
Prob(F-statistic)	0.179370			

Null Hypothesis: LBIST100 has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-1.372107	0.8656
Test critical values:		
1% level	-4.015341	
5% level	-3.437629	
10% level	-3.143037	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.000823
HAC corrected variance (Bartlett kernel)	0.000716

Phillips-Perron Test Equation
Dependent Variable: D(LBIST100)
Method: Least Squares
Date: 01/18/19 Time: 12:01
Sample (adjusted): 10/16/2015 11/23/2018
Included observations: 163 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LBIST100(-1)	-0.035340	0.023200	-1.523282	0.1297
C	0.398924	0.260006	1.534289	0.1269
@TREND("10/09/2015")	6.54E-05	7.57E-05	0.863269	0.3893
R-squared	0.015754	Mean dependent var		0.000984
Adjusted R-squared	0.003451	S.D. dependent var		0.028998
S.E. of regression	0.028948	Akaike info criterion		-4.228390
Sum squared resid	0.134079	Schwarz criterion		-4.171450
Log likelihood	347.6138	Hannan-Quinn criter.		-4.205273
F-statistic	1.280492	Durbin-Watson stat		2.239408
Prob(F-statistic)	0.280733			

Null Hypothesis: LBIST100 has a unit root
Exogenous: None
Bandwidth: 5 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	0.475805	0.8167
Test critical values:		
1% level	-2.579226	
5% level	-1.942793	
10% level	-1.615408	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.000836
HAC corrected variance (Bartlett kernel)	0.000648

Phillips-Perron Test Equation
Dependent Variable: D(LBIST100)
Method: Least Squares
Date: 01/18/19 Time: 12:02
Sample (adjusted): 10/16/2015 11/23/2018
Included observations: 163 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LBIST100(-1)	8.26E-05	0.000199	0.415273	0.6785
R-squared	-0.000095	Mean dependent var		0.000984
Adjusted R-squared	-0.000095	S.D. dependent var		0.028998
S.E. of regression	0.029000	Akaike info criterion		-4.236955
Sum squared resid	0.136238	Schwarz criterion		-4.217975
Log likelihood	346.3119	Hannan-Quinn criter.		-4.229250
Durbin-Watson stat	2.283567			

Null Hypothesis: D(LBIST100) has a unit root
Exogenous: Constant
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-14.60029	0.0000
Test critical values:		
1% level	-3.470934	
5% level	-2.879267	
10% level	-2.576301	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.000823
HAC corrected variance (Bartlett kernel)	0.000825

Phillips-Perron Test Equation
Dependent Variable: D(LBIST100,2)
Method: Least Squares
Date: 01/18/19 Time: 12:02
Sample (adjusted): 10/23/2015 11/23/2018
Included observations: 162 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LBIST100(-1))	-1.142457	0.078236	-14.60262	0.0000
C	0.001195	0.002270	0.526377	0.5994
R-squared	0.571318	Mean dependent var		1.67E-05
Adjusted R-squared	0.568638	S.D. dependent var		0.043957
S.E. of regression	0.028870	Akaike info criterion		-4.239763
Sum squared resid	0.133356	Schwarz criterion		-4.201645
Log likelihood	345.4208	Hannan-Quinn criter.		-4.224286
F-statistic	213.2366	Durbin-Watson stat		1.992081
Prob(F-statistic)	0.000000			

Null Hypothesis: D(LBIST100) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-14.62168	0.0000
Test critical values:		
1% level	-4.015700	
5% level	-3.437801	
10% level	-3.143138	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.000821
HAC corrected variance (Bartlett kernel)	0.000794

Phillips-Perron Test Equation
Dependent Variable: D(LBIST100,2)
Method: Least Squares
Date: 01/18/19 Time: 12:02
Sample (adjusted): 10/23/2015 11/23/2018
Included observations: 162 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LBIST100(-1))	-1.144181	0.078441	-14.58645	0.0000
C	0.003643	0.004614	0.789568	0.4310
@TREND("10/09/2015")	-2.97E-05	4.86E-05	-0.609865	0.5428
R-squared	0.572318	Mean dependent var		1.67E-05
Adjusted R-squared	0.566938	S.D. dependent var		0.043957
S.E. of regression	0.028927	Akaike info criterion		-4.229754
Sum squared resid	0.133044	Schwarz criterion		-4.172576
Log likelihood	345.6101	Hannan-Quinn criter.		-4.206539
F-statistic	106.3858	Durbin-Watson stat		1.993262
Prob(F-statistic)	0.000000			

Null Hypothesis: D(LBIST100) has a unit root
Exogenous: None
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-14.62220	0.0000
Test critical values:		
1% level	-2.579315	
5% level	-1.942805	
10% level	-1.615400	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.000825
HAC corrected variance (Bartlett kernel)	0.000828

Phillips-Perron Test Equation
Dependent Variable: D(LBIST100,2)
Method: Least Squares
Date: 01/18/19 Time: 12:02
Sample (adjusted): 10/23/2015 11/23/2018
Included observations: 162 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LBIST100(-1))	-1.140993	0.078011	-14.62601	0.0000
R-squared	0.570575	Mean dependent var		1.67E-05
Adjusted R-squared	0.570575	S.D. dependent var		0.043957
S.E. of regression	0.028805	Akaike info criterion		-4.250379
Sum squared resid	0.133587	Schwarz criterion		-4.231319
Log likelihood	345.2807	Hannan-Quinn criter.		-4.242640
Durbin-Watson stat	1.991582			

Null Hypothesis: LFPPF has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-1.723674	0.4175
Test critical values: 1% level	-3.470679	
5% level	-2.879155	
10% level	-2.576241	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LFPPF)
Method: Least Squares
Date: 01/18/19 Time: 12:03
Sample (adjusted): 10/16/2015 11/23/2018
Included observations: 163 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LFPPF(-1)	-0.004771	0.002768	-1.723674	0.0867
C	0.121930	0.068572	1.778117	0.0773
R-squared	0.018119	Mean dependent var		0.003737
Adjusted R-squared	0.012021	S.D. dependent var		0.006686
S.E. of regression	0.006646	Akaike info criterion		-7.177479
Sum squared resid	0.007111	Schwarz criterion		-7.139519
Log likelihood	586.9646	Hannan-Quinn criter.		-7.162068
F-statistic	2.971053	Durbin-Watson stat		2.185289
Prob(F-statistic)	0.086686			

Null Hypothesis: LFPPF has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-1.370984	0.8659
Test critical values: 1% level	-4.015341	
5% level	-3.437629	
10% level	-3.143037	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LFPPF)
Method: Least Squares
Date: 01/18/19 Time: 12:03
Sample (adjusted): 10/16/2015 11/23/2018
Included observations: 163 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LFPPF(-1)	-0.039957	0.029145	-1.370984	0.1723
C	0.982110	0.712570	1.378265	0.1700
@TREND("10/09/2015")	0.000141	0.000116	1.212764	0.2270
R-squared	0.027063	Mean dependent var		0.003737
Adjusted R-squared	0.014901	S.D. dependent var		0.006686
S.E. of regression	0.006636	Akaike info criterion		-7.174360
Sum squared resid	0.007046	Schwarz criterion		-7.117420
Log likelihood	587.7103	Hannan-Quinn criter.		-7.151243
F-statistic	2.225269	Durbin-Watson stat		2.129467
Prob(F-statistic)	0.111372			

Null Hypothesis: LFPPF has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	7.117921	1.0000
Test critical values: 1% level	-2.579226	
5% level	-1.942793	
10% level	-1.615408	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LFPPF)
Method: Least Squares
Date: 01/18/19 Time: 12:03
Sample (adjusted): 10/16/2015 11/23/2018
Included observations: 163 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LFPPF(-1)	0.000151	2.11E-05	7.117921	0.0000
R-squared	-0.001163	Mean dependent var		0.003737
Adjusted R-squared	-0.001163	S.D. dependent var		0.006686
S.E. of regression	0.006690	Akaike info criterion		-7.170302
Sum squared resid	0.007250	Schwarz criterion		-7.151322
Log likelihood	585.3796	Hannan-Quinn criter.		-7.162596
Durbin-Watson stat	2.153766			

Null Hypothesis: D(LFPPF) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-13.69628	0.0000
Test critical values: 1% level	-3.470934	
5% level	-2.879267	
10% level	-2.576301	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LFPPF,2)
Method: Least Squares
Date: 01/18/19 Time: 12:03
Sample (adjusted): 10/23/2015 11/23/2018
Included observations: 162 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LFPPF(-1))	-1.085493	0.079255	-13.69628	0.0000
C	0.004050	0.000606	6.679279	0.0000
R-squared	0.539685	Mean dependent var		-6.95E-05
Adjusted R-squared	0.536808	S.D. dependent var		0.009847
S.E. of regression	0.006702	Akaike info criterion		-7.160554
Sum squared resid	0.007187	Schwarz criterion		-7.122435
Log likelihood	582.0048	Hannan-Quinn criter.		-7.145077
F-statistic	187.5882	Durbin-Watson stat		1.998928
Prob(F-statistic)	0.000000			

Null Hypothesis: D(LFPPF) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-13.88265	0.0000
Test critical values: 1% level	-4.015700	
5% level	-3.437801	
10% level	-3.143138	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LFPPF,2)
Method: Least Squares
Date: 01/18/19 Time: 12:04
Sample (adjusted): 10/23/2015 11/23/2018
Included observations: 162 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LFPPF(-1))	-1.100603	0.079279	-13.88265	0.0000
C	0.005695	0.001136	5.013390	0.0000
@TREND("10/09/2015")	-1.92E-05	1.13E-05	-1.708017	0.0896
R-squared	0.547979	Mean dependent var		-6.95E-05
Adjusted R-squared	0.542293	S.D. dependent var		0.009847
S.E. of regression	0.006662	Akaike info criterion		-7.166390
Sum squared resid	0.007057	Schwarz criterion		-7.109212
Log likelihood	583.4776	Hannan-Quinn criter.		-7.143175
F-statistic	96.37672	Durbin-Watson stat		2.008504
Prob(F-statistic)	0.000000			

Null Hypothesis: D(LFPPF) has a unit root
Exogenous: None
Lag Length: 5 (Automatic - based on SIC, maxlag=13)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-2.528099	0.0115
Test critical values: 1% level	-2.579774	
5% level	-1.942869	
10% level	-1.615359	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LFPPF,2)
Method: Least Squares
Date: 01/18/19 Time: 12:04
Sample (adjusted): 11/27/2015 11/23/2018
Included observations: 157 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LFPPF(-1))	-0.315992	0.124992	-2.528099	0.0125
D(LFPPF(-1),2)	-0.665035	0.129973	-5.116724	0.0000
D(LFPPF(-2),2)	-0.660426	0.131587	-5.018952	0.0000
D(LFPPF(-3),2)	-0.502924	0.127169	-3.954777	0.0001
D(LFPPF(-4),2)	-0.311449	0.109163	-2.853055	0.0049
D(LFPPF(-5),2)	-0.222450	0.079147	-2.810583	0.0056
R-squared	0.514172	Mean dependent var		-5.40E-05
Adjusted R-squared	0.498085	S.D. dependent var		0.009904
S.E. of regression	0.007017	Akaike info criterion		-7.043573
Sum squared resid	0.007434	Schwarz criterion		-6.926774
Log likelihood	558.9205	Hannan-Quinn criter.		-6.996137
Durbin-Watson stat	1.989761			

Null Hypothesis: LFPPF has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-1.092087	0.9264
Test critical values:		
1% level	-4.015341	
5% level	-3.437629	
10% level	-3.143037	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	4.32E-05
HAC corrected variance (Bartlett kernel)	3.65E-05

Phillips-Perron Test Equation
Dependent Variable: D(LFPPF)
Method: Least Squares
Date: 01/18/19 Time: 12:05
Sample (adjusted): 10/16/2015 11/23/2018
Included observations: 163 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LFPPF(-1)	-0.039957	0.029145	-1.370984	0.1723
C	0.982110	0.712570	1.378265	0.1700
@TREND("10/09/2015")	0.000141	0.000116	1.212764	0.2270
R-squared	0.027063	Mean dependent var		0.003737
Adjusted R-squared	0.014901	S.D. dependent var		0.006686
S.E. of regression	0.006636	Akaike info criterion		-7.174360
Sum squared resid	0.007046	Schwarz criterion		-7.117420
Log likelihood	587.7103	Hannan-Quinn criter.		-7.151243
F-statistic	2.225269	Durbin-Watson stat		2.129467
Prob(F-statistic)	0.111372			

Null Hypothesis: LFPPF has a unit root
Exogenous: Constant
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-1.791302	0.3838
Test critical values:		
1% level	-3.470679	
5% level	-2.879155	
10% level	-2.576241	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	4.36E-05
HAC corrected variance (Bartlett kernel)	3.94E-05

Phillips-Perron Test Equation
Dependent Variable: D(LFPPF)
Method: Least Squares
Date: 01/18/19 Time: 12:04
Sample (adjusted): 10/16/2015 11/23/2018
Included observations: 163 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LFPPF(-1)	-0.004771	0.002768	-1.723674	0.0867
C	0.121930	0.068572	1.778117	0.0773
R-squared	0.018119	Mean dependent var		0.003737
Adjusted R-squared	0.012021	S.D. dependent var		0.006686
S.E. of regression	0.006646	Akaike info criterion		-7.177479
Sum squared resid	0.007111	Schwarz criterion		-7.139519
Log likelihood	586.9646	Hannan-Quinn criter.		-7.162068
F-statistic	2.971053	Durbin-Watson stat		2.185289
Prob(F-statistic)	0.086686			

Null Hypothesis: LFPPF has a unit root

Exogenous: None

Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	7.825432	1.0000
Test critical values:		
1% level	-2.579226	
5% level	-1.942793	
10% level	-1.615408	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	4.45E-05
HAC corrected variance (Bartlett kernel)	3.68E-05

Phillips-Perron Test Equation

Dependent Variable: D(LFPPF)

Method: Least Squares

Date: 01/18/19 Time: 12:05

Sample (adjusted): 10/16/2015 11/23/2018

Included observations: 163 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LFPPF(-1)	0.000151	2.11E-05	7.117921	0.0000
R-squared	-0.001163	Mean dependent var		0.003737
Adjusted R-squared	-0.001163	S.D. dependent var		0.006686
S.E. of regression	0.006690	Akaike info criterion		-7.170302
Sum squared resid	0.007250	Schwarz criterion		-7.151322
Log likelihood	585.3796	Hannan-Quinn criter.		-7.162596
Durbin-Watson stat	2.153766			

Null Hypothesis: D(LFPPF) has a unit root

Exogenous: Constant

Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-13.75529	0.0000
Test critical values:		
1% level	-3.470934	
5% level	-2.879267	
10% level	-2.576301	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	4.44E-05
HAC corrected variance (Bartlett kernel)	4.04E-05

Phillips-Perron Test Equation

Dependent Variable: D(LFPPF,2)

Method: Least Squares

Date: 01/18/19 Time: 12:05

Sample (adjusted): 10/23/2015 11/23/2018

Included observations: 162 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LFPPF(-1))	-1.085493	0.079255	-13.69628	0.0000
C	0.004050	0.000606	6.679279	0.0000
R-squared	0.539685	Mean dependent var		-6.95E-05
Adjusted R-squared	0.536808	S.D. dependent var		0.009847
S.E. of regression	0.006702	Akaike info criterion		-7.160554
Sum squared resid	0.007187	Schwarz criterion		-7.122435
Log likelihood	582.0048	Hannan-Quinn criter.		-7.145077
F-statistic	187.5882	Durbin-Watson stat		1.998928
Prob(F-statistic)	0.000000			

Null Hypothesis: D(LFPPF) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-13.88998	0.0000
Test critical values:		
1% level	-4.015700	
5% level	-3.437801	
10% level	-3.143138	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	4.36E-05
HAC corrected variance (Bartlett kernel)	4.30E-05

Phillips-Perron Test Equation
Dependent Variable: D(LFPPF,2)
Method: Least Squares
Date: 01/18/19 Time: 12:05
Sample (adjusted): 10/23/2015 11/23/2018
Included observations: 162 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LFPPF(-1))	-1.100603	0.079279	-13.88265	0.0000
C	0.005695	0.001136	5.013390	0.0000
@TREND("10/09/2015")	-1.92E-05	1.13E-05	-1.708017	0.0896
R-squared	0.547979	Mean dependent var		-6.95E-05
Adjusted R-squared	0.542293	S.D. dependent var		0.009847
S.E. of regression	0.006662	Akaike info criterion		-7.166390
Sum squared resid	0.007057	Schwarz criterion		-7.109212
Log likelihood	583.4776	Hannan-Quinn criter.		-7.143175
F-statistic	96.37672	Durbin-Watson stat		2.008504
Prob(F-statistic)	0.000000			

Null Hypothesis: D(LFPPF) has a unit root
Exogenous: None
Bandwidth: 8 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-11.84648	0.0000
Test critical values:		
1% level	-2.579315	
5% level	-1.942805	
10% level	-1.615400	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	5.67E-05
HAC corrected variance (Bartlett kernel)	0.000110

Phillips-Perron Test Equation
Dependent Variable: D(LFPPF,2)
Method: Least Squares
Date: 01/18/19 Time: 12:05
Sample (adjusted): 10/23/2015 11/23/2018
Included observations: 162 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LFPPF(-1))	-0.822912	0.077580	-10.60727	0.0000
R-squared	0.411336	Mean dependent var		-6.95E-05
Adjusted R-squared	0.411336	S.D. dependent var		0.009847
S.E. of regression	0.007555	Akaike info criterion		-6.926954
Sum squared resid	0.009191	Schwarz criterion		-6.907895
Log likelihood	562.0833	Hannan-Quinn criter.		-6.919216
Durbin-Watson stat	2.047243			

Null Hypothesis: LEURO has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	0.271058	0.9761
Test critical values: 1% level	-3.470679	
5% level	-2.879155	
10% level	-2.576241	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LEURO)
Method: Least Squares
Date: 01/18/19 Time: 12:06
Sample (adjusted): 10/16/2015 11/23/2018
Included observations: 163 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LEURO(-1)	0.001984	0.007319	0.271058	0.7867
C	0.000862	0.010480	0.082297	0.9345
R-squared	0.000456	Mean dependent var		0.003666
Adjusted R-squared	-0.005752	S.D. dependent var		0.021597
S.E. of regression	0.021659	Akaike info criterion		-4.814633
Sum squared resid	0.075524	Schwarz criterion		-4.776672
Log likelihood	394.3926	Hannan-Quinn criter.		-4.799221
F-statistic	0.073473	Durbin-Watson stat		1.686117
Prob(F-statistic)	0.786693			

Null Hypothesis: LEURO has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-2.478926	0.3382
Test critical values: 1% level	-4.015341	
5% level	-3.437629	
10% level	-3.143037	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LEURO)
Method: Least Squares
Date: 01/18/19 Time: 12:06
Sample (adjusted): 10/16/2015 11/23/2018
Included observations: 163 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LEURO(-1)	-0.052869	0.021328	-2.478926	0.0142
C	0.054839	0.022275	2.461947	0.0149
@TREND("10/09/2015")	0.000287	0.000105	2.731214	0.0070
R-squared	0.044981	Mean dependent var		0.003666
Adjusted R-squared	0.033043	S.D. dependent var		0.021597
S.E. of regression	0.021237	Akaike info criterion		-4.847930
Sum squared resid	0.072160	Schwarz criterion		-4.790990
Log likelihood	398.1063	Hannan-Quinn criter.		-4.824813
F-statistic	3.767975	Durbin-Watson stat		1.671269
Prob(F-statistic)	0.025174			

Null Hypothesis: LEURO has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	2.182856	0.9932
Test critical values: 1% level	-2.579226	
5% level	-1.942793	
10% level	-1.615408	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LEURO)
Method: Least Squares
Date: 01/18/19 Time: 12:06
Sample (adjusted): 10/16/2015 11/23/2018
Included observations: 163 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LEURO(-1)	0.002578	0.001181	2.182856	0.0305
R-squared	0.000414	Mean dependent var		0.003666
Adjusted R-squared	0.000414	S.D. dependent var		0.021597
S.E. of regression	0.021592	Akaike info criterion		-4.826860
Sum squared resid	0.075528	Schwarz criterion		-4.807880
Log likelihood	394.3891	Hannan-Quinn criter.		-4.819155
Durbin-Watson stat	1.687048			

Null Hypothesis: D(LEURO) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-10.77979	0.0000
Test critical values: 1% level	-3.470934	
5% level	-2.879267	
10% level	-2.576301	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LEURO,2)
Method: Least Squares
Date: 01/18/19 Time: 12:06
Sample (adjusted): 10/23/2015 11/23/2018
Included observations: 162 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LEURO(-1))	-0.843216	0.078222	-10.77979	0.0000
C	0.003131	0.001711	1.829680	0.0692
R-squared	0.420718	Mean dependent var		-5.82E-05
Adjusted R-squared	0.417097	S.D. dependent var		0.028096
S.E. of regression	0.021451	Akaike info criterion		-4.833850
Sum squared resid	0.073621	Schwarz criterion		-4.795732
Log likelihood	393.5418	Hannan-Quinn criter.		-4.818373
F-statistic	116.2039	Durbin-Watson stat		2.025734
Prob(F-statistic)	0.000000			

Null Hypothesis: D(LEURO) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-10.81218	0.0000
Test critical values: 1% level	-4.015700	
5% level	-3.437801	
10% level	-3.143138	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LEURO,2)
Method: Least Squares
Date: 01/18/19 Time: 12:07
Sample (adjusted): 10/23/2015 11/23/2018
Included observations: 162 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LEURO(-1))	-0.850560	0.078667	-10.81218	0.0000
C	0.000411	0.003419	0.120058	0.9046
@TREND("10/09/2015")	3.33E-05	3.62E-05	0.919040	0.3595
R-squared	0.423779	Mean dependent var	-5.82E-05	
Adjusted R-squared	0.416531	S.D. dependent var	0.028096	
S.E. of regression	0.021461	Akaike info criterion	-4.826802	
Sum squared resid	0.073232	Schwarz criterion	-4.769625	
Log likelihood	393.9710	Hannan-Quinn criter.	-4.803587	
F-statistic	58.46786	Durbin-Watson stat	2.020473	
Prob(F-statistic)	0.000000			

Null Hypothesis: D(LEURO) has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-10.54682	0.0000
Test critical values: 1% level	-2.579315	
5% level	-1.942805	
10% level	-1.615400	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LEURO,2)
Method: Least Squares
Date: 01/18/19 Time: 12:07
Sample (adjusted): 10/23/2015 11/23/2018
Included observations: 162 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LEURO(-1))	-0.818471	0.077604	-10.54682	0.0000
R-squared	0.408597	Mean dependent var	-5.82E-05	
Adjusted R-squared	0.408597	S.D. dependent var	0.028096	
S.E. of regression	0.021607	Akaike info criterion	-4.825488	
Sum squared resid	0.075162	Schwarz criterion	-4.806429	
Log likelihood	391.8645	Hannan-Quinn criter.	-4.817750	
Durbin-Watson stat	2.038171			

Null Hypothesis: LEURO has a unit root
Exogenous: Constant
Bandwidth: 6 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-0.065134	0.9502
Test critical values:		
1% level	-3.470679	
5% level	-2.879155	
10% level	-2.576241	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.000463
HAC corrected variance (Bartlett kernel)	0.000740

Phillips-Perron Test Equation
Dependent Variable: D(LEURO)
Method: Least Squares
Date: 01/18/19 Time: 12:08
Sample (adjusted): 10/16/2015 11/23/2018
Included observations: 163 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LEURO(-1)	0.001984	0.007319	0.271058	0.7867
C	0.000862	0.010480	0.082297	0.9345
R-squared	0.000456	Mean dependent var		0.003666
Adjusted R-squared	-0.005752	S.D. dependent var		0.021597
S.E. of regression	0.021659	Akaike info criterion		-4.814633
Sum squared resid	0.075524	Schwarz criterion		-4.776672
Log likelihood	394.3926	Hannan-Quinn criter.		-4.799221
F-statistic	0.073473	Durbin-Watson stat		1.686117
Prob(F-statistic)	0.786693			

Null Hypothesis: LEURO has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 6 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-2.798890	0.1999
Test critical values:		
1% level	-4.015341	
5% level	-3.437629	
10% level	-3.143037	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.000443
HAC corrected variance (Bartlett kernel)	0.000728

Phillips-Perron Test Equation
Dependent Variable: D(LEURO)
Method: Least Squares
Date: 01/18/19 Time: 12:08
Sample (adjusted): 10/16/2015 11/23/2018
Included observations: 163 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LEURO(-1)	-0.052869	0.021328	-2.478926	0.0142
C	0.054839	0.022275	2.461947	0.0149
@TREND("10/09/2015")	0.000287	0.000105	2.731214	0.0070
R-squared	0.044981	Mean dependent var		0.003666
Adjusted R-squared	0.033043	S.D. dependent var		0.021597
S.E. of regression	0.021237	Akaike info criterion		-4.847930
Sum squared resid	0.072160	Schwarz criterion		-4.790990
Log likelihood	398.1063	Hannan-Quinn criter.		-4.824813
F-statistic	3.767975	Durbin-Watson stat		1.671269
Prob(F-statistic)	0.025174			

Null Hypothesis: LEURO has a unit root
Exogenous: None
Bandwidth: 6 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	1.684624	0.9776
Test critical values:		
1% level	-2.579226	
5% level	-1.942793	
10% level	-1.615408	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.000463
HAC corrected variance (Bartlett kernel)	0.000738

Phillips-Perron Test Equation
Dependent Variable: D(LEURO)
Method: Least Squares
Date: 01/18/19 Time: 12:08
Sample (adjusted): 10/16/2015 11/23/2018
Included observations: 163 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LEURO(-1)	0.002578	0.001181	2.182856	0.0305
R-squared	0.000414	Mean dependent var		0.003666
Adjusted R-squared	0.000414	S.D. dependent var		0.021597
S.E. of regression	0.021592	Akaike info criterion		-4.826860
Sum squared resid	0.075528	Schwarz criterion		-4.807880
Log likelihood	394.3891	Hannan-Quinn criter.		-4.819155
Durbin-Watson stat	1.687048			

Null Hypothesis: D(LEURO) has a unit root
Exogenous: Constant
Bandwidth: 5 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-10.99842	0.0000
Test critical values:		
1% level	-3.470934	
5% level	-2.879267	
10% level	-2.576301	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.000454
HAC corrected variance (Bartlett kernel)	0.000549

Phillips-Perron Test Equation
Dependent Variable: D(LEURO,2)
Method: Least Squares
Date: 01/18/19 Time: 12:08
Sample (adjusted): 10/23/2015 11/23/2018
Included observations: 162 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LEURO(-1))	-0.843216	0.078222	-10.77979	0.0000
C	0.003131	0.001711	1.829680	0.0692
R-squared	0.420718	Mean dependent var		-5.82E-05
Adjusted R-squared	0.417097	S.D. dependent var		0.028096
S.E. of regression	0.021451	Akaike info criterion		-4.833850
Sum squared resid	0.073621	Schwarz criterion		-4.795732
Log likelihood	393.5418	Hannan-Quinn criter.		-4.818373
F-statistic	116.2039	Durbin-Watson stat		2.025734
Prob(F-statistic)	0.000000			

Null Hypothesis: D(LEURO) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 5 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-11.02188	0.0000
Test critical values:		
1% level	-4.015700	
5% level	-3.437801	
10% level	-3.143138	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.000452
HAC corrected variance (Bartlett kernel)	0.000542

Phillips-Perron Test Equation
Dependent Variable: D(LEURO,2)
Method: Least Squares
Date: 01/18/19 Time: 12:09
Sample (adjusted): 10/23/2015 11/23/2018
Included observations: 162 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LEURO(-1))	-0.850560	0.078667	-10.81218	0.0000
C	0.000411	0.003419	0.120058	0.9046
@TREND("10/09/2015")	3.33E-05	3.62E-05	0.919040	0.3595
R-squared	0.423779	Mean dependent var	-5.82E-05	
Adjusted R-squared	0.416531	S.D. dependent var	0.028096	
S.E. of regression	0.021461	Akaike info criterion	-4.826802	
Sum squared resid	0.073232	Schwarz criterion	-4.769625	
Log likelihood	393.9710	Hannan-Quinn criter.	-4.803587	
F-statistic	58.46786	Durbin-Watson stat	2.020473	
Prob(F-statistic)	0.000000			

Null Hypothesis: D(LEURO) has a unit root
Exogenous: None
Bandwidth: 6 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-10.89169	0.0000
Test critical values:		
1% level	-2.579315	
5% level	-1.942805	
10% level	-1.615400	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.000464
HAC corrected variance (Bartlett kernel)	0.000601

Phillips-Perron Test Equation
Dependent Variable: D(LEURO,2)
Method: Least Squares
Date: 01/18/19 Time: 12:09
Sample (adjusted): 10/23/2015 11/23/2018
Included observations: 162 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LEURO(-1))	-0.818471	0.077604	-10.54682	0.0000
R-squared	0.408597	Mean dependent var	-5.82E-05	
Adjusted R-squared	0.408597	S.D. dependent var	0.028096	
S.E. of regression	0.021607	Akaike info criterion	-4.825488	
Sum squared resid	0.075162	Schwarz criterion	-4.806429	
Log likelihood	391.8645	Hannan-Quinn criter.	-4.817750	
Durbin-Watson stat	2.038171			

Null Hypothesis: LINT has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	1.590054	0.9995
Test critical values: 1% level	-3.470679	
5% level	-2.879155	
10% level	-2.576241	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LINT)
Method: Least Squares
Date: 01/18/19 Time: 12:09
Sample (adjusted): 10/16/2015 11/23/2018
Included observations: 163 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LINT(-1)	0.015374	0.009669	1.590054	0.1138
C	-0.034817	0.024817	-1.402923	0.1626
R-squared	0.015461	Mean dependent var		0.004498
Adjusted R-squared	0.009346	S.D. dependent var		0.027334
S.E. of regression	0.027206	Akaike info criterion		-4.358573
Sum squared resid	0.119166	Schwarz criterion		-4.320613
Log likelihood	357.2237	Hannan-Quinn criter.		-4.343162
F-statistic	2.528273	Durbin-Watson stat		2.006478
Prob(F-statistic)	0.113784			

Null Hypothesis: LINT has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-0.517785	0.9819
Test critical values: 1% level	-4.015341	
5% level	-3.437629	
10% level	-3.143037	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LINT)
Method: Least Squares
Date: 01/18/19 Time: 12:09
Sample (adjusted): 10/16/2015 11/23/2018
Included observations: 163 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LINT(-1)	-0.007817	0.015098	-0.517785	0.6053
C	0.012964	0.034391	0.376964	0.7067
@TREND("10/09/2015")	0.000141	7.07E-05	1.987609	0.0486
R-squared	0.039184	Mean dependent var		0.004498
Adjusted R-squared	0.027174	S.D. dependent var		0.027334
S.E. of regression	0.026960	Akaike info criterion		-4.370695
Sum squared resid	0.116294	Schwarz criterion		-4.313754
Log likelihood	359.2116	Hannan-Quinn criter.		-4.347577
F-statistic	3.262598	Durbin-Watson stat		2.008862
Prob(F-statistic)	0.040851			

Null Hypothesis: LINT has a unit root
Exogenous: None
Lag Length: 5 (Automatic - based on SIC, maxlag=13)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	1.599739	0.9731
Test critical values: 1% level	-2.579680	
5% level	-1.942856	
10% level	-1.615368	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LINT)
Method: Least Squares
Date: 01/18/19 Time: 12:10
Sample (adjusted): 11/20/2015 11/23/2018
Included observations: 158 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LINT(-1)	0.001386	0.000867	1.599739	0.1117
D(LINT(-1))	0.085774	0.078592	1.091391	0.2768
D(LINT(-2))	0.205443	0.076046	2.701563	0.0077
D(LINT(-3))	0.004728	0.077753	0.060810	0.9516
D(LINT(-4))	-0.265928	0.076718	-3.466321	0.0007
D(LINT(-5))	0.257957	0.079412	3.248357	0.0014
R-squared	0.160913	Mean dependent var		0.004837
Adjusted R-squared	0.133311	S.D. dependent var		0.027663
S.E. of regression	0.025753	Akaike info criterion		-4.443299
Sum squared resid	0.100809	Schwarz criterion		-4.326998
Log likelihood	357.0206	Hannan-Quinn criter.		-4.396067
Durbin-Watson stat	2.016311			

Null Hypothesis: D(LINT) has a unit root
Exogenous: Constant
Lag Length: 4 (Automatic - based on SIC, maxlag=13)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-4.550595	0.0002
Test critical values: 1% level	-3.471987	
5% level	-2.879727	
10% level	-2.576546	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LINT,2)
Method: Least Squares
Date: 01/18/19 Time: 12:10
Sample (adjusted): 11/20/2015 11/23/2018
Included observations: 158 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LINT(-1))	-0.695696	0.152880	-4.550595	0.0000
D(LINT(-1),2)	-0.215065	0.134180	-1.602805	0.1111
D(LINT(-2),2)	-0.007064	0.122730	-0.057558	0.9542
D(LINT(-3),2)	0.000113	0.108445	0.001045	0.9992
D(LINT(-4),2)	-0.262136	0.079068	-3.315342	0.0011
C	0.003372	0.002185	1.543352	0.1248
R-squared	0.570136	Mean dependent var		2.16E-05
Adjusted R-squared	0.555996	S.D. dependent var		0.038671
S.E. of regression	0.025768	Akaike info criterion		-4.442151
Sum squared resid	0.100924	Schwarz criterion		-4.325850
Log likelihood	356.9300	Hannan-Quinn criter.		-4.394920
F-statistic	40.32008	Durbin-Watson stat		2.018449
Prob(F-statistic)	0.000000			

Null Hypothesis: D(LINT) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 4 (Automatic - based on SIC, maxlag=13)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-4.935965	0.0004
Test critical values:		
1% level	-4.017185	
5% level	-3.438515	
10% level	-3.143558	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LINT,2)
Method: Least Squares
Date: 01/18/19 Time: 12:10
Sample (adjusted): 11/20/2015 11/23/2018
Included observations: 158 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LINT(-1))	-0.831670	0.168492	-4.935965	0.0000
D(LINT(-1),2)	-0.108995	0.144906	-0.752175	0.4531
D(LINT(-2),2)	0.077801	0.130089	0.598055	0.5507
D(LINT(-3),2)	0.066254	0.113354	0.584488	0.5598
D(LINT(-4),2)	-0.225080	0.080952	-2.780418	0.0061
C	-0.003717	0.004398	-0.845257	0.3993
@TREND("10/09/2015")	9.19E-05	4.96E-05	1.852881	0.0659
R-squared	0.579692	Mean dependent var		2.16E-05
Adjusted R-squared	0.562991	S.D. dependent var		0.038671
S.E. of regression	0.025564	Akaike info criterion		-4.451975
Sum squared resid	0.098681	Schwarz criterion		-4.316290
Log likelihood	358.7060	Hannan-Quinn criter.		-4.396872
F-statistic	34.71012	Durbin-Watson stat		2.002212
Prob(F-statistic)	0.000000			

Null Hypothesis: D(LINT) has a unit root
Exogenous: None
Lag Length: 4 (Automatic - based on SIC, maxlag=13)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-4.261816	0.0000
Test critical values:		
1% level	-2.579680	
5% level	-1.942856	
10% level	-1.615368	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LINT,2)
Method: Least Squares
Date: 01/18/19 Time: 12:10
Sample (adjusted): 11/20/2015 11/23/2018
Included observations: 158 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LINT(-1))	-0.614018	0.144074	-4.261816	0.0000
D(LINT(-1),2)	-0.277179	0.128579	-2.155713	0.0327
D(LINT(-2),2)	-0.054455	0.119362	-0.456217	0.6489
D(LINT(-3),2)	-0.035981	0.106370	-0.338267	0.7356
D(LINT(-4),2)	-0.282588	0.078301	-3.609008	0.0004
R-squared	0.563400	Mean dependent var		2.16E-05
Adjusted R-squared	0.551986	S.D. dependent var		0.038671
S.E. of regression	0.025884	Akaike info criterion		-4.439261
Sum squared resid	0.102506	Schwarz criterion		-4.342343
Log likelihood	355.7016	Hannan-Quinn criter.		-4.399901
Durbin-Watson stat	2.027928			

Null Hypothesis: LINT has a unit root

Exogenous: Constant

Bandwidth: 7 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	1.405784	0.9990
Test critical values:		
1% level	-3.470679	
5% level	-2.879155	
10% level	-2.576241	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.000731
HAC corrected variance (Bartlett kernel)	0.000823

Phillips-Perron Test Equation

Dependent Variable: D(LINT)

Method: Least Squares

Date: 01/18/19 Time: 12:11

Sample (adjusted): 10/16/2015 11/23/2018

Included observations: 163 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LINT(-1)	0.015374	0.009669	1.590054	0.1138
C	-0.034817	0.024817	-1.402923	0.1626
R-squared	0.015461	Mean dependent var		0.004498
Adjusted R-squared	0.009346	S.D. dependent var		0.027334
S.E. of regression	0.027206	Akaike info criterion		-4.358573
Sum squared resid	0.119166	Schwarz criterion		-4.320613
Log likelihood	357.2237	Hannan-Quinn criter.		-4.343162
F-statistic	2.528273	Durbin-Watson stat		2.006478
Prob(F-statistic)	0.113784			

Null Hypothesis: LINT has a unit root

Exogenous: Constant, Linear Trend

Bandwidth: 7 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-0.645164	0.9747
Test critical values:		
1% level	-4.015341	
5% level	-3.437629	
10% level	-3.143037	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.000713
HAC corrected variance (Bartlett kernel)	0.000814

Phillips-Perron Test Equation

Dependent Variable: D(LINT)

Method: Least Squares

Date: 01/18/19 Time: 12:11

Sample (adjusted): 10/16/2015 11/23/2018

Included observations: 163 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LINT(-1)	-0.007817	0.015098	-0.517785	0.6053
C	0.012964	0.034391	0.376964	0.7067
@TREND("10/09/2015")	0.000141	7.07E-05	1.987609	0.0486
R-squared	0.039184	Mean dependent var		0.004498
Adjusted R-squared	0.027174	S.D. dependent var		0.027334
S.E. of regression	0.026960	Akaike info criterion		-4.370695
Sum squared resid	0.116294	Schwarz criterion		-4.313754
Log likelihood	359.2116	Hannan-Quinn criter.		-4.347577
F-statistic	3.262598	Durbin-Watson stat		2.008862
Prob(F-statistic)	0.040851			

Null Hypothesis: LINT has a unit root
Exogenous: None
Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	1.987541	0.9889
Test critical values:		
1% level	-2.579226	
5% level	-1.942793	
10% level	-1.615408	
*MacKinnon (1996) one-sided p-values.		
Residual variance (no correction)		0.000740
HAC corrected variance (Bartlett kernel)		0.000920

Phillips-Perron Test Equation
Dependent Variable: D(LINT)
Method: Least Squares
Date: 01/18/19 Time: 12:11
Sample (adjusted): 10/16/2015 11/23/2018
Included observations: 163 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LINT(-1)	0.001859	0.000833	2.233070	0.0269
R-squared	0.003425	Mean dependent var		0.004498
Adjusted R-squared	0.003425	S.D. dependent var		0.027334
S.E. of regression	0.027287	Akaike info criterion		-4.358692
Sum squared resid	0.120623	Schwarz criterion		-4.339712
Log likelihood	356.2334	Hannan-Quinn criter.		-4.350987
Durbin-Watson stat	1.955621			

Null Hypothesis: D(LINT) has a unit root
Exogenous: Constant
Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-12.39364	0.0000
Test critical values:		
1% level	-3.470934	
5% level	-2.879267	
10% level	-2.576301	
*MacKinnon (1996) one-sided p-values.		
Residual variance (no correction)		0.000746
HAC corrected variance (Bartlett kernel)		0.000877

Phillips-Perron Test Equation
Dependent Variable: D(LINT,2)
Method: Least Squares
Date: 01/18/19 Time: 12:11
Sample (adjusted): 10/23/2015 11/23/2018
Included observations: 162 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LINT(-1))	-0.973212	0.078986	-12.32125	0.0000
C	0.004448	0.002188	2.032955	0.0437
R-squared	0.486872	Mean dependent var		5.86E-05
Adjusted R-squared	0.483665	S.D. dependent var		0.038242
S.E. of regression	0.027479	Akaike info criterion		-4.338502
Sum squared resid	0.120817	Schwarz criterion		-4.300384
Log likelihood	353.4187	Hannan-Quinn criter.		-4.323025
F-statistic	151.8132	Durbin-Watson stat		2.010928
Prob(F-statistic)	0.000000			

Null Hypothesis: D(LINT) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 8 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-12.75765	0.0000
Test critical values:		
1% level	-4.015700	
5% level	-3.437801	
10% level	-3.143138	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.000719
HAC corrected variance (Bartlett kernel)	0.000788

Phillips-Perron Test Equation
Dependent Variable: D(LINT,2)
Method: Least Squares
Date: 01/18/19 Time: 12:12
Sample (adjusted): 10/23/2015 11/23/2018
Included observations: 162 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LINT(-1))	-1.011185	0.079341	-12.74479	0.0000
C	-0.004702	0.004330	-1.085952	0.2791
@TREND("10/09/2015")	0.000113	4.64E-05	2.436554	0.0159
R-squared	0.505342	Mean dependent var	5.86E-05	
Adjusted R-squared	0.499120	S.D. dependent var	0.038242	
S.E. of regression	0.027065	Akaike info criterion	-4.362815	
Sum squared resid	0.116469	Schwarz criterion	-4.305637	
Log likelihood	356.3880	Hannan-Quinn criter.	-4.339600	
F-statistic	81.21711	Durbin-Watson stat	1.995522	
Prob(F-statistic)	0.000000			

Null Hypothesis: D(LINT) has a unit root
Exogenous: None
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-12.03223	0.0000
Test critical values:		
1% level	-2.579315	
5% level	-1.942805	
10% level	-1.615400	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.000765
HAC corrected variance (Bartlett kernel)	0.000756

Phillips-Perron Test Equation
Dependent Variable: D(LINT,2)
Method: Least Squares
Date: 01/18/19 Time: 12:12
Sample (adjusted): 10/23/2015 11/23/2018
Included observations: 162 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LINT(-1))	-0.947067	0.078687	-12.03587	0.0000
R-squared	0.473618	Mean dependent var	5.86E-05	
Adjusted R-squared	0.473618	S.D. dependent var	0.038242	
S.E. of regression	0.027745	Akaike info criterion	-4.325345	
Sum squared resid	0.123938	Schwarz criterion	-4.306286	
Log likelihood	351.3530	Hannan-Quinn criter.	-4.317607	
Durbin-Watson stat	2.022017			

Null Hypothesis: LM1 has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-0.859390	0.7988
Test critical values: 1% level	-3.470679	
5% level	-2.879155	
10% level	-2.576241	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LM1)
Method: Least Squares
Date: 01/18/19 Time: 12:12
Sample (adjusted): 10/16/2015 11/23/2018
Included observations: 163 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LM1(-1)	-0.007854	0.009139	-0.859390	0.3914
C	0.158471	0.180909	0.875971	0.3824
R-squared	0.004566	Mean dependent var		0.003006
Adjusted R-squared	-0.001616	S.D. dependent var		0.021102
S.E. of regression	0.021119	Akaike info criterion		-4.865117
Sum squared resid	0.071806	Schwarz criterion		-4.827157
Log likelihood	398.5070	Hannan-Quinn criter.		-4.849705
F-statistic	0.738551	Durbin-Watson stat		2.113740
Prob(F-statistic)	0.391403			

Null Hypothesis: LM1 has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-3.281015	0.0731
Test critical values: 1% level	-4.015341	
5% level	-3.437629	
10% level	-3.143037	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LM1)
Method: Least Squares
Date: 01/18/19 Time: 12:13
Sample (adjusted): 10/16/2015 11/23/2018
Included observations: 163 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LM1(-1)	-0.131356	0.040035	-3.281015	0.0013
C	2.563164	0.780166	3.285409	0.0013
@TREND("10/09/2015")	0.000487	0.000154	3.163891	0.0019
R-squared	0.063177	Mean dependent var		0.003006
Adjusted R-squared	0.051467	S.D. dependent var		0.021102
S.E. of regression	0.020552	Akaike info criterion		-4.913531
Sum squared resid	0.067578	Schwarz criterion		-4.856591
Log likelihood	403.4528	Hannan-Quinn criter.		-4.890414
F-statistic	5.395045	Durbin-Watson stat		1.985560
Prob(F-statistic)	0.005402			

Null Hypothesis: LM1 has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	1.810771	0.9831
Test critical values: 1% level	-2.579226	
5% level	-1.942793	
10% level	-1.615408	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LM1)
Method: Least Squares
Date: 01/18/19 Time: 12:13
Sample (adjusted): 10/16/2015 11/23/2018
Included observations: 163 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LM1(-1)	0.000151	8.35E-05	1.810771	0.0720
R-squared	-0.000178	Mean dependent var		0.003006
Adjusted R-squared	-0.000178	S.D. dependent var		0.021102
S.E. of regression	0.021104	Akaike info criterion		-4.872632
Sum squared resid	0.072149	Schwarz criterion		-4.853652
Log likelihood	398.1195	Hannan-Quinn criter.		-4.864926
Durbin-Watson stat	2.120597			

Null Hypothesis: D(LM1) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-13.45796	0.0000
Test critical values: 1% level	-3.470934	
5% level	-2.879267	
10% level	-2.576301	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LM1,2)
Method: Least Squares
Date: 01/18/19 Time: 12:13
Sample (adjusted): 10/23/2015 11/23/2018
Included observations: 162 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LM1(-1))	-1.064989	0.079135	-13.45796	0.0000
C	0.003155	0.001682	1.875113	0.0626
R-squared	0.530952	Mean dependent var		-0.000198
Adjusted R-squared	0.528021	S.D. dependent var		0.030824
S.E. of regression	0.021176	Akaike info criterion		-4.859602
Sum squared resid	0.071750	Schwarz criterion		-4.821483
Log likelihood	395.6277	Hannan-Quinn criter.		-4.844125
F-statistic	181.1166	Durbin-Watson stat		2.007976
Prob(F-statistic)	0.000000			

Null Hypothesis: D(LM1) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-13.41628	0.0000
Test critical values:		
1% level	-4.015700	
5% level	-3.437801	
10% level	-3.143138	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LM1,2)
Method: Least Squares
Date: 01/18/19 Time: 12:13
Sample (adjusted): 10/23/2015 11/23/2018
Included observations: 162 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LM1(-1))	-1.064994	0.079381	-13.41628	0.0000
C	0.003438	0.003394	1.012933	0.3126
@TREND("10/09/2015")	-3.43E-06	3.57E-05	-0.096150	0.9235
R-squared	0.530979	Mean dependent var		-0.000198
Adjusted R-squared	0.525080	S.D. dependent var		0.030824
S.E. of regression	0.021242	Akaike info criterion		-4.847314
Sum squared resid	0.071745	Schwarz criterion		-4.790137
Log likelihood	395.6325	Hannan-Quinn criter.		-4.824099
F-statistic	90.00215	Durbin-Watson stat		2.008083
Prob(F-statistic)	0.000000			

Null Hypothesis: D(LM1) has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-13.22428	0.0000
Test critical values:		
1% level	-2.579315	
5% level	-1.942805	
10% level	-1.615400	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LM1,2)
Method: Least Squares
Date: 01/18/19 Time: 12:13
Sample (adjusted): 10/23/2015 11/23/2018
Included observations: 162 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LM1(-1))	-1.043020	0.078872	-13.22428	0.0000
R-squared	0.520645	Mean dependent var		-0.000198
Adjusted R-squared	0.520645	S.D. dependent var		0.030824
S.E. of regression	0.021341	Akaike info criterion		-4.850210
Sum squared resid	0.073326	Schwarz criterion		-4.831151
Log likelihood	393.8670	Hannan-Quinn criter.		-4.842472
Durbin-Watson stat	2.003467			

Null Hypothesis: LM1 has a unit root

Exogenous: Constant

Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-0.793055	0.8181
Test critical values:		
1% level	-3.470679	
5% level	-2.879155	
10% level	-2.576241	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.000441
HAC corrected variance (Bartlett kernel)	0.000349

Phillips-Perron Test Equation

Dependent Variable: D(LM1)

Method: Least Squares

Date: 01/18/19 Time: 12:14

Sample (adjusted): 10/16/2015 11/23/2018

Included observations: 163 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LM1(-1)	-0.007854	0.009139	-0.859390	0.3914
C	0.158471	0.180909	0.875971	0.3824
R-squared	0.004566	Mean dependent var		0.003006
Adjusted R-squared	-0.001616	S.D. dependent var		0.021102
S.E. of regression	0.021119	Akaike info criterion		-4.865117
Sum squared resid	0.071806	Schwarz criterion		-4.827157
Log likelihood	398.5070	Hannan-Quinn criter.		-4.849705
F-statistic	0.738551	Durbin-Watson stat		2.113740
Prob(F-statistic)	0.391403			

Null Hypothesis: LM1 has a unit root

Exogenous: Constant, Linear Trend

Bandwidth: 6 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-3.410150	0.0535
Test critical values:		
1% level	-4.015341	
5% level	-3.437629	
10% level	-3.143037	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.000415
HAC corrected variance (Bartlett kernel)	0.000449

Phillips-Perron Test Equation

Dependent Variable: D(LM1)

Method: Least Squares

Date: 01/18/19 Time: 12:14

Sample (adjusted): 10/16/2015 11/23/2018

Included observations: 163 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LM1(-1)	-0.131356	0.040035	-3.281015	0.0013
C	2.563164	0.780166	3.285409	0.0013
@TREND("10/09/2015")	0.000487	0.000154	3.163891	0.0019
R-squared	0.063177	Mean dependent var		0.003006
Adjusted R-squared	0.051467	S.D. dependent var		0.021102
S.E. of regression	0.020552	Akaike info criterion		-4.913531
Sum squared resid	0.067578	Schwarz criterion		-4.856591
Log likelihood	403.4528	Hannan-Quinn criter.		-4.890414
F-statistic	5.395045	Durbin-Watson stat		1.985560
Prob(F-statistic)	0.005402			

Null Hypothesis: LM1 has a unit root

Exogenous: None

Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	2.055901	0.9906
Test critical values:		
1% level	-2.579226	
5% level	-1.942793	
10% level	-1.615408	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.000443
HAC corrected variance (Bartlett kernel)	0.000344

Phillips-Perron Test Equation

Dependent Variable: D(LM1)

Method: Least Squares

Date: 01/18/19 Time: 12:14

Sample (adjusted): 10/16/2015 11/23/2018

Included observations: 163 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LM1(-1)	0.000151	8.35E-05	1.810771	0.0720
R-squared	-0.000178	Mean dependent var		0.003006
Adjusted R-squared	-0.000178	S.D. dependent var		0.021102
S.E. of regression	0.021104	Akaike info criterion		-4.872632
Sum squared resid	0.072149	Schwarz criterion		-4.853652
Log likelihood	398.1195	Hannan-Quinn criter.		-4.864926
Durbin-Watson stat	2.120597			

Null Hypothesis: D(LM1) has a unit root

Exogenous: Constant

Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-13.54604	0.0000
Test critical values:		
1% level	-3.470934	
5% level	-2.879267	
10% level	-2.576301	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.000443
HAC corrected variance (Bartlett kernel)	0.000383

Phillips-Perron Test Equation

Dependent Variable: D(LM1,2)

Method: Least Squares

Date: 01/18/19 Time: 12:14

Sample (adjusted): 10/23/2015 11/23/2018

Included observations: 162 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LM1(-1))	-1.064989	0.079135	-13.45796	0.0000
C	0.003155	0.001682	1.875113	0.0626
R-squared	0.530952	Mean dependent var		-0.000198
Adjusted R-squared	0.528021	S.D. dependent var		0.030824
S.E. of regression	0.021176	Akaike info criterion		-4.859602
Sum squared resid	0.071750	Schwarz criterion		-4.821483
Log likelihood	395.6277	Hannan-Quinn criter.		-4.844125
F-statistic	181.1166	Durbin-Watson stat		2.007976
Prob(F-statistic)	0.000000			

Null Hypothesis: D(LM1) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-13.50130	0.0000
Test critical values:		
1% level	-4.015700	
5% level	-3.437801	
10% level	-3.143138	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.000443
HAC corrected variance (Bartlett kernel)	0.000383

Phillips-Perron Test Equation
Dependent Variable: D(LM1,2)
Method: Least Squares
Date: 01/18/19 Time: 12:15
Sample (adjusted): 10/23/2015 11/23/2018
Included observations: 162 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LM1(-1))	-1.064994	0.079381	-13.41628	0.0000
C	0.003438	0.003394	1.012933	0.3126
@TREND("10/09/2015")	-3.43E-06	3.57E-05	-0.096150	0.9235
R-squared	0.530979	Mean dependent var		-0.000198
Adjusted R-squared	0.525080	S.D. dependent var		0.030824
S.E. of regression	0.021242	Akaike info criterion		-4.847314
Sum squared resid	0.071745	Schwarz criterion		-4.790137
Log likelihood	395.6325	Hannan-Quinn criter.		-4.824099
F-statistic	90.00215	Durbin-Watson stat		2.008083
Prob(F-statistic)	0.000000			

Null Hypothesis: D(LM1) has a unit root
Exogenous: None
Bandwidth: 5 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-13.22366	0.0000
Test critical values:		
1% level	-2.579315	
5% level	-1.942805	
10% level	-1.615400	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.000453
HAC corrected variance (Bartlett kernel)	0.000454

Phillips-Perron Test Equation
Dependent Variable: D(LM1,2)
Method: Least Squares
Date: 01/18/19 Time: 12:15
Sample (adjusted): 10/23/2015 11/23/2018
Included observations: 162 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LM1(-1))	-1.043020	0.078872	-13.22428	0.0000
R-squared	0.520645	Mean dependent var		-0.000198
Adjusted R-squared	0.520645	S.D. dependent var		0.030824
S.E. of regression	0.021341	Akaike info criterion		-4.850210
Sum squared resid	0.073326	Schwarz criterion		-4.831151
Log likelihood	393.8670	Hannan-Quinn criter.		-4.842472
Durbin-Watson stat	2.003467			

Null Hypothesis: LCBOND has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-0.180220	0.9372
Test critical values:		
1% level	-3.470679	
5% level	-2.879155	
10% level	-2.576241	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LCBOND)
Method: Least Squares
Date: 01/18/19 Time: 12:16
Sample (adjusted): 10/16/2015 11/23/2018
Included observations: 163 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LCBOND(-1)	-0.000990	0.005492	-0.180220	0.8572
C	0.014029	0.060610	0.231471	0.8172
R-squared	0.000202	Mean dependent var		0.003108
Adjusted R-squared	-0.006008	S.D. dependent var		0.013461
S.E. of regression	0.013501	Akaike info criterion		-5.759925
Sum squared resid	0.029346	Schwarz criterion		-5.721965
Log likelihood	471.4339	Hannan-Quinn criter.		-5.744514
F-statistic	0.032479	Durbin-Watson stat		2.007773
Prob(F-statistic)	0.857206			

Null Hypothesis: LCBOND has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-1.465154	0.8376
Test critical values:		
1% level	-4.015341	
5% level	-3.437629	
10% level	-3.143037	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LCBOND)
Method: Least Squares
Date: 01/18/19 Time: 12:16
Sample (adjusted): 10/16/2015 11/23/2018
Included observations: 163 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LCBOND(-1)	-0.023218	0.015847	-1.465154	0.1448
C	0.251337	0.169869	1.479594	0.1409
@TREND("10/09/2015")	9.69E-05	6.48E-05	1.494607	0.1370
R-squared	0.013968	Mean dependent var		0.003108
Adjusted R-squared	0.001643	S.D. dependent var		0.013461
S.E. of regression	0.013449	Akaike info criterion		-5.761520
Sum squared resid	0.028942	Schwarz criterion		-5.704580
Log likelihood	472.5639	Hannan-Quinn criter.		-5.738403
F-statistic	1.133289	Durbin-Watson stat		1.991055
Prob(F-statistic)	0.324543			

Null Hypothesis: LCBOND has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	2.944061	0.9992
Test critical values: 1% level	-2.579226	
5% level	-1.942793	
10% level	-1.615408	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LCBOND)
Method: Least Squares
Date: 01/18/19 Time: 12:16
Sample (adjusted): 10/16/2015 11/23/2018
Included observations: 163 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LCBOND(-1)	0.000281	9.55E-05	2.944061	0.0037
R-squared	-0.000131	Mean dependent var		0.003108
Adjusted R-squared	-0.000131	S.D. dependent var		0.013461
S.E. of regression	0.013461	Akaike info criterion		-5.771862
Sum squared resid	0.029356	Schwarz criterion		-5.752882
Log likelihood	471.4068	Hannan-Quinn criter.		-5.764157
Durbin-Watson stat	2.009658			

Null Hypothesis: D(LCBOND) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-12.71655	0.0000
Test critical values: 1% level	-3.470934	
5% level	-2.879267	
10% level	-2.576301	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LCBOND,2)
Method: Least Squares
Date: 01/18/19 Time: 12:16
Sample (adjusted): 10/23/2015 11/23/2018
Included observations: 162 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LCBOND(-1))	-1.005256	0.079051	-12.71655	0.0000
C	0.003098	0.001091	2.838226	0.0051
R-squared	0.502659	Mean dependent var		-2.68E-06
Adjusted R-squared	0.499550	S.D. dependent var		0.019140
S.E. of regression	0.013540	Akaike info criterion		-5.754083
Sum squared resid	0.029333	Schwarz criterion		-5.715964
Log likelihood	468.0807	Hannan-Quinn criter.		-5.738606
F-statistic	161.7106	Durbin-Watson stat		2.000667
Prob(F-statistic)	0.000000			

Null Hypothesis: D(LCBOND) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-12.68862	0.0000
Test critical values:		
1% level	-4.015700	
5% level	-3.437801	
10% level	-3.143138	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LCBOND,2)
Method: Least Squares
Date: 01/18/19 Time: 12:16
Sample (adjusted): 10/23/2015 11/23/2018
Included observations: 162 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LCBOND(-1))	-1.006012	0.079285	-12.68862	0.0000
C	0.002363	0.002172	1.087964	0.2783
@TREND("10/09/2015")	8.93E-06	2.28E-05	0.391422	0.6960
R-squared	0.503137	Mean dependent var	-2.68E-06	
Adjusted R-squared	0.496888	S.D. dependent var	0.019140	
S.E. of regression	0.013576	Akaike info criterion	-5.742700	
Sum squared resid	0.029304	Schwarz criterion	-5.685522	
Log likelihood	468.1587	Hannan-Quinn criter.	-5.719485	
F-statistic	80.50400	Durbin-Watson stat	2.001166	
Prob(F-statistic)	0.000000			

Null Hypothesis: D(LCBOND) has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-12.13277	0.0000
Test critical values:		
1% level	-2.579315	
5% level	-1.942805	
10% level	-1.615400	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LCBOND,2)
Method: Least Squares
Date: 01/18/19 Time: 12:17
Sample (adjusted): 10/23/2015 11/23/2018
Included observations: 162 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LCBOND(-1))	-0.955137	0.078724	-12.13277	0.0000
R-squared	0.477619	Mean dependent var	-2.68E-06	
Adjusted R-squared	0.477619	S.D. dependent var	0.019140	
S.E. of regression	0.013833	Akaike info criterion	-5.717308	
Sum squared resid	0.030809	Schwarz criterion	-5.698248	
Log likelihood	464.1019	Hannan-Quinn criter.	-5.709569	
Durbin-Watson stat	1.999815			

Null Hypothesis: LCBOND has a unit root
Exogenous: Constant
Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-0.155695	0.9402
Test critical values:		
1% level	-3.470679	
5% level	-2.879155	
10% level	-2.576241	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.000180
HAC corrected variance (Bartlett kernel)	0.000168

Phillips-Perron Test Equation
Dependent Variable: D(LCBOND)
Method: Least Squares
Date: 01/18/19 Time: 12:17
Sample (adjusted): 10/16/2015 11/23/2018
Included observations: 163 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LCBOND(-1)	-0.000990	0.005492	-0.180220	0.8572
C	0.014029	0.060610	0.231471	0.8172
R-squared	0.000202	Mean dependent var		0.003108
Adjusted R-squared	-0.006008	S.D. dependent var		0.013461
S.E. of regression	0.013501	Akaike info criterion		-5.759925
Sum squared resid	0.029346	Schwarz criterion		-5.721965
Log likelihood	471.4339	Hannan-Quinn criter.		-5.744514
F-statistic	0.032479	Durbin-Watson stat		2.007773
Prob(F-statistic)	0.857206			

Null Hypothesis: LCBOND has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-1.457236	0.8401
Test critical values:		
1% level	-4.015341	
5% level	-3.437629	
10% level	-3.143037	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.000178
HAC corrected variance (Bartlett kernel)	0.000175

Phillips-Perron Test Equation
Dependent Variable: D(LCBOND)
Method: Least Squares
Date: 01/18/19 Time: 12:17
Sample (adjusted): 10/16/2015 11/23/2018
Included observations: 163 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LCBOND(-1)	-0.023218	0.015847	-1.465154	0.1448
C	0.251337	0.169869	1.479594	0.1409
@TREND("10/09/2015")	9.69E-05	6.48E-05	1.494607	0.1370
R-squared	0.013968	Mean dependent var		0.003108
Adjusted R-squared	0.001643	S.D. dependent var		0.013461
S.E. of regression	0.013449	Akaike info criterion		-5.761520
Sum squared resid	0.028942	Schwarz criterion		-5.704580
Log likelihood	472.5639	Hannan-Quinn criter.		-5.738403
F-statistic	1.133289	Durbin-Watson stat		1.991055
Prob(F-statistic)	0.324543			

Null Hypothesis: LCBOND has a unit root

Exogenous: None

Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	3.053224	0.9995
Test critical values:		
1% level	-2.579226	
5% level	-1.942793	
10% level	-1.615408	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.000180
HAC corrected variance (Bartlett kernel)	0.000168

Phillips-Perron Test Equation

Dependent Variable: D(LCBOND)

Method: Least Squares

Date: 01/18/19 Time: 12:17

Sample (adjusted): 10/16/2015 11/23/2018

Included observations: 163 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LCBOND(-1)	0.000281	9.55E-05	2.944061	0.0037
R-squared	-0.000131	Mean dependent var		0.003108
Adjusted R-squared	-0.000131	S.D. dependent var		0.013461
S.E. of regression	0.013461	Akaike info criterion		-5.771862
Sum squared resid	0.029356	Schwarz criterion		-5.752882
Log likelihood	471.4068	Hannan-Quinn criter.		-5.764157
Durbin-Watson stat	2.009658			

Null Hypothesis: D(LCBOND) has a unit root

Exogenous: Constant

Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-12.72266	0.0000
Test critical values:		
1% level	-3.470934	
5% level	-2.879267	
10% level	-2.576301	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.000181
HAC corrected variance (Bartlett kernel)	0.000170

Phillips-Perron Test Equation

Dependent Variable: D(LCBOND,2)

Method: Least Squares

Date: 01/18/19 Time: 12:18

Sample (adjusted): 10/23/2015 11/23/2018

Included observations: 162 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LCBOND(-1))	-1.005256	0.079051	-12.71655	0.0000
C	0.003098	0.001091	2.838226	0.0051
R-squared	0.502659	Mean dependent var		-2.68E-06
Adjusted R-squared	0.499550	S.D. dependent var		0.019140
S.E. of regression	0.013540	Akaike info criterion		-5.754083
Sum squared resid	0.029333	Schwarz criterion		-5.715964
Log likelihood	468.0807	Hannan-Quinn criter.		-5.738606
F-statistic	161.7106	Durbin-Watson stat		2.000667
Prob(F-statistic)	0.000000			

Null Hypothesis: D(LCBOND) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-12.69421	0.0000
Test critical values:		
1% level	-4.015700	
5% level	-3.437801	
10% level	-3.143138	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.000181
HAC corrected variance (Bartlett kernel)	0.000169

Phillips-Perron Test Equation
Dependent Variable: D(LCBOND,2)
Method: Least Squares
Date: 01/18/19 Time: 12:18
Sample (adjusted): 10/23/2015 11/23/2018
Included observations: 162 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LCBOND(-1))	-1.006012	0.079285	-12.68862	0.0000
C	0.002363	0.002172	1.087964	0.2783
@TREND("10/09/2015")	8.93E-06	2.28E-05	0.391422	0.6960
R-squared	0.503137	Mean dependent var	-2.68E-06	
Adjusted R-squared	0.496888	S.D. dependent var	0.019140	
S.E. of regression	0.013576	Akaike info criterion	-5.742700	
Sum squared resid	0.029304	Schwarz criterion	-5.685522	
Log likelihood	468.1587	Hannan-Quinn criter.	-5.719485	
F-statistic	80.50400	Durbin-Watson stat	2.001166	
Prob(F-statistic)	0.000000			

Null Hypothesis: D(LCBOND) has a unit root
Exogenous: None
Bandwidth: 5 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-12.18814	0.0000
Test critical values:		
1% level	-2.579315	
5% level	-1.942805	
10% level	-1.615400	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.000190
HAC corrected variance (Bartlett kernel)	0.000214

Phillips-Perron Test Equation
Dependent Variable: D(LCBOND,2)
Method: Least Squares
Date: 01/18/19 Time: 12:18
Sample (adjusted): 10/23/2015 11/23/2018
Included observations: 162 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LCBOND(-1))	-0.955137	0.078724	-12.13277	0.0000
R-squared	0.477619	Mean dependent var	-2.68E-06	
Adjusted R-squared	0.477619	S.D. dependent var	0.019140	
S.E. of regression	0.013833	Akaike info criterion	-5.717308	
Sum squared resid	0.030809	Schwarz criterion	-5.698248	
Log likelihood	464.1019	Hannan-Quinn criter.	-5.709569	
Durbin-Watson stat	1.999815			

Null Hypothesis: LC1BOND has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-0.094413	0.9471
Test critical values: 1% level	-3.470679	
5% level	-2.879155	
10% level	-2.576241	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LC1BOND)
Method: Least Squares
Date: 01/18/19 Time: 12:21
Sample (adjusted): 10/16/2015 11/23/2018
Included observations: 163 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LC1BOND(-1)	-0.000505	0.005351	-0.094413	0.9249
C	0.008759	0.059105	0.148186	0.8824
R-squared	0.000055	Mean dependent var		0.003179
Adjusted R-squared	-0.006155	S.D. dependent var		0.013301
S.E. of regression	0.013341	Akaike info criterion		-5.783683
Sum squared resid	0.028657	Schwarz criterion		-5.745722
Log likelihood	473.3701	Hannan-Quinn criter.		-5.768271
F-statistic	0.008914	Durbin-Watson stat		2.043733
Prob(F-statistic)	0.924898			

Null Hypothesis: LC1BOND has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-1.479076	0.8330
Test critical values: 1% level	-4.015341	
5% level	-3.437629	
10% level	-3.143037	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LC1BOND)
Method: Least Squares
Date: 01/18/19 Time: 12:21
Sample (adjusted): 10/16/2015 11/23/2018
Included observations: 163 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LC1BOND(-1)	-0.022907	0.015488	-1.479076	0.1411
C	0.248024	0.166093	1.493284	0.1373
@TREND("10/09/2015")	9.90E-05	6.43E-05	1.540509	0.1254
R-squared	0.014670	Mean dependent var		0.003179
Adjusted R-squared	0.002353	S.D. dependent var		0.013301
S.E. of regression	0.013285	Akaike info criterion		-5.786136
Sum squared resid	0.028238	Schwarz criterion		-5.729196
Log likelihood	474.5701	Hannan-Quinn criter.		-5.763019
F-statistic	1.191079	Durbin-Watson stat		2.028091
Prob(F-statistic)	0.306573			

Null Hypothesis: LC1BOND has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	3.049314	0.9994
Test critical values: 1% level	-2.579226	
5% level	-1.942793	
10% level	-1.615408	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LC1BOND)
Method: Least Squares
Date: 01/18/19 Time: 12:21
Sample (adjusted): 10/16/2015 11/23/2018
Included observations: 163 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LC1BOND(-1)	0.000288	9.43E-05	3.049314	0.0027
R-squared	-0.000081	Mean dependent var		0.003179
Adjusted R-squared	-0.000081	S.D. dependent var		0.013301
S.E. of regression	0.013301	Akaike info criterion		-5.795816
Sum squared resid	0.028661	Schwarz criterion		-5.776836
Log likelihood	473.3590	Hannan-Quinn criter.		-5.788110
Durbin-Watson stat	2.045075			

Null Hypothesis: D(LC1BOND) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-12.94737	0.0000
Test critical values: 1% level	-3.470934	
5% level	-2.879267	
10% level	-2.576301	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LC1BOND,2)
Method: Least Squares
Date: 01/18/19 Time: 12:22
Sample (adjusted): 10/23/2015 11/23/2018
Included observations: 162 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LC1BOND(-1))	-1.023162	0.079025	-12.94737	0.0000
C	0.003220	0.001080	2.981777	0.0033
R-squared	0.511651	Mean dependent var		-5.08E-06
Adjusted R-squared	0.508599	S.D. dependent var		0.019078
S.E. of regression	0.013373	Akaike info criterion		-5.778818
Sum squared resid	0.028616	Schwarz criterion		-5.740700
Log likelihood	470.0843	Hannan-Quinn criter.		-5.763342
F-statistic	167.6343	Durbin-Watson stat		2.002745
Prob(F-statistic)	0.000000			

Null Hypothesis: D(LC1BOND) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-12.92660	0.0000
Test critical values: 1% level	-4.015700	
5% level	-3.437801	
10% level	-3.143138	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LC1BOND,2)
Method: Least Squares
Date: 01/18/19 Time: 12:22
Sample (adjusted): 10/23/2015 11/23/2018
Included observations: 162 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LC1BOND(-1))	-1.024415	0.079249	-12.92660	0.0000
C	0.002287	0.002144	1.066572	0.2878
@TREND("10/09/2015")	1.14E-05	2.25E-05	0.503939	0.6150
R-squared	0.512429	Mean dependent var		-5.08E-06
Adjusted R-squared	0.506296	S.D. dependent var		0.019078
S.E. of regression	0.013405	Akaike info criterion		-5.768069
Sum squared resid	0.028570	Schwarz criterion		-5.710891
Log likelihood	470.2136	Hannan-Quinn criter.		-5.744854
F-statistic	83.55333	Durbin-Watson stat		2.003574
Prob(F-statistic)	0.000000			

Null Hypothesis: D(LC1BOND) has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-12.30148	0.0000
Test critical values: 1% level	-2.579315	
5% level	-1.942805	
10% level	-1.615400	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LC1BOND,2)
Method: Least Squares
Date: 01/18/19 Time: 12:25
Sample (adjusted): 10/23/2015 11/23/2018
Included observations: 162 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LC1BOND(-1))	-0.968810	0.078756	-12.30148	0.0000
R-squared	0.484514	Mean dependent var		-5.08E-06
Adjusted R-squared	0.484514	S.D. dependent var		0.019078
S.E. of regression	0.013697	Akaike info criterion		-5.737084
Sum squared resid	0.030206	Schwarz criterion		-5.718025
Log likelihood	465.7038	Hannan-Quinn criter.		-5.729346
Durbin-Watson stat	2.000434			

Null Hypothesis: LC1BOND has a unit root
Exogenous: Constant
Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-0.056214	0.9511
Test critical values:		
1% level	-3.470679	
5% level	-2.879155	
10% level	-2.576241	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.000176
HAC corrected variance (Bartlett kernel)	0.000159

Phillips-Perron Test Equation
Dependent Variable: D(LC1BOND)
Method: Least Squares
Date: 01/18/19 Time: 12:25
Sample (adjusted): 10/16/2015 11/23/2018
Included observations: 163 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LC1BOND(-1)	-0.000505	0.005351	-0.094413	0.9249
C	0.008759	0.059105	0.148186	0.8824
R-squared	0.000055	Mean dependent var		0.003179
Adjusted R-squared	-0.006155	S.D. dependent var		0.013301
S.E. of regression	0.013341	Akaike info criterion		-5.783683
Sum squared resid	0.028657	Schwarz criterion		-5.745722
Log likelihood	473.3701	Hannan-Quinn criter.		-5.768271
F-statistic	0.008914	Durbin-Watson stat		2.043733
Prob(F-statistic)	0.924898			

Null Hypothesis: LC1BOND has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-1.441417	0.8451
Test critical values:		
1% level	-4.015341	
5% level	-3.437629	
10% level	-3.143037	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.000173
HAC corrected variance (Bartlett kernel)	0.000161

Phillips-Perron Test Equation
Dependent Variable: D(LC1BOND)
Method: Least Squares
Date: 01/18/19 Time: 12:25
Sample (adjusted): 10/16/2015 11/23/2018
Included observations: 163 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LC1BOND(-1)	-0.022907	0.015488	-1.479076	0.1411
C	0.248024	0.166093	1.493284	0.1373
@TREND("10/09/2015")	9.90E-05	6.43E-05	1.540509	0.1254
R-squared	0.014670	Mean dependent var		0.003179
Adjusted R-squared	0.002353	S.D. dependent var		0.013301
S.E. of regression	0.013285	Akaike info criterion		-5.786136
Sum squared resid	0.028238	Schwarz criterion		-5.729196
Log likelihood	474.5701	Hannan-Quinn criter.		-5.763019
F-statistic	1.191079	Durbin-Watson stat		2.028091
Prob(F-statistic)	0.306573			

Null Hypothesis: LC1BOND has a unit root
Exogenous: None
Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	3.208664	0.9997
Test critical values:		
1% level	-2.579226	
5% level	-1.942793	
10% level	-1.615408	

*Mackinnon (1996) one-sided p-values.

Residual variance (no correction)	0.000176
HAC corrected variance (Bartlett kernel)	0.000159

Phillips-Perron Test Equation
Dependent Variable: D(LC1BOND)
Method: Least Squares
Date: 01/18/19 Time: 12:26
Sample (adjusted): 10/16/2015 11/23/2018
Included observations: 163 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LC1BOND(-1)	0.000288	9.43E-05	3.049314	0.0027
R-squared	-0.000081	Mean dependent var		0.003179
Adjusted R-squared	-0.000081	S.D. dependent var		0.013301
S.E. of regression	0.013301	Akaike info criterion		-5.795816
Sum squared resid	0.028661	Schwarz criterion		-5.776836
Log likelihood	473.3590	Hannan-Quinn criter.		-5.788110
Durbin-Watson stat	2.045075			

Null Hypothesis: D(LC1BOND) has a unit root
Exogenous: Constant
Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-12.96161	0.0000
Test critical values:		
1% level	-3.470934	
5% level	-2.879267	
10% level	-2.576301	

*Mackinnon (1996) one-sided p-values.

Residual variance (no correction)	0.000177
HAC corrected variance (Bartlett kernel)	0.000165

Phillips-Perron Test Equation
Dependent Variable: D(LC1BOND,2)
Method: Least Squares
Date: 01/18/19 Time: 12:26
Sample (adjusted): 10/23/2015 11/23/2018
Included observations: 162 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LC1BOND(-1))	-1.023162	0.079025	-12.94737	0.0000
C	0.003220	0.001080	2.981777	0.0033
R-squared	0.511651	Mean dependent var		-5.08E-06
Adjusted R-squared	0.508599	S.D. dependent var		0.019078
S.E. of regression	0.013373	Akaike info criterion		-5.778818
Sum squared resid	0.028616	Schwarz criterion		-5.740700
Log likelihood	470.0843	Hannan-Quinn criter.		-5.763342
F-statistic	167.6343	Durbin-Watson stat		2.002745
Prob(F-statistic)	0.000000			

Null Hypothesis: D(LC1BOND) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-12.94123	0.0000
Test critical values:		
1% level	-4.015700	
5% level	-3.437801	
10% level	-3.143138	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.000176
HAC corrected variance (Bartlett kernel)	0.000165

Phillips-Perron Test Equation
Dependent Variable: D(LC1BOND,2)
Method: Least Squares
Date: 01/18/19 Time: 12:26
Sample (adjusted): 10/23/2015 11/23/2018
Included observations: 162 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LC1BOND(-1))	-1.024415	0.079249	-12.92660	0.0000
C	0.002287	0.002144	1.066572	0.2878
@TREND("10/09/2015")	1.14E-05	2.25E-05	0.503939	0.6150
R-squared	0.512429	Mean dependent var		-5.08E-06
Adjusted R-squared	0.506296	S.D. dependent var		0.019078
S.E. of regression	0.013405	Akaike info criterion		-5.768069
Sum squared resid	0.028570	Schwarz criterion		-5.710891
Log likelihood	470.2136	Hannan-Quinn criter.		-5.744854
F-statistic	83.55333	Durbin-Watson stat		2.003574
Prob(F-statistic)	0.000000			

Null Hypothesis: D(LC1BOND) has a unit root
Exogenous: None
Bandwidth: 6 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-12.37859	0.0000
Test critical values:		
1% level	-2.579315	
5% level	-1.942805	
10% level	-1.615400	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.000186
HAC corrected variance (Bartlett kernel)	0.000220

Phillips-Perron Test Equation
Dependent Variable: D(LC1BOND,2)
Method: Least Squares
Date: 01/18/19 Time: 12:26
Sample (adjusted): 10/23/2015 11/23/2018
Included observations: 162 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LC1BOND(-1))	-0.968810	0.078756	-12.30148	0.0000
R-squared	0.484514	Mean dependent var		-5.08E-06
Adjusted R-squared	0.484514	S.D. dependent var		0.019078
S.E. of regression	0.013697	Akaike info criterion		-5.737084
Sum squared resid	0.030206	Schwarz criterion		-5.718025
Log likelihood	465.7038	Hannan-Quinn criter.		-5.729346
Durbin-Watson stat	2.000434			

Null Hypothesis: LINT1 has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=13)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-0.312677	0.9191
Test critical values:		
1% level	-3.470934	
5% level	-2.879267	
10% level	-2.576301	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LINT1)
Method: Least Squares
Date: 01/18/19 Time: 12:27
Sample (adjusted): 10/23/2015 11/23/2018
Included observations: 162 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LINT1(-1)	-0.008415	0.026914	-0.312677	0.7549
D(LINT1(-1))	-0.408248	0.074357	-5.490417	0.0000
C	0.029150	0.066675	0.437196	0.6626
R-squared	0.172171	Mean dependent var		0.006000
Adjusted R-squared	0.161758	S.D. dependent var		0.086682
S.E. of regression	0.079363	Akaike info criterion		-2.211235
Sum squared resid	1.001449	Schwarz criterion		-2.154057
Log likelihood	182.1100	Hannan-Quinn criter.		-2.188020
F-statistic	16.53430	Durbin-Watson stat		1.997960
Prob(F-statistic)	0.000000			

Null Hypothesis: LINT1 has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=13)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-1.852792	0.6742
Test critical values:		
1% level	-4.015700	
5% level	-3.437801	
10% level	-3.143138	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LINT1)
Method: Least Squares
Date: 01/18/19 Time: 12:28
Sample (adjusted): 10/23/2015 11/23/2018
Included observations: 162 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LINT1(-1)	-0.081409	0.043939	-1.852792	0.0658
D(LINT1(-1))	-0.372770	0.075517	-4.936218	0.0000
C	0.171692	0.094924	1.808735	0.0724
@TREND("10/09/2015")	0.000455	0.000218	2.088750	0.0383
R-squared	0.194415	Mean dependent var		0.006000
Adjusted R-squared	0.179120	S.D. dependent var		0.086682
S.E. of regression	0.078536	Akaike info criterion		-2.226128
Sum squared resid	0.974538	Schwarz criterion		-2.149891
Log likelihood	184.3164	Hannan-Quinn criter.		-2.195174
F-statistic	12.71029	Durbin-Watson stat		1.978179
Prob(F-statistic)	0.000000			

Null Hypothesis: LINT1 has a unit root
Exogenous: None
Lag Length: 1 (Automatic - based on SIC, maxlag=13)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	1.311320	0.9519
Test critical values: 1% level	-2.579315	
5% level	-1.942805	
10% level	-1.615400	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LINT1)
Method: Least Squares
Date: 01/18/19 Time: 12:28
Sample (adjusted): 10/23/2015 11/23/2018
Included observations: 162 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LINT1(-1)	0.003300	0.002516	1.311320	0.1916
D(LINT1(-1))	-0.415981	0.072040	-5.774330	0.0000
R-squared	0.171176	Mean dependent var		0.006000
Adjusted R-squared	0.165995	S.D. dependent var		0.086682
S.E. of regression	0.079162	Akaike info criterion		-2.222379
Sum squared resid	1.002652	Schwarz criterion		-2.184261
Log likelihood	182.0127	Hannan-Quinn criter.		-2.206902
Durbin-Watson stat	2.003505			

Null Hypothesis: D(LINT1) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-19.66904	0.0000
Test critical values: 1% level	-3.470934	
5% level	-2.879267	
10% level	-2.576301	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LINT1,2)
Method: Least Squares
Date: 01/18/19 Time: 12:28
Sample (adjusted): 10/23/2015 11/23/2018
Included observations: 162 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LINT1(-1))	-1.413944	0.071887	-19.66904	0.0000
C	0.008394	0.006232	1.347024	0.1799
R-squared	0.707427	Mean dependent var		0.000218
Adjusted R-squared	0.705598	S.D. dependent var		0.145854
S.E. of regression	0.079138	Akaike info criterion		-2.222966
Sum squared resid	1.002064	Schwarz criterion		-2.184847
Log likelihood	182.0602	Hannan-Quinn criter.		-2.207489
F-statistic	386.8712	Durbin-Watson stat		2.002146
Prob(F-statistic)	0.000000			

Null Hypothesis: D(LINT1) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-19.69540	0.0000
Test critical values: 1% level	-4.015700	
5% level	-3.437801	
10% level	-3.143138	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LINT1,2)
Method: Least Squares
Date: 01/18/19 Time: 12:28
Sample (adjusted): 10/23/2015 11/23/2018
Included observations: 162 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LINT1(-1))	-1.418047	0.071999	-19.69540	0.0000
C	-0.002647	0.012610	-0.209906	0.8340
@TREND("10/09/2015")	0.000134	0.000133	1.007151	0.3154
R-squared	0.709281	Mean dependent var		0.000218
Adjusted R-squared	0.705624	S.D. dependent var		0.145854
S.E. of regression	0.079135	Akaike info criterion		-2.216979
Sum squared resid	0.995712	Schwarz criterion		-2.159802
Log likelihood	182.5753	Hannan-Quinn criter.		-2.193764
F-statistic	193.9601	Durbin-Watson stat		2.006693
Prob(F-statistic)	0.000000			

Null Hypothesis: D(LINT1) has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-19.57345	0.0000
Test critical values: 1% level	-2.579315	
5% level	-1.942805	
10% level	-1.615400	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LINT1,2)
Method: Least Squares
Date: 01/18/19 Time: 12:28
Sample (adjusted): 10/23/2015 11/23/2018
Included observations: 162 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LINT1(-1))	-1.407485	0.071908	-19.57345	0.0000
R-squared	0.704109	Mean dependent var		0.000218
Adjusted R-squared	0.704109	S.D. dependent var		0.145854
S.E. of regression	0.079338	Akaike info criterion		-2.224035
Sum squared resid	1.013428	Schwarz criterion		-2.204976
Log likelihood	181.1468	Hannan-Quinn criter.		-2.216296
Durbin-Watson stat	1.992642			

Null Hypothesis: LINT1 has a unit root
Exogenous: Constant
Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-0.729740	0.8351
Test critical values:		
1% level	-3.470679	
5% level	-2.879155	
10% level	-2.576241	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.007330
HAC corrected variance (Bartlett kernel)	0.004214

Phillips-Perron Test Equation
Dependent Variable: D(LINT1)
Method: Least Squares
Date: 01/18/19 Time: 12:29
Sample (adjusted): 10/16/2015 11/23/2018
Included observations: 163 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LINT1(-1)	-0.043072	0.028236	-1.525460	0.1291
C	0.112039	0.070035	1.599755	0.1116
R-squared	0.014248	Mean dependent var		0.005700
Adjusted R-squared	0.008125	S.D. dependent var		0.086499
S.E. of regression	0.086147	Akaike info criterion		-2.053322
Sum squared resid	1.194839	Schwarz criterion		-2.015362
Log likelihood	169.3458	Hannan-Quinn criter.		-2.037911
F-statistic	2.327028	Durbin-Watson stat		2.744862
Prob(F-statistic)	0.129106			

Null Hypothesis: LINT1 has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-2.969808	0.1440
Test critical values:		
1% level	-4.015341	
5% level	-3.437629	
10% level	-3.143037	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.006906
HAC corrected variance (Bartlett kernel)	0.005308

Phillips-Perron Test Equation
Dependent Variable: D(LINT1)
Method: Least Squares
Date: 01/18/19 Time: 12:29
Sample (adjusted): 10/16/2015 11/23/2018
Included observations: 163 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LINT1(-1)	-0.152254	0.044359	-3.432335	0.0008
C	0.323651	0.095928	3.373876	0.0009
@TREND("10/09/2015")	0.000707	0.000225	3.136262	0.0020
R-squared	0.071338	Mean dependent var		0.005700
Adjusted R-squared	0.059730	S.D. dependent var		0.086499
S.E. of regression	0.083876	Akaike info criterion		-2.100712
Sum squared resid	1.125639	Schwarz criterion		-2.043772
Log likelihood	174.2081	Hannan-Quinn criter.		-2.077595
F-statistic	6.145442	Durbin-Watson stat		2.604135
Prob(F-statistic)	0.002683			

Null Hypothesis: LINT1 has a unit root
Exogenous: None
Bandwidth: 13 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	1.632606	0.9749
Test critical values:		
1% level	-2.579226	
5% level	-1.942793	
10% level	-1.615408	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.007447
HAC corrected variance (Bartlett kernel)	0.002029

Phillips-Perron Test Equation
Dependent Variable: D(LINT1)
Method: Least Squares
Date: 01/18/19 Time: 12:29
Sample (adjusted): 10/16/2015 11/23/2018
Included observations: 163 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LINT1(-1)	0.001888	0.002733	0.690566	0.4908
R-squared	-0.001422	Mean dependent var		0.005700
Adjusted R-squared	-0.001422	S.D. dependent var		0.086499
S.E. of regression	0.086561	Akaike info criterion		-2.049821
Sum squared resid	1.213831	Schwarz criterion		-2.030841
Log likelihood	168.0604	Hannan-Quinn criter.		-2.042116
Durbin-Watson stat	2.826983			

Null Hypothesis: D(LINT1) has a unit root
Exogenous: Constant
Bandwidth: 5 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-20.20675	0.0000
Test critical values:		
1% level	-3.470934	
5% level	-2.879267	
10% level	-2.576301	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.006186
HAC corrected variance (Bartlett kernel)	0.005467

Phillips-Perron Test Equation
Dependent Variable: D(LINT1,2)
Method: Least Squares
Date: 01/18/19 Time: 12:29
Sample (adjusted): 10/23/2015 11/23/2018
Included observations: 162 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LINT1(-1))	-1.413944	0.071887	-19.66904	0.0000
C	0.008394	0.006232	1.347024	0.1799
R-squared	0.707427	Mean dependent var		0.000218
Adjusted R-squared	0.705598	S.D. dependent var		0.145854
S.E. of regression	0.079138	Akaike info criterion		-2.222966
Sum squared resid	1.002064	Schwarz criterion		-2.184847
Log likelihood	182.0602	Hannan-Quinn criter.		-2.207489
F-statistic	386.8712	Durbin-Watson stat		2.002146
Prob(F-statistic)	0.000000			

Null Hypothesis: D(LINT1) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 7 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-20.87259	0.0000
Test critical values:		
1% level	-4.015700	
5% level	-3.437801	
10% level	-3.143138	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.006146
HAC corrected variance (Bartlett kernel)	0.004784

Phillips-Perron Test Equation
Dependent Variable: D(LINT1,2)
Method: Least Squares
Date: 01/18/19 Time: 12:30
Sample (adjusted): 10/23/2015 11/23/2018
Included observations: 162 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LINT1(-1))	-1.418047	0.071999	-19.69540	0.0000
C	-0.002647	0.012610	-0.209906	0.8340
@TREND("10/09/2015")	0.000134	0.000133	1.007151	0.3154
R-squared	0.709281	Mean dependent var		0.000218
Adjusted R-squared	0.705624	S.D. dependent var		0.145854
S.E. of regression	0.079135	Akaike info criterion		-2.216979
Sum squared resid	0.995712	Schwarz criterion		-2.159802
Log likelihood	182.5753	Hannan-Quinn criter.		-2.193764
F-statistic	193.9601	Durbin-Watson stat		2.006693
Prob(F-statistic)	0.000000			

Null Hypothesis: D(LINT1) has a unit root
Exogenous: None
Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

	Adj. t-Stat	Prob.*
Phillips-Perron test statistic	-19.95545	0.0000
Test critical values:		
1% level	-2.579315	
5% level	-1.942805	
10% level	-1.615400	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.006256
HAC corrected variance (Bartlett kernel)	0.005712

Phillips-Perron Test Equation
Dependent Variable: D(LINT1,2)
Method: Least Squares
Date: 01/18/19 Time: 12:30
Sample (adjusted): 10/23/2015 11/23/2018
Included observations: 162 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LINT1(-1))	-1.407485	0.071908	-19.57345	0.0000
R-squared	0.704109	Mean dependent var		0.000218
Adjusted R-squared	0.704109	S.D. dependent var		0.145854
S.E. of regression	0.079338	Akaike info criterion		-2.224035
Sum squared resid	1.013428	Schwarz criterion		-2.204976
Log likelihood	181.1468	Hannan-Quinn criter.		-2.216296
Durbin-Watson stat	1.992642			

Date: 01/18/19 Time: 12:31
Sample: 10/09/2015 11/23/2018
Included observations: 158
Series: LBIST100 LFPPF LEURO LINT LM1
Lags interval: 1 to 5

Selected (0.05 level*) Number of Cointegrating Relations by Model

Data Trend:	None	None	Linear	Linear	Quadratic
Test Type	No Intercept No Trend	Intercept No Trend	Intercept No Trend	Intercept Trend	Intercept Trend
Trace	2	1	1	1	1
Max-Eig	2	2	1	1	1

*Critical values based on MacKinnon-Haug-Michelis (1999)

Information Criteria by Rank and Model

Data Trend:	None	None	Linear	Linear	Quadratic
Rank or No. of CEs	No Intercept No Trend	Intercept No Trend	Intercept No Trend	Intercept Trend	Intercept Trend
Log Likelihood by Rank (rows) and Model (columns)					
0	2259.184	2259.184	2278.671	2278.671	2285.741
1	2282.054	2291.559	2301.424	2301.540	2308.516
2	2296.945	2307.994	2311.080	2317.083	2323.745
3	2300.244	2313.706	2315.897	2325.922	2329.181
4	2302.100	2316.962	2318.295	2330.128	2332.443
5	2302.404	2318.390	2318.390	2332.524	2332.524
Akaike Information Criteria by Rank (rows) and Model (columns)					
0	-27.01498	-27.01498	-27.19837	-27.19837	-27.22457
1	-27.17790	-27.28555	-27.35979	-27.34860	-27.38628
2	-27.23981	-27.35435	-27.35544	-27.40611	-27.45247*
3	-27.15499	-27.28742	-27.28983	-27.37875	-27.39469
4	-27.05190	-27.18939	-27.19361	-27.29275	-27.30940
5	-26.92917	-27.06823	-27.06823	-27.18385	-27.18385
Schwarz Criteria by Rank (rows) and Model (columns)					
0	-24.59204	-24.59204	-24.67851*	-24.67851*	-24.60780
1	-24.56112	-24.64939	-24.64610	-24.61553	-24.57567
2	-24.42920	-24.50498	-24.44792	-24.45982	-24.44802
3	-24.15054	-24.22483	-24.18847	-24.21924	-24.19641
4	-23.85362	-23.91358	-23.89841	-23.92002	-23.91729
5	-23.53706	-23.57920	-23.57920	-23.59790	-23.59790

Date: 01/18/19 Time: 12:31
Sample (adjusted): 11/20/2015 11/23/2018
Included observations: 158 after adjustments
Trend assumption: Linear deterministic trend
Series: LBIST100 LFPPF LEURO LINT LM1
Lags interval (in first differences): 1 to 5

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.250244	79.43901	69.81889	0.0070
At most 1	0.115059	33.93374	47.85613	0.5055
At most 2	0.059152	14.62074	29.79707	0.8040
At most 3	0.029900	4.986941	15.49471	0.8102
At most 4	0.001207	0.190755	3.841466	0.6623

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.250244	45.50527	33.87687	0.0014
At most 1	0.115059	19.31300	27.58434	0.3907
At most 2	0.059152	9.633801	21.13162	0.7782
At most 3	0.029900	4.796186	14.26460	0.7673
At most 4	0.001207	0.190755	3.841466	0.6623

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b*S11*b=I):

LBIST100	LFPPF	LEURO	LINT	LM1
12.71426	-54.65406	22.68950	-10.46345	32.73173
4.264161	-2.886268	11.35286	0.203715	-21.02817
0.549892	3.125537	23.63016	-10.98025	-19.75755
6.186155	10.52350	-6.966798	11.66556	-15.97178
-12.46510	23.84793	-3.508541	8.197818	-17.85997

Unrestricted Adjustment Coefficients (alpha):

D(LBIST100)	-0.001200	0.001012	-0.001644	-0.003975	0.000408
D(LFPPF)	0.000558	0.000548	-0.000683	-0.000733	-1.78E-05
D(LEURO)	-0.001647	-0.003560	-0.000397	-0.000249	-0.000310
D(LINT)	0.007409	-0.002443	0.002059	-0.000957	3.04E-05
D(LM1)	-0.002696	0.000461	0.003176	-0.001134	-0.000370

1 Cointegrating Equation(s): Log likelihood 2301.424

Normalized cointegrating coefficients (standard error in parentheses)

LBIST100	LFPPF	LEURO	LINT	LM1
1.000000	-4.298643	1.784571	-0.822970	2.574411
	(0.43420)	(0.36356)	(0.22495)	(0.52678)

Adjustment coefficients (standard error in parentheses)

D(LBIST100)	-0.015254
	(0.02992)
D(LFPPF)	0.007096
	(0.00605)
D(LEURO)	-0.020934
	(0.01582)
D(LINT)	0.094203
	(0.01985)
D(LM1)	-0.034278
	(0.02080)

Vector Error Correction Estimates

Date: 01/18/19 Time: 12:33

Sample (adjusted): 11/20/2015 11/23/2018

Included observations: 158 after adjustments

Standard errors in () & t-statistics in []

Cointegrating Eq:	CointEq1
LBIST100(-1)	1.000000
LFPPF(-1)	-4.298643 (0.43420) [-9.90006]
LEURO(-1)	1.784571 (0.36356) [4.90859]
LINT(-1)	-0.822970 (0.22495) [-3.65841]
LM1(-1)	2.574411 (0.52678) [4.88710]
C	43.72311

VEC Granger Causality/Block Exogeneity Wald Tests
Date: 01/18/19 Time: 12:35
Sample: 10/09/2015 11/23/2018
Included observations: 158

Dependent variable: D(LBIST100)

Excluded	Chi-sq	df	Prob.
D(LFPPF)	4.013327	5	0.5475
D(LEURO)	3.289721	5	0.6554
D(LINT)	6.170237	5	0.2900
D(LM1)	1.751390	5	0.8824
All	16.76732	20	0.6680

Dependent variable: D(LFPPF)

Excluded	Chi-sq	df	Prob.
D(LBIST100)	12.47303	5	0.0289
D(LEURO)	6.312372	5	0.2770
D(LINT)	17.22541	5	0.0041
D(LM1)	2.584029	5	0.7638
All	56.04123	20	0.0000

Dependent variable: D(LEURO)

Excluded	Chi-sq	df	Prob.
D(LBIST100)	75.86831	5	0.0000
D(LFPPF)	81.33483	5	0.0000
D(LINT)	17.87171	5	0.0031
D(LM1)	11.78940	5	0.0378
All	150.9328	20	0.0000

Dependent variable: D(LINT)

Excluded	Chi-sq	df	Prob.
D(LBIST100)	2.523070	5	0.7730
D(LFPPF)	3.629956	5	0.6038
D(LEURO)	13.63962	5	0.0181
D(LM1)	31.11491	5	0.0000
All	89.43106	20	0.0000

Dependent variable: D(LM1)

Excluded	Chi-sq	df	Prob.
D(LBIST100)	4.698271	5	0.4538
D(LFPPF)	3.301452	5	0.6536
D(LEURO)	4.810680	5	0.4394
D(LINT)	2.201832	5	0.8206
All	21.24029	20	0.3831

Date: 01/18/19 Time: 12:36
Sample: 10/09/2015 11/23/2018
Included observations: 158
Series: LCBOND LFPPF LC1BOND LINT1
Lags interval: 1 to 5

Selected (0.05 level*) Number of Cointegrating Relations by Model

Data Trend:	None	None	Linear	Linear	Quadratic
Test Type	No Intercept	Intercept	Intercept	Intercept	Intercept
	No Trend	No Trend	No Trend	Trend	Trend
Trace	2	2	1	1	1
Max-Eig	2	2	1	1	1

*Critical values based on MacKinnon-Haug-Michelis (1999)

Information Criteria by Rank and Model

Data Trend:	None	None	Linear	Linear	Quadratic
Rank or	No Intercept	Intercept	Intercept	Intercept	Intercept
No. of CEs	No Trend	No Trend	No Trend	Trend	Trend
Log Likelihood by Rank (rows) and Model (columns)					
0	2038.387	2038.387	2047.638	2047.638	2056.061
1	2054.963	2060.182	2068.817	2069.491	2077.813
2	2067.105	2074.716	2077.070	2081.404	2086.845
3	2070.830	2079.934	2079.983	2087.155	2089.371
4	2070.956	2081.434	2081.434	2089.380	2089.380
Akaike Information Criteria by Rank (rows) and Model (columns)					
0	-24.78971	-24.78971	-24.85618	-24.85618	-24.91216
1	-24.89827	-24.95167	-25.02300	-25.01887	-25.08624
2	-24.95070	-25.02173	-25.02620	-25.05575	-25.09931*
3	-24.89659	-24.97385	-24.96181	-25.01462	-25.03001
4	-24.79691	-24.87891	-24.87891	-24.92886	-24.92886
Schwarz Criteria by Rank (rows) and Model (columns)					
0	-23.23902	-23.23902	-23.22796	-23.22796	-23.20641
1	-23.19252	-23.22654	-23.23972*	-23.21621	-23.22542
2	-23.08988	-23.12214	-23.08785	-23.07863	-23.08342
3	-22.88070	-22.89981	-22.86839	-22.86305	-22.85905
4	-22.62596	-22.63042	-22.63042	-22.60283	-22.60283

Date: 01/18/19 Time: 12:37
Sample (adjusted): 11/20/2015 11/23/2018
Included observations: 158 after adjustments
Trend assumption: Linear deterministic trend
Series: LCBOND LFPPF LC1BOND LINT1
Lags interval (in first differences): 1 to 5

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.235162	67.59149	47.85613	0.0003
At most 1	0.099194	25.23313	29.79707	0.1533
At most 2	0.036203	8.727650	15.49471	0.3912
At most 3	0.018196	2.901474	3.841466	0.0885

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.235162	42.35836	27.58434	0.0003
At most 1	0.099194	16.50548	21.13162	0.1967
At most 2	0.036203	5.826176	14.26460	0.6356
At most 3	0.018196	2.901474	3.841466	0.0885

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b*S11*b=I):

LCBOND	LFPPF	LC1BOND	LINT1
484.9263	-9.141837	-483.3126	13.29259
-110.8384	-1.150099	106.2469	-2.068280
-241.0518	-7.368634	242.9119	2.715314
100.0225	-12.00814	-85.94786	-1.679001

Unrestricted Adjustment Coefficients (alpha):

D(LCBOND)	-0.000979	-0.001101	-0.001340	-0.001188
D(LFPPF)	0.000512	0.001235	-0.000842	0.000281
D(LC1BOND)	-0.000548	-0.001358	-0.001399	-0.001067
D(LINT1)	-0.027669	-0.004289	-0.001467	0.005753

1 Cointegrating Equation(s): Log likelihood 2068.817

Normalized cointegrating coefficients (standard error in parentheses)

LCBOND	LFPPF	LC1BOND	LINT1
1.000000	-0.018852 (0.00493)	-0.996672 (0.00461)	0.027412 (0.00290)

Adjustment coefficients (standard error in parentheses)

D(LCBOND)	-0.474767 (0.49646)
D(LFPPF)	0.248132 (0.26345)
D(LC1BOND)	-0.265871 (0.48524)
D(LINT1)	-13.41755 (2.80613)

2 Cointegrating Equation(s): Log likelihood 2077.070

Normalized cointegrating coefficients (standard error in parentheses)

LCBOND	LFPPF	LC1BOND	LINT1
1.000000	0.000000	-0.972100 (0.01467)	0.021767 (0.01282)
0.000000	1.000000	1.303447 (0.78308)	-0.299409 (0.68430)

Adjustment coefficients (standard error in parentheses)

D(LCBOND)	-0.352734 (0.50709)	0.010217 (0.00939)
D(LFPPF)	0.111259 (0.26506)	-0.006098 (0.00491)
D(LC1BOND)	-0.115342 (0.49437)	0.006574 (0.00916)
D(LINT1)	-12.94216 (2.87267)	0.257881 (0.05321)

3 Cointegrating Equation(s): Log likelihood 2079.983

Normalized cointegrating coefficients (standard error in parentheses)

LCBOND	LFPPF	LC1BOND	LINT1
1.000000	0.000000	0.000000	0.329378 (0.31028)
0.000000	1.000000	0.000000	-0.711871 (0.18647)
0.000000	0.000000	1.000000	0.316440 (0.31164)

Adjustment coefficients (standard error in parentheses)

D(LCBOND)	-0.029664 (0.55990)	0.020092 (0.01195)	0.030646 (0.55838)
D(LFPPF)	0.314179 (0.29183)	0.000105 (0.00623)	-0.320590 (0.29104)
D(LC1BOND)	0.221899 (0.54534)	0.016883 (0.01164)	-0.219150 (0.54386)
D(LINT1)	-12.58844 (3.19144)	0.268693 (0.06812)	12.56075 (3.18276)

Vector Error Correction Estimates

Date: 01/18/19 Time: 12:38

Sample (adjusted): 11/20/2015 11/23/2018

Included observations: 158 after adjustments

Standard errors in () & t-statistics in []

Cointegrating Eq:	CointEq1
LCBOND(-1)	1.000000
LFPPF(-1)	-0.018852 (0.00493) [-3.82159]
LC1BOND(-1)	-0.996672 (0.00461) [-216.088]
LINT1(-1)	0.027412 (0.00290) [9.45725]
C	0.371865

VEC Granger Causality/Block Exogeneity Wald Tests

Date: 01/18/19 Time: 12:38

Sample: 10/09/2015 11/23/2018

Included observations: 158

Dependent variable: D(LCBOND)

Excluded	Chi-sq	df	Prob.
D(LFPPF)	15.67585	5	0.0078
D(LC1BOND)	17.86635	5	0.0031
D(LINT1)	3.930094	5	0.5595
All	37.72572	15	0.0010

Dependent variable: D(LFPPF)

Excluded	Chi-sq	df	Prob.
D(LCBOND)	6.318096	5	0.2765
D(LC1BOND)	6.301005	5	0.2780
D(LINT1)	1.127192	5	0.9517
All	11.40439	15	0.7234

Dependent variable: D(LC1BOND)

Excluded	Chi-sq	df	Prob.
D(LCBOND)	18.71576	5	0.0022
D(LFPPF)	16.86575	5	0.0048
D(LINT1)	4.465560	5	0.4845
All	40.36996	15	0.0004

Dependent variable: D(LINT1)

Excluded	Chi-sq	df	Prob.
D(LCBOND)	17.65419	5	0.0034
D(LFPPF)	1.999558	5	0.8492
D(LC1BOND)	18.78578	5	0.0021
All	30.54046	15	0.0101