T.C.
MARMARA ÜNİVERSİTESİ
AVRUPA TOPLULUĞU ENSTİTÜSÜ
AVRUPA BİRLİĞİ İKTİSADI
ANABİLİM DALI

AN ANALYSIS OF COINTEGRATION BETWEEN SOME EURO-ZONE, EU AND TURKISH SOVEREIGN DEBT SECURITIES MARKETS

Master Thesis

ILKIM BILGINEN

Istanbul, 2007

T.C.
MARMARA ÜNİVERSİTESİ
AVRUPA TOPLULUĞU ENSTİTÜSÜ
AVRUPA BİRLİĞİ İKTİSADI
ANABİLİM DALI

AN ANALYSIS OF COINTEGRATION BETWEEN SOME EURO-ZONE, EU AND TURKISH SOVEREIGN DEBT SECURITIES MARKETS

Master Thesis

ILKIM BILGINEN

Supervisor: ASST.PROF.DR. IMRE ERSOY

Istanbul, 2007

FOREWORD

This paper is the result of a job that was left unfinished for years. As I started working at the Istanbul Stock Exchange after I had finished my courses at the Marmara University European Community Institute I was unable to write my thesis. Last year I decided to finish a job that was left uncompleted: to write my thesis and to graduate from the EC Institute. Working at the Istanbul Stock Exchange Bonds and Bills Department since 16 years, I could not think of any other topic then the fixed income securities markets. Thus, my thesis "An Analysis of Cointegration between some Euro-zone, EU and Turkish Sovereign Debt Securities Markets" is a result of my work experience and I hope that it will help to emphasize the importance of fixed income securities markets.

I would like to give my special thanks to my mother Günseli Bilginen who encouraged me to finish my work. But at most, I appreciate the support and understanding of my advisor Asst. Professor Dr. Imre Ersoy. I want to give her my very special thanks and regards. Without her I would not be able to bring it to an end. I also would like to thank to Asst. Professor Dr. Sadullah Çelik for his support in econometrics. Finally, I would like to thank to Prof. Dr. Osman Küçükahmetoğlu for showing me to do things with care and patience.

İlkim BİLGİNEN

İstanbul, 2007

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

ADF	Augmented Dickey Fuller Test
AEG	Augmented Engle-Granger Test
AEX	Amsterdam Exchanges
AIC	Akaike Information Criterion
AOBL	Austrian Bundesobligationen
ATB	Austrian Treasury Bills
BIAG	Bond Issues Auction Group
BSN	Belgian State Notes
BTAN	Bon du Tresor a Taux Fixe et a Interets Annuels (Fixed-rate Treasury Notes)
BTB	Belgian Treasury Bills
BTC	Belgian Treasury Certificates
BTF	Bon du Tresor a Taux Fixe et a Interest Precomptes (Fixed-rate Treasury Bills)
Bobls	Bundesobligationen (Five Year Federal Notes)
BOT	Buoni Ordinari del Tesero (Treasury Bills)
BTs	Bilhetes do Tesuoro (Bills)
BTP	Buoni del Tesoro Poliennali (Bonds)
BTP€i	Italian Treasury Bonds indexed to Euro-zone inflation
BRSA	Banking Regulation and Supervision Agency
Bubills	Unverzinsliche Schatzanweisungen (Treasury Discount Papers)
CBT	The Central Bank of Turkey
CCT	Certificati di Credito del Tesoro (Credit Certificates)
CEDEL	Central Clearing Agency
CMB	Capital Markets Board of Turkey
CPI	Consumer Price Index
CTZ	Certificati del Tesoro Zero-coupon (Zero-coupon Treasury Certifcates)
DF	Dickey-Fuller
DSL	Dutch State Loans
DSTA	Dutch State Treasury Agency
DTC	Dutch State Certificates
DW	Durbin Watson Test Statistics
EC	The European Community
ECB	European Central Bank
EIB	European Investment Bank
EU	The European Union
EMU	Economic and Monetary Union
EMS	European Monetary System
ERM	Exchange Rate Mechanism
EUROCLEAR	Central Clearing Agency
EURIBOR	Euro Interbank Offered Rate

EURONEXT	Electronic Trading Platform of Euronext
EUROMTS	Electronic Trading Platform owned by the company MTS
EUROSTAT	Statistical Office of the European Commission
FSAP	Financial Services Action Plan
FIBV	Federation Internationale des Bourses de Valeurs (International Federation of Stock Exchanges)
GARCH	Generalised Autoregressive Conditional Heteroscedasticity
GDP	Gross Domestic Product
HDAT	Greek Electronic Trading Platform
HEX	Helsinki Stock Exchange
HICP	Harmonised Index of Consumer Prices
JMP EMBI	J.P. Morgan emerging markets bond index
JPM GBI	J.P. Morgan global government bond index
ICAP	Intercapital Public Limited Company
IFS	International Financial Statistics
IGCP	Instituto do Gestao do Credito Publico (Public Credit Institution)
IMF	International Monetary Fund
INSEE	National Institute For Statistics and Economic Studies
ISE	Istanbul Stock Exchange
LIBOR	London Interbank Offered rate
LISBOR	Lisbon Interbank Offered Rate
LIFFE	London International Forward and Futures Exchange
LS	Least Squares method in econometrics
MCS	Mercato di Coupon Stripping (Italian Strips Market)
MDPA	Mercado de Deuda Publica Anotada (Spain's Primary Market)
MEOG	Electronic Special Market
MOT	Mercato Telematico delle Obbligazioni e dei Titoli di Stato (Italian Retail Market)
MSCI	Morgan Stanley Capital Incorporation
MTN	Medium Term Notes
MTS	Mercato Telematico Secondario (Secondary Market)
NTMA	National Treasury Management Agency
OAT	Obligations Assimilables du Tresor (French Floating Rate Bonds)
OATi	Inflation indexed OATs (Inflation-indexed Bonds)
OECD	Organisation for Economic Co-operation and Development
OCA	Optimum Currency Area
OEVTs	Specialist Primary Dealers
OLO	Linear Obligations (Belgian bills)
OLUX	Luxembourg Treasury Bonds
OT	Obrigaçoes do Tesouro (Portuguese Bonds)
OTC	Over-the Counter
OTRVs	Obrigaçoes do Tesuoro a Rendimiento Variable (Portuguese Bonds)
PSE	Paris Stock Exchange
SCB	Settlement and Custody Bank in Turkey

SDR	Special Drawing Rights
SENAF	Sistema Electronico de Negociacion de Activos Financieros (Electronic Trading System of Financial Assets)
SGP	The Stability and Growth Pact
SICOVAM	French Central Clearing and Settlement System
STRIPS	Separate Trading of Registered Interest and Principal of Securities
SVT	Specialistes en Valeurs du Tresor (French Primary Dealers)
UK	The United Kingdom
US	United States
VAR	Vector Autoregression method in econometrics
VECM	Vector Error Correction Model
VVS	Finnish Treasury Bills
XETRA	German Stock Exchanges Electronic Trading System

ABSRACT

Government debt securities markets in the Euro-zone countries and in Turkey constituted the subject of the paper. First detail information about sovereign debt instruments and debt securities markets in the Euro-zone were given. Then the relations among the markets of some Euro-zone and European Community countries, for the pre- and pan-Euro periods separately, were investigated empirically in order to determine if they were cointegrated. The results of the analysis indicated that following the introduction of the Euro, cointegration existed among some Euro-zone and European Community countries. Finally, information about the Turkish government debt securities market was given and an empirical analysis was run to see if the Turkish market was cointegrated with some Euro-zone and European Community countries' sovereign debt securities markets. Determining that the Turkish market did not have cointegration with the Euro-zone markets, the paper was concluded with some proposals that would help Turkey to move towards cointegration.

I. INTRODUCTION

Last decade has been an era where capital markets have considerably gained in importance as a result of their contributions to economic development. As gains attained in capital markets, in particular in the debt securities markets, were directed to investment, the real sectors enjoyed an impetus resulting in further growth and development most desired by governments. The catalysing effect of government debt securities markets on the growth of all other debt securities markets was recognised. Also the insulating effects of a developed domestic debt securities market on the financial markets during external shocks were considered as a fact. At the macroeconomic level, a mature domestic debt securities market provides easier and cheaper fund raising for the government. Thus to cover its financial needs, the government can rely on domestic borrowing instead of using monetary measures. At the microeconomic level, a well-established debt securities market leads towards increased financial stability. Increased competition requires the development of new financial products both by government agencies and by private institutions, offering better risk diversification options for the investors.

Accepting the importance of domestic debt securities markets, government authorities had to realise that efficiency in these markets could only be attained through a well functioning, liquid and transparent organisation, which would make them attractive for investors. There should be no barriers to prevent the free movement of capital in order to make investors enjoy any advantages in any markets. The European Union (EU) has progressed much in attaining well-functioning markets first by introducing the free movement of capital, then shifting it one step further and establishing a monetary union with the introduction of the Euro.

The EU enlargement is a process, which still continues. 10 new countries from Central and Eastern Europe (Accession Countries) have joined the European Union on the 1st of May 2004. At the beginning of 2007 two new countries, namely Bulgaria and Romania are also accepted as members. All these new EU member states are planning to

adopt the Euro, once the degree of sustainable economic convergence has been attained. Empirical studies show that new members made significant progress towards financial integration with the European Economic and Monetary Union (EMU) after having joined the Union.

Turkey has been accepted as a candidate to join the EU in the EU Council Summit in Helsinki in 1999 and a pre-accession strategy has been started since then in order to prepare Turkey for EU membership. On December 17th, 2004, the European Council has decided to open accession talks with Turkey as of October 3rd, 2005.

Integration of financial markets is one of the major subjects of the EU policies, as it would bring considerable benefits to the EU economy. The subject falls within the scope of the articles about " Free Movement of Persons, Services and Capital " of the European Community (EC) Treaty. The Single European Act sets the legal framework on the establishment of a common European market. Developing a Single Market in financial services would require the removal of all the regulatory and other barriers in cross border transactions and the encouragement of free flow of capital within member countries. In 1999, the Financial Services Action Plan (FSAP), which was aimed at improving the single market in financial services and providing the legal and regulatory environment, was accepted. The plan supported the development and the improvement of the financial system with respect to proper functioning and efficiency of the markets. However, eventhough much progress has been achieved in the adoption of the FSAP, a single financial market still seems to be far away.

The aim of this paper is, with regard to the government debt securities markets, evaluate the level of cointegration attained in the Euro-zone markets following the introduction of the new single currency. Then Turkey's position with respect to the level of cointegration attained with the Euro-zone markets is evaluated. And finally looking at the results obtained in the empirical part, some conclusions that would lead to an increased level of co-movement for the Turkish debt securities market are proposed.

The following section starts with information about the developments in the European government debt securities markets towards the EMU and the recent steps taken towards complete harmonisation of these markets. Basic information about the Euro-zone government debt securities and country specific applications for debt securities are also provided in this section. Section three includes the empirical analysis about the level of cointegration between the Euro-zone countries and the two new entrant countries Poland and Hungary. Section four is reserved for the Turkish sovereign debt securities market, for the discussion about the aspects of Turkey's cointegration and for some proposals to increase the level of cointegration for the Turkish government debt securities market. Section five concludes the study.

II. EURO-ZONE GOVERNMENT DEBT SECURITIES MARKETS

Before the introduction of the Euro into the European financial system on the 1st of January 1999, talking about a European debt securities market was not meaningful as each country had its own sovereign debt market and its own domestic debt securities denominated in its own currency. The changeover to the Euro has resulted in an integration of the sovereign debt securities markets. On the one hand, European countries taking part in the EMU were faced with greater competition in debt securities markets mainly due to the elimination of the currency risk. On the other hand, global investors were faced with a greater debt securities market leading to re-consideration of their investment decisions resulting in restructuring of portfolios.

Following the Euro, all EU countries accepting to join the Euro-zone, have replaced their domestic currencies with the new currency. The aim of the EMU was to achieve a Single Financial Market and to benefit from the outcomes of full integration.

The introduction of the Euro was expected to create the conditions for a substantially more integrated public debt market in the Euro area. The final point of integration would be to establish an Euro-area public debt market that would be compatible with other major world markets, like the US or Japan debt securities markets, in terms of issuance and trading volume. However, whereas the European Central Bank (ECB) is the only entity responsible for the money market, determining the short-term interest rates throughout the Euro-zone, long-term debt management still remains decentralised under the responsibility of the separate national agencies. Differences in issuance techniques and instruments between these national agencies continue to fragment the Euro-area market. On the other hand, following the elimination of the currency risk, debt issuers are now faced with greater competition on the government securities markets and each country is now

faced with the challenge of turning its bonds into benchmarks[1] on the single Euro debt securities market.

In most of the Euro-zone countries sovereigns use similar debt instruments for financing and for long-term debt management. Following the introduction of the Euro, all member countries started issuing their debt instruments in Euro (the securities are denominated in Euro) and almost all of the outstanding domestic debt has been converted to Euro.

II.1. The Pre-Euro Period

Comparing the past and present situation of European debt securities market structures, debt issuance procedures and the secondary market activities, one can clearly see that most of the EU countries have started a re-organisation process long before the adoption of the Euro, in order to get ready for the new environment. Most of the countries have established new departments to be responsible of public debt management and introduced new systems to increase the efficiency of trading, registry as well as of custody and settlement services. Some major developments seen almost in all the Euro-zone countries follow:

- New book-entry systems were introduced in order to increase the efficiency in custody and settlement services.

- Public debt market maker systems were created in order to increase efficiency in debt issuance and liquidity in the secondary market.

- Buy-back and swapping operations were used in order to eliminate illiquid securities from the market and to replace them with highly liquid new issues to be accepted as benchmarks.

[1] The most actively traded securities are called benchmark issues. Their yields are used as a reference for determining interest rates of other securities.

- Electronic trading platforms to operate in domestic markets, but also on international level, were established. Those platforms took a major share of secondary market activity as they provided efficient, transparent and liquid markets.

- New instruments that would offer investors better risk diversification options were developed.

As a result of the above-mentioned developments, government debt securities markets in the Euro-zone started to establish closer links among each other. The next step is expected to be the complete harmonisation of the securities markets with special emphasis being on the debt securities markets because they are seen as an integral part of growth and stability.

II.2. Recent Developments Following the Euro

With regard to the Article 56 of the Treaty Establishing the EC regulating free movement of capital among member states, the EU institutions took action in order to promote and regulate integration and harmonisation in the financial markets of member states. With regard to this, the FSAP has been pursued, the Lamfalussy arrangements were introduced[2]. Much of progress has been achieved in recent years where a number of Directives have been issued. One of them was Directive 2004/39 EC[3] (replacing the Investment Services Directive 93/22/EEC[4]). The aim of this Directive was to harmonise the initial authorisation and operating requirements for investment firms including conduct of business rules and to provide for the harmonisation of conditions governing the operation of regulated markets. The final action of the Commission was a decision taken

[2] The Lamfalussy Report was prepared by the Committee of Wise Men chaired by Alexander Lamfalussy. Their duty was to establish a plan on future arrangements for the securities market regulations. The report was publicised in 2001.

[3] Official Journal L 145, 30.04.2004, Directive on Markets in Financial Instruments.

[4] Official Journal L 141, 11.6.1993, Directive on Investment Services.

on 30th of March 2006 about setting up a European Securities Markets Expert Group[5] to provide legal and economic advice on the application of the EU securities directives in order to reach complete harmonisation in the securities markets.

II.3. The Debate about the EMU and the Role of the Debt Securities Markets

On the way to the harmonisation of capital markets, there is still debate going on about the success of the monetary union established by the EMU, the adjustment mechanisms of the new entrant countries to the system and the benefits/costs the members inquire by joining the monetary union.

As known, countries joining a currency area adopt a fixed exchange rate regime or a single currency among each other but keep a flexible exchange rate regime against the rest of the world. Mundell defined an optimum currency area (OCA) as one where the benefits of adopting a single currency were higher than the costs of keeping the exchange rate mechanism as an internal instrument for adjustment[6]. Thus, in the OCA gains obtained from the single currency would be maximised.

The basic benefits of monetary unions were accepted to be the elimination of the exchange rate risk, increased competition due to increased transparency, lower transaction costs, lower inflation and lower country risk premium leading to easier and cheaper government borrowing[7]. On the other hand, opponents of monetary unions imply that giving up the control in monetary policy to a supra-national body might weaken the resistance of the country to economic shocks. As De Grauwe and Schnabl stated:

---

[5] Official Journal L 106/14, 19.04.2006, Commission Decision about Setting up a European Securities Markets Expert Group.

[6] Robert A.Mundell, "A Theory of Optimum Currency Areas", **The American Economic Review**, Vol.51, No.4, September 1961, p.657.

[7] Commissioner Joaquin Almunia, "The Euro and the New Member States", **Kangaroo Group Lunch Debate**, 13 September 2005, p.2.

"The costs and benefits of EMU membership have been widely discussed within the theoretical framework of optimum currency areas (OCAs) put forward by Mundel and McKinnon. In their seminal papers the two authors relied on three main criteria to make an assessment about the pros and cons of joining a monetary union: asymmetry, flexibility and openness."[8]

The OCA theory of Mundell considered the labour mobility and the flexibility of nominal wages as perfect substitutes for nominal exchange rate stability[9]. Thus, if nominal wages were easily adjusted in case of asymmetric shocks or if labour force could easily move between markets, a monetary union would be advisable, as the costs of joining the union would then be less. In parallel, it was claimed that leaving the floating exchange rate system could be costly if other mechanisms like labour mobility and wage flexibility were not effective or did not exist at all[10].

Thus, the requirements for a successful monetary union can be summarised as follows[11]:

- The economic structure of the countries taking part in the union should be similar,
- The countries should only be faced with symmetric shocks,
- To be able to deal with asymmetric shocks, the macroeconomic adjustment mechanisms, the mobility of labour and the flexibility of nominal wages in the joining countries should be high,

[8] Paul De Grauwe and Gunther Schnabl, "EMU Entry Strategies for the New Member States", **Intereconometrics**, 39(5), September/October 2004, p.241.

[9] Paul De Grauwe, **Economics of Monetary Union**, 4th Edition, Oxford, Oxford University Press, 2000, p.28.

[10] Jakup Borowski, "Potential Benefits of Poland's EMU Accession", **Focus on Transition**, 1/2003, p.148.

[11] Hüseyin M.Yüceol, "Optimal Para Alanı Teorisi Üzerine Bir Değerlendirme: Teori, Uygulama ve Politika", **Pivolka,** 3(12), 2004, p.3-6.

- Joining countries should attain high trading activity among each other and they must have open economies at compatible levels,

- Joining countries should maintain a balance in performing the structural reforms and attain similar levels of development in establishing a common fiscal policy and the common currency,

- For the successful application of the monetary policies and exchange rate regimes, joining countries should have similar levels of price and wage flexibility,

- Fiscal transfer systems similar to regional redistribution schemes should be available.

However, as the labour mobility and wage flexibility in the Euro-zone countries are known to be rather rigid and as the fiscal policies are not enough centralised to deal with asymmetric shocks, the EMU's success in establishing an OCA remains as a critical question[12].

The European Union is actually aimed at establishing a monetary union to attain price stability, the principles of which are determined by the Maastricht Treaty. Thus the ECB is accepted as the sole responsible entity in attaining the required price stability. The fiscal policy applications however, are left within the proprietorship of the national governments as the single instrument to be used in case of asymmetric shocks. And as capital markets are one of the major playfield for fiscal policy applications left to the sovereigns, their importance is increased under the current situation.

De Grauwe stated that theoretically as a higher level of integration is attained in the markets, the sustainability of the economy to asymmetric shocks is also increased[13].

---

[12] Roman Horvath and Lubos Komarek, "Optimum Currency Area Theory: An Approach for Thinking About Monetary Integration", **Warwick Economic Research Papers, No.647**, August 2002, p.8.

[13] De Grauwe, p.219.

Thus it could be expected that, if a cointegrating relation persists between the government debt securities markets then they would be less open to asymmetric shocks.

However, the impact of the currency union on financial markets remains an area for further research. The European experience is still too young to conclude on its success and it is still unknown if the union will result in greater financial integration or will be doomed to a collapse in the future.

Before starting with the empirical part, some basic information about debt securities and the debt securities markets in the Euro-zone countries is given in the following pages.

II.4. Basic Determinants of Debt Securities

Debt instruments are fixed income securities issued by a borrower who promises to pay to the investor (the lender) the borrowed amount plus an interest after a pre-specified period of time. Most of the EU countries use the bond as the main debt instrument. Basic determinants of debt securities are explained below.

II.4.1. Type of Issuer

Fixed income instruments are primarily differentiated with respect to the issuer. The type of the issuer is one of the main factors determining the bond's riskiness. In general, four main groups of bond issuers can be mentioned: sovereign governments and their agencies, local government authorities, supranational bodies and corporations.

As the subject of the paper is restricted solely to government debt securities, which make up the largest markets, issues of supranational bodies and corporates will not be considered anymore. In some countries the issues of local government authorities are seen as part of the government debt, thus in the context of this paper they will be treated similarly.

The government of each country determines its borrowing policies and usually the Treasury is the responsible entity for debt management activity. Most of the EU countries have established special agencies within their Treasuries in order to attain an effective debt management system.

II.4.2. Term to Maturity

The "term to maturity" of a debt security implies its lifetime. Thus the maturity of a security sets the date at which it is liquidated. At maturity the issuer will pay all his obligations related to the security and will have successfully redeemed the issue. Looking at the term to maturity of a bond, the bondholder will know for how long of a period of time he will expect interest payments and the date at which the principal will be paid in full so that the lender will have received all the expected income. The term to maturity (in practice used as "the maturity" or "the term") is an important element as the number of coupons, the price of the bond and the return on the bond are calculated depending on the term to maturity. It is also the maturity of a security, which distinguishes which part of the debt market it is counted to.

The maturity of bonds may vary from 1 up to 50 years. Bonds issued with terms to maturity shorter then one year are called bills. Bills are sold on discount and the nominal value is paid at maturity. They do not have periodical interest payments but the difference between the purchase price and the nominal value received at maturity is the interest earned on the bill. Bills, certificates of deposits and repurchase agreements (repo or reverse repo trades) are some examples of money market instruments because, securities with maximum of one-year maturity are considered as money market instruments. Securities with longer than one-year maturity are accepted as capital market instruments.

Generally, the maturity of Euro-zone debt securities can be grouped into three categories: The short-term made up of 2-3 year maturity, the intermediate made up of 5-7 year maturity and the long- and the ultra long-term beginning with 10 year maturity going up to 30 and even 50 years maturity.

II.4.3. Coupons

The coupon rate implies the rate of interest the lender will receive. Depending on the number of coupons, the issuer makes annual, semi-annual or in any other form of equal periods interest payments to the bondholder. The amount of the payments is determined by the coupon rate. Coupon payments can be done annually, semi-annually, quarterly or even monthly and the coupon rate can be fixed, floating or indexed.

Another possibility is a bond that does not have any coupons and does not make any coupon payments. Such bonds are called zero-coupon bonds[14]. One widely used version of the zero- coupon bond is the so-called strips[15]. A bond can also have a floating coupon rate. Such bonds are called "floating-rate securities" or "floaters"[16].

[14] Zero-coupon bonds pay a lump sum of money at maturity. They are sold on discount and the difference between the purchase price and the payment at maturity is the interest earned by the bondholder.

[15] Strips are zero-coupon government bonds, however they are not directly issued by the debt agency. Stripping is the practice of separating a bond's financial flows (coupons and principal) into several zero-coupon securities. The strip technique, which originated in the United States and which stands for Separate Trading of Registered Interest and Principal of Securities, was applied for the first time in 1985 to United States (US) Treasury bonds. It allows separate trading of principal and coupon maturity of the same bond. Stripping has become a common practice in European government bond markets.

[16] The rate of the coupon is linked to a reference value and it is recalculated at the coupon payment date with regard to this reference rate. For such bonds, the coupon rate will change throughout the bond's lifetime. The coupon calculation method and the reference rate are pre-determined so that the purchaser knows how the interest he will earn will be calculated. The reference rate is usually a well-known and widely used interest rate like the London Interbank Offered Rate (LIBOR) or the Euro Interbank Offered Rate (EURIBOR) plus an extra yield (for example: LIBOR + 0.45 basis points). For further details see Frank J.Fabozzi (Ed.), **Handbook of Fixed Income Securities**, 6th Edition, New York: McGraw&Hill, 2001, p.326.

Index-linked bonds are preferred and issued by some sovereigns. Such bonds are linked to a specific index like a consumer or commodity price index or even to a stock market index[17].

II.4.4. Denomination

The denomination of a security determines the currency with which the payment is done. Thus the bondholder knows that he will receive the coupon payments and the principal in the denominated currency and not in any other currency. The denomination is specified in the indenture of the issue[18].

Before the introduction of the Euro, EU countries used to issue government debt securities in their own currencies. Following the introduction of the Euro, all issuance is done in Euro and most of the sovereigns have preferred converting their outstanding debt into Euro. Only very few exceptions remained like in the case of Austria who has not denominated the outstanding Bundesobligationen[19].

II.4.5. Pricing

"The price of a bond is the net present value today of all its future cash flows" as defined and accepted in all financial markets[20]. The price is given for 100 nominal (the face value) of the bond. So for example, if the price of a zero-coupon bond is given as 95 Euro, this means that the buyer will have to pay 95 Euro for every 100 Euro nominal of the

[17] A very successful example of index-linked bonds are the Italian Treasury Bonds indexed to Euro-zone inflation rate. Both the principals of the notes to be redeemable at maturity and their coupons payable half-yearly, are recalculated taking into account inflation in the Euro-zone. At maturity the holders are re-compensated for any loss in purchasing power that has occurred over the term of the notes.

[18] There are some bonds, their coupon payments are in one currency and the maturity value is in another currency. Such bonds are called dual-currency issues.

[19] Austrian Bundesobligationen are long-term coupon-bearing bonds with fixed rate annual payments. They were designed specially for individual investors and were sold through private placement. They are not issued any more and the outstanding amount is ought to expire in 2010.

[20] Fabozzi (Ed.), 2001, p.51.

bond. The market interest rate or discount rate is essential in determining the real market value of the bond. All the specification of the bond; the issuer, the maturity, the coupon rate/coupon payment frequency and the denomination are factors affecting the interest rate at which the cash flows will be discounted. The present value of expected cash flows of a bond constitutes the bond's fair price.

Depending on the specifications of fixed-income securities and the practical applications in various countries, price and yield calculation of bonds may vary due to different methods used in day counting. Mainly there are five different methods in day counting used in the capital markets.

Table 1: Day Counting Methods

Actual/365	The year is made up of 365 days and in calculating the number of days between two dates the actual number of days is counted.
Actual/360	The year is considered to be 360 days and in calculating the number of days between two dates the actual number of days is counted.
Actual/Actual	The actual number of days is accepted and in calculating the number of days between two dates the actual number of days is counted.
30/360	A year is considered to be 360 days and each moth is accepted as consisting of 30 days. If the first date falls on the 31st of the month it is changed to the 30th of the month and if the second date falls on the 31st and the first date is on the 30th or 31st, the second date is changed to the 30th.
30E/360	The same as 30/360 but if the second date falls on the 31st of the month it is automatically changed to the 30th.

Source: Frank J.Fabozzi (Ed), **Handbook of European Fixed Income Securities**, New Jersey: John Willey&Sons Inc, 2004, p.17.

To determine the fair price (the value) of a bond, first of all, the future cash flows of the bond must be estimated. However, one must be aware of the case that, as the cash flows of a conventional bond are made up of the coupon payments plus the principal to be paid at redemption, an accurate calculation can only be done for a bond with fixed coupon rate that is redeemable at maturity. For non-conventional bonds that have embedded options like a call/put option or convertibility option or for securitised bonds like asset-

backed or mortgage-backed securities calculation of the cash flows becomes problematic[21]. Secondly, one must try to determine the appropriate interest rate with which the cash flows will be discounted. And finally, the future cash flows shall be discounted with the appropriate interest rate to find out their present value.

The present value of the expected cash flows for the period of time *t* using the discount rate *i* can be calculated with the formula below:

$$\text{Present value}_{\,t} = \sum_{t} \frac{\text{Expected cash flows in period } t}{(1+i)^{t}}$$

Expected cash returns for an annual coupon paying bond are calculated with the below given formula where *t* denotes the term to maturity and *r* the annual discount rate.

$$\text{Coupon payments x} \left[\frac{1 - \frac{1}{(1+r)^{t}}}{r} \right]$$

Thus calculating the present value of the coupon payments and the principal and adding them gives the present value (the fair price) of the bond. The date on which the calculation is done is called the value date or the settlement date. The settlement date actually refers to the date on which the bondholder sells his bonds and receives payment on the secondary market. The settlement date does not have to be the same with the trade date. Different markets have different settlement date conventions for different types of securities. As an example, if a bond is traded with T+2, this means that settlement will occur 2 days after the trade has been done.

[21] Callable bonds have the embedded option that the issuer can call the outstanding securities and pay its value. Putable bonds are subject to repurchase by the issuer upon request of the bondholder before the final stated maturity date. Convertible bonds can be converted into any other pre-determined form of securities like stocks.

The calculation method we presented above assumes that the settlement date is the same as the coupon payment date. However, the settlement date can be anytime during the term of the bond. In that case, the so-called accrued interest which is the interest earned by the bondholder between the last coupon payment date and the settlement date has to be taken into account in order to calculate a fair price for the bond as bonds earn interest on daily basis. The calculation method for accrued interest may vary depending on the day count conventions used in different markets.

Table 2: Day Counting Conventions in Some Major European Countries

MARKET	COUPON FREQUENCY	DAY COUNT BASIS	EX-DIVIDEND PERIOD
AUSTRIA	Annual	Actual/Actual	No
BELGIUM	Annual	Actual/Actual	No
DENMARK	Annual	30E/360	Yes
EUROBONDS	Annual	30/360	No
FRANCE	Annual	Actual/Actual	No
GERMANY	Annual	Actual/Actual	No
IRELAND	Annual	Actual/Actual	No
ITALY	Annual	Actual/Actual	No
NORWAY	Annual	Actual/365	Yes
SPAIN	Annual	Actual/Actual	No
SWEDEN	Annual	30E/360	Yes
SWITZERLAN	Annual	30E/360	No
UK	Semi-annual	Actual/Actual	Yes

Source: Frank J.Fabozzi (Ed), **Handbook of European Fixed Income Securities**, New Jersey: John Willey&Sons Inc, 2004, p.17.
Note: In the EU countries bonds are usually traded cum dividend meaning including the coupon. But in some conventions bonds are traded without the coupon (ex-dividend). This period where bonds are traded ex-dividend is called the ex-dividend period.

In the Euro-zone countries' debt securities markets the price of a bond is usually quoted as a clean price, that is the price which includes the value of future cash flows without taking into account the value of the interest earned since the latest coupon payment (the accrued interest). If the accrued interest is included in the price then this is called as the dirty price (gross price) of the bond. As the clean price is quoted in the market, to find the market value of the bond, the accrued interest must be added to the clean price. Thus;

Dirty Price = Clean Price + Accrued Interest

Accrued interest is important when trading coupon securities. As the bond earns interest on daily basis, the dirty price of the bond increases continuously till the next coupon date but the clean price changes with respect to the conditions in the markets. Assuming that the market interest rate remains constant, the clean price of the bond also remains constant eventhough the bond is earning interest over time. So if a bondholder decides to sell his bonds in-between the coupon payment dates, he will have to give up the accrued interest as according to market convention, he has to deliver the bond with coupons (cum dividend), if only the clean price is considered. Calculating the accrued interest and adding it to the clean price to obtain the dirty price, which will actually be the settlement price, gives the bondseller the compensation for the loss he would have experienced from delivering his bond cum dividend.

On the coupon payment date, the clean price and the dirty price are equal as the accrued interest on that day is zero.

The accrued interest can be calculated with the following formula:

$$\text{Accrued Interest} = \text{Coupon} \times \left[\frac{N_t - N_c}{Days} \right]$$

Coupon : Coupon rate
N_t : Number of days between the last coupon payment and the next coupon payment date
N_c : Number of days between the next coupon payment and the settlement date
Days : Number of total days as determined according to the day count convention method used for the specific security in the relevant country.

II.5. Organisation of Debt Issuance

Among different issuance procedures, the auctioning systems and the syndicate are most commonly used in all of the Euro-zone countries.

II.5.1. Auctions

Auctions are the most widely used method for the sale of securities. There are different auctioning systems which debt managers can choose to use for different types of securities. In most of the countries, primary market activity is limited to selected institutional investors only.

II.5.1.1. The Uniform Price Auction

In the uniform price auction, the debt agency announces the maturity and other characteristics of the security to be issued and collects bids from the investors [22]. Investors have to state the bid price and the amount they are willing to purchase in their orders. Once all bids have been submitted, the debt agency determines the price at which he is willing to sell the security. Bids equal to or better then the determined price win the auction. Better-priced bids are allotted entirely; bids at the auction price are matched partially or completely depending on the total volume of the issue.

The date and time of the auction, the participation period in the auction, the announcement of the auction results, the settlement date of the auction may show differences among the sovereign debt issuers.

In most of the Euro-zone countries, a two-tier auction system is used where the first round is made up of the competitive auction. The second round is non-competitive and only market makers can take part in this round. They are allowed to purchase the securities at the weighted average auction price without exceeding the pre-determined maximum volume.

In order to increase transparency in the primary market, all debt agencies of the Euro-zone countries make a pre-announcement regarding to the issuing calendar and the securities to be auctioned off.

[22] The uniform price auction is usually called the Dutch auction.

II.5.1.2. The Multi-Price Auction

In the multi-price auction, the debt agency announces the maturity and other characteristics of the security to be issued and collects bids from the investors[23]. Similar to the single price auction, orders include price and size information. Once all bids have been submitted, the debt agency determines the cut-off price. Bids equal to or better then the determined price win the auction. The successful bidders purchase the securities at their bid price.

II.5.2. Tap Issuance

The debt agency may choose to use tap issuance for some securities. In this case the ask price is announced and bidders have to submit the amount they are willing to purchase. The agency decides the total volume to be issued and accepts bids according to that.

II.5.3. Syndicate

In case of a syndicate, the debt agency places the total amount of the issue to a syndicate-leading group who then allocates the debt securities to the final investors[24]. This method has been preferred by countries that are having smaller funding needs, or in the issuance of a new group of securities. The French Debt Agency for example, uses syndication for selling its inflation-linked bonds.

---

[23] The multi-price auction is usually called the American auction.

[24] Bond issuance is intermediated by a syndicate of banks, usually comprising 2-4 lead managers and 4-6 co-lead managers. The lead managers are responsible for co-ordinating and distributing the largest share of the issue, while the remaining bonds are sold via co-lead managers. Issuance is often based on book-building whereby lead managers and co-lead managers obtain bids from investors. When the book of bids has been built up, the issuer determines price and allocation, which subsequently can be accepted by the investors. For further details see Denmark Nationalbank, Danish Government Borrowing and Debt 2005, www.nationalbanken.dk. (26.05.2006), p45.

II.5.4. Direct Placement (Private Placement)

In case of direct placement (private placement) the debt agency sells the securities directly to retail investors without employing any intermediary institutions.

II.5.5. Security Exchanges (Buy-back and Switching Operations)

Security exchange operations (Buy-back and switching operations) are used by debt agencies in order to change the maturity composition of the outstanding debt stock[25]. In line with the debt management strategies, determined securities are swapped with new securities. This is mainly used when the debt agency wants to decrease the amount of its payments at a certain date. As an example, for lengthening the average maturity of the outstanding debt, short-term securities can be bought back in return for long term securities. Security exchanges have been widely used by the Euro-zone countries for calling back illiquid securities in order to replace them with new issues made in larger amounts so that they obtain greater liquidity in the market. As a result of competition arising from the Euro, debt agencies preferred exchanging the large number of less liquid securities with less but liquid issues trying to make them accepted benchmark securities.

II.5.6. Primary Dealership (Market Maker System)

Primary Dealership is a system used by most of the Euro-zone countries to ensure the well functioning of debt securities' primary market as well as the secondary market activities. Primary dealers are chosen among the financial institutions. They are obliged to take part in the auctions and purchase a certain amount of the total offering. In the secondary market primary dealers give two way quotations on the benchmark securities with a pre-determined bid-offer spread to provide for the liquidity of those securities. In return, the Debt Agencies lets the primary dealers benefit in some other occasions.

---

[25] For further details see OECD, **Debt Management and Government Securities Markets in the 21st Century**, 2002, p.26.

The activity of the primary dealers is evaluated periodically by the Debt Agencies. Their performance in the auctions, their trading volumes in the secondary market are monitored closely as failure to fulfil the pre-determined obligations will result in the cancellation of primary dealership rights.

II.6. Methods of Trading for Debt Securities

Debt securities markets facilitate the exchange of securities among investors. The structure of markets can vary depending on the type of securities traded and the way trading of securities is organised. Markets are mainly characterised according to how buyers and sellers meet each other.

As liquidity of debt securities is a major element for investors in making up their portfolio decisions, an active, transparent, easily accessible and well-performing secondary market plays an important role in increasing the attractiveness of debt securities.

Most of the European countries started to have a liquid government debt securities market from the early 1990's onward. The sovereign markets then were fragmented due to different currencies, restrictions on capital movements, differences in tax regimes, little global investor interest, etc. Therefore, the secondary market activity was inadequate. Those who invested in government debt were expected to keep the securities till maturity. As issuance of debt securities increased mainly due to changes in the economic conditions leading to increased borrowing requirements of sovereigns, some activity in the secondary market started. Trading was first done on telephone-based markets. In some countries electronic trading systems for bonds were established within the local exchanges. Electronic trading of fixed income securities expanded rapidly following the introduction of the single currency. Today, trading of fixed income securities in the Euro-zone countries continues to be done both on the bilateral-agreement based OTC (over-the-counter) markets and on domestic as well as international market places usually established as electronic trading platforms.

II.6.1. The OTC (Over-the-Counter) Markets

In the OTC market, there is not a central marketplace for debt securities. The direct search or the brokered markets are some examples for the OTC market.

In the direct search market, a buyer or a seller must try to find a counterpart through his own effort. All possible partners must be contacted in order to obtain the best price. And once the parties agree upon the conditions (price, size, term, value date, etc.) the trade is done. Trade information is not disseminated to other market participants. It remains disclosed among the trading parties.

As direct search is costly both in time and money terms, brokers overtake the job of bringing the buyers and the sellers together in return for a fee. This is called the brokered market. Since the brokers are in contact with many market participants continuously, they have information of prices as well as of potential buyers and sellers in the market. Therefore in the brokered market some information about the market is available to the market participants.

However, as the OTC markets have developed very much in recent years, price information has been made available to public via data dissemination firms.

In the OTC market, orders are quoted on a spread basis and transactions are usually done on price. The price calculation method is determined by market practice.

As there is no central clearing and settlement entity for OTC trades, parties are liable against each other to fulfil their obligations. Therefore, the creditworthiness of the parties becomes very important issue for trading in the OTC market. It is common in the OTC market that investors deal only with well-established and reliable institutions.

II.6.2. Organised Markets

Organised markets include a central market place usually established as an order matching system, where trading continues without interruption between market opening

and closing times and trades are executed as long as there are matching orders in the system[26]. Such markets provide more flexibility, transparency and efficiency.

Electronic trading systems provide a transparent, liquid, competitive, confident and cost-effective environment for secondary market trading of debt securities so that they encourage investors to participate. In those markets the price information is available to all market participants. The electronic platforms led to an increase both in the volume of trading and the number of market participants. Various types of electronic systems can be mentioned such as dealer-based systems, matching systems, competitive bidding and auction systems[27]. One of the major advantages of such markets is that they reduce the costs for all participants.

The regulatory status of electronic markets differs among countries. In some countries they have an official status whereas in others they are established by private ownership.

In the Euro-zone debt securities markets, all the above mentioned systems are available for trading. Almost all countries have domestic electronic trading platforms most of them being inaugurated within the local exchanges. In recent years some global electronic trading platforms have given access to securities from different countries to be traded on the same platform. One of the most known is the EuroMTS[28] system where benchmark securities of major Euro-zone countries are traded.

---

[26] For further details see World Bank and International Monetary Fund, **Developing Government Bond Markets, A Handbook**, Washington D.C.: 2001, p.227.

[27] OECD, p.39.

[28] EuroMTS is part of the Italian firm MTS, one of the first companies establishing a fully automated electronic trading platform in Italy. As a result of the success of MTS Italy other European countries also have chosen this system. MTS platforms in different countries can have access to each other's systems as well. Finally the company established a general electronic trading platform where selected debt securities of different EU countries can be traded. For further details see www.euromts-ltd.com (26.06.2006).

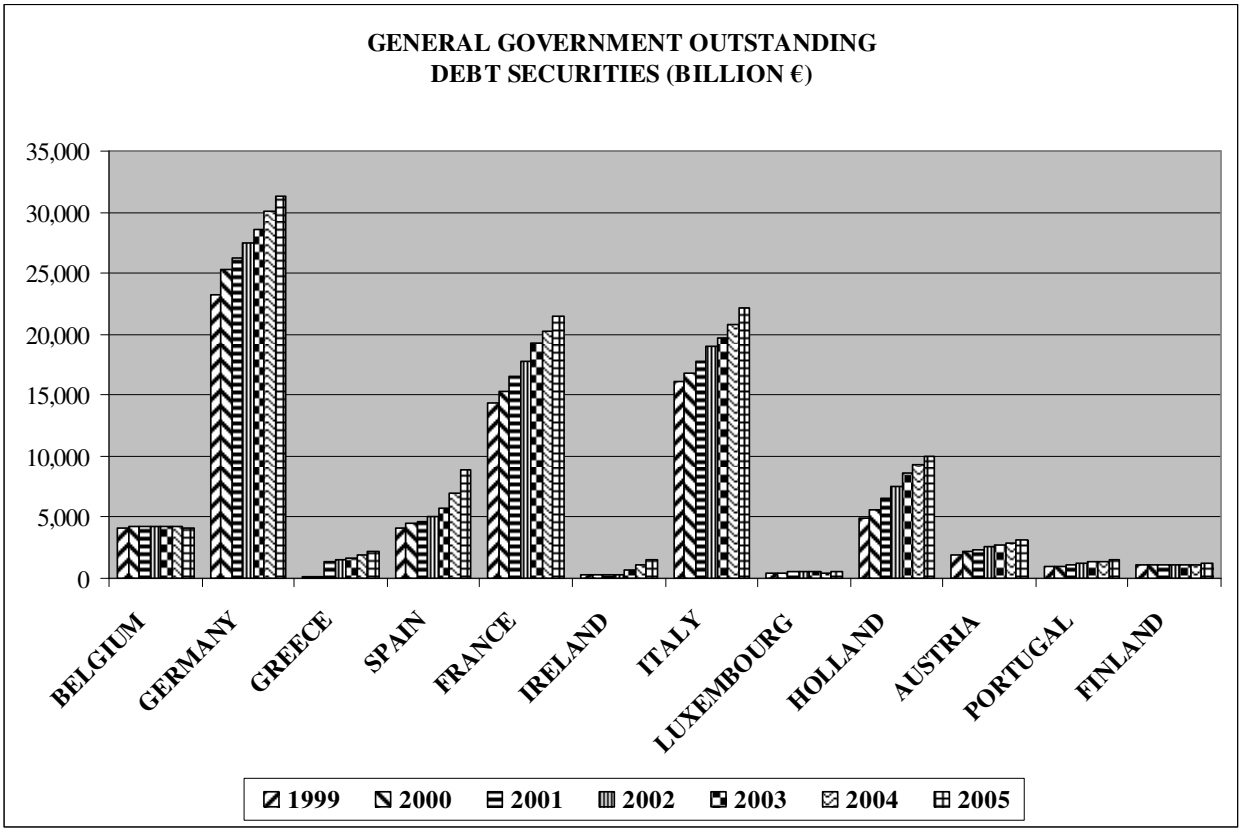


Figure 1: General Government Outstanding Debt Securities in the Euro-zone
Source: Eurostat, http://www.eurostat.ec.europa.eu (30.05.2006).

Figure-1 above gives some idea about the size of the outstanding government debt securities in the Euro-zone. As it can clearly be seen the market is growing continuously in recent years. The German debt securities are leading the market followed by Italy and France.

II.7. Applications in the Euro-zone Countries

As the debt issuance is still controlled by sovereigns, some differences in the types of securities, issuance procedure and secondary market structures are in tact. Basic information about applications in the 12 Euro-zone countries is given below.

II.7.1. Austrian Sovereign Debt Securities

Austrian government debt securities market counts among the smaller ones within the Euro area.

Table 3: Austrian Sovereign Debt Securities

Types of Debt Instruments	Issuance Method[29]	Maturity Composition	Currency	Coupons	Strips	Investor Base	Secondary Market
Federal Bonds (BAs)	Yield based American auction and syndicate to the market makers	5,10,30 years max.50 years	Minimum 1.000 Euro	Fixed annual coupons	N.A.	Domestic and global retail investors	OTC Vienna Stock Exchange, XETRA EuroMTS.
Bundes-obligationen (AOBLs)	They have been issued before 1988.	5,10,30 years	Austrian Schilling. They are not converted to Euro as total outstanding will mature on 2010	Fixed annual coupons	N.A.	Individual investors	OTC
Austrian Treasury Bills (ATBs)	Auction or direct placement	7-365 days	Euro but also other currencies	Normally discounted but fixed Floating Indexed coupons possible	N.A.	Retail investors	OTC Vienna Stock Exchange, XETRA EuroMTS
Medium Term International Notes -MTN[30]	Direct placement	7-365 days	In any agreed currency	Normally discounted	N.A.	Private investors	N.A.

Source: This table has been constructed using data from Oesterreichische Kontrollbank AG http://www.oekb.at/bin/file.bin; Wiener Börse http://www.wienerborse.at/marketplaces_products (27.07.2006).

[29] Since 1998 the Treasury sets 10% of the total issue volume (this is however not included within the total volume announced) aside on behalf of the Government to be sold on the secondary market within the scope of open-market operations.

[30] The MTNs can have maturities between 7 to 365 days denominated in any currency, in any face value mutually agreed between the issuer and the Austrian government. The applicable legislation is the British legislation. Settlement and clearing is done via CEDEL or EUROCLEAR.

II.7.2. Belgian Sovereign Debt Securities

Table 4: Belgian Sovereign Debt Securities

Types of Debt Instruments	Issuance Method	Maturity Composition	Currency	Coupons	Strips	Investor Base	Secondary Market
Linear Obligations (OLOs or Bonds)	Multi-price auction for market makers and direct placement twice a month	Medium-long term up to 30 years	Euro	Fixed or floating	Yes	Domestic and global investor	Brussels Stock Exchange MTSBelgium[31]
Treasury Certificates (BTCs or Bills)	Multi-price auction and a second round for market makers at weighted average rate, weekly issuance	Short term: 3,6, 12 months	Euro	Discounted	N.A.	Domestic and global investor	Brussels Stock Exchange MTSBelgium
Belgian State Notes (BSNs)	Panel or syndicate for recognised dealers on quarterly basis starting from March.	Medium to long term	Euro or any foreign currency	Fixed annual coupons	N.A.	Retail investor	Brussels Stock Exchange MTSBelgium
Belgian Treasury Bills (BTBs)	Direct placement on occasional basis.	Short-term, usually 3 months, max.12 months	Euro	Discounted	N.A.	Individuals and other investors	Brussels Stock Exchange MTSBelgium

Source: This table has been constructed using data provided by the Belgian Debt Agency, Federal Government Debt Annual Report, http://www.debtagency.fgov.be/en_service_missions.htm (22.05.2006).

[31] Following the Euro, the new electronic trading platform MTS Belgium has been established. The MTS trading systems has been chosen, as it was an already accepted system among some other European markets, offering a trading platform throughout the Euro-zone. It has a build-in market maker system and offers connection of domestic markets to each other and to EuroMTS. The system allows for direct sales as well as repo transactions in linear obligations and Treasury certificates mainly.

II.7.3. Dutch Sovereign Debt Securities

The Dutch State Treasury Agency is responsible of the debt management activity in Netherlands. In 1999, the DSTA has laid down the new strategies to be followed in order to realise the borrowing policies set by the government. The aim was to attain a more transparent and more liquid market that would be able to compete with other sovereign issuers of the Euro-zone. Dutch government's total outstanding debt in 2004 was about 197,09 billion € increasing to 203,16 billion € at the end of 2005.

Table 5: Dutch Sovereign Debt Securities

Types of Debt Instrument	Issuance Method	Maturity Composition	Currency	Coupons	Strips	Investor Base	Secondary Market
Dutch State Certificates (DTCs or Bills)	Single-priced Dutch auction twice a month	3,6 and 12 months	Euro	Discounted	N.A.	Domestic and international investors	Amsterdam Exchanges (AEX)[32] MTSAmsterdam[33]
Dutch State Loans (DSLs or Bonds)	Direct placement among market makers[34]	Medium-long term usually 3,10 and 30 year	Euro	Fixed annual coupons	Strippable	Domestic and international investors	Strips trade on AEX, MTS Amsterdam

Source: This table has been constructed using data provided by the Dutch State Treasury Agency, http://www.dutchstate.nl/index.cfm (15.06.2006).

[32]Amsterdam Exchanges is part of the EURONEXT alliance. EURONEXT is an electronic trading platform providing a cross-border exchange for cash and derivatives market among EU countries, namely Belgium, France, the UK, the Netherlands and Portugal. In 2002 it purchased the London based derivatives market LIFFE and merged with the Portuguese Stock Exchange. For further detail see www.euronext.com (07.07.2006).

[33] MTS Amsterdam is the electronic platform established by the MTS Group for the Dutch domestic market.

[34]The DSTA sometimes wants to keep up to 20% of a tap issue for its own portfolio for selling it afterwards depending on the Treasury's financing needs. Announcement of the sale is done via DSTA screens and the sale takes place in the coming few weeks depending on demand and on market conditions. Buyers submit their bids via phone and purchase the securities at the same conditions applied in the tap issuance. The portfolio is weekly updated by the DSTA.

II.7.4. Finnish Sovereign Debt Securities

In Finland the State Treasury owns a unit called the Finance Unit which is responsible of government debt management. This unit administers and runs operations to increase the performance of public debt management; it does risk management and also offers custody services. In 1990's the Finnish economy suffered a severe recession which resulted in an increase of its public debt up to 60% of GDP in 1993. The tight budgeting introduced by the government considering the preparation for the monetary union has been helpful in bringing government spending down and to reduce the public debt/GDP ratio to 45 % of GDP in 2001[35]. In 2004 the ratio was about %44,9 decreasing further and reaching %42,7 in 2005.

Table 6: Finnish Sovereign Debt Securities

Types of Debt Instruments	Issuance Method	Maturity Composition	Currency	Coupons	Strips	Investor Base	Secondary Market
Treasury Bills (VVSs)	Mainly continuous tap placement or American auction for market makers only	Very short, 1-364 days	Euro	Discounted	N.A.	Individual investors	Helsinki Stock Exchange (HEX)
Serial Bonds	Dutch auction, syndicate through market makers and continuous tapping	1-30 years, mainly 3 and 10 years[36]	Euro	Fixed-rate annual coupons	N.A.	Domestic and global investors	HEX
Yield Bonds	Direct placement through banks, post-offices and the Treasury	2-4 years	Euro	Fixed-rate annual coupons	N.A.	Retail investors	HEX

Source: This table has been constructed using data provided by the Finnish Treasury at http://www.valtiokonttori.fi/public/default.aspx (15.06.2006).

[35] OECD, "Options for Reforming The Finnish Tax System", **Economics Department Working Paper No.319**, February 2002, p.5.

[36] The serial bonds constitute the major portion of total debt of the Finnish government. The Finnish Treasury is running exchange operations for less liquid issues or issues nearing maturity to concentrate outstanding debt on more liquid benchmark securities.

II.7.5. French Sovereign Debt Securities

Table 7: French Sovereign Debt Securities

Types of Debt Instruments	Issuance Method	Maturity Composition	Currency	Coupons	Strips	Investor Base	Secondary Market
Treasury Bills-BTF	American auction[37], weekly	Short term 3,6 and 12 months	Euro	Fixed-rate annual		Domestic and global	Paris Stock Exchange-PSE
Fixed-rate Treasury Notes-BTAN	American auction, monthly	2-5 years	Euro	Fixed-rate annual coupons		Domestic and global investors	PSE, MTSFrance EuroMTS
Inflation indexed Bonds-OATi	Indexed issues are same as OATs	Mostly 10 Years	Euro	Indexed to French CPI or Euro HCPI[38]		Domestic and global investors	PSE, MTSFrance EuroMTS
Treasury Bonds-OAT	American auction monthly at least one 10 year issue [39]	Long term up to 10-30 years	Euro	Mainly fixed annual, floating or indexed	Strippable [40]	Wholesale investors	PSE, MTSFrance EuroMTS

Source: This table has been constructed using data provided by the French Treasury at http://www.aft.gov.fr/cft_en_21/debt_management_51 (19.06.2006).

[37] Members of the French Central Clearing and Settlement System (Sicovam) can take part in the auctions but the Specialistes en Valeurs du Tresor (SVTs), the primary dealers, are the main players in the auctions accounting about 90% of securities bought at auctions. Since 1987 the SVTs play an important role in the primary as well as the secondary market: They help to ensure that auctions are proceeded smoothly. They are required to assess global market demand prior to the auction, generally on a line-by-line basis, and to inform the Treasury of their assessment. They are required to bid reasonable amounts at each auction and undertake to acquire at least 2% of the annual volumes issued in each category of securities. Each primary dealer is required to participate in the secondary market for government debt. The minimum participation in these operations is 3% of the total volume They are required to quote their customers and the other primary dealers a price on demand. They undertake to display continuously the bid and offer prices on the principal lines, indicating the amounts for which these prices represent a firm purchase or sale commitment. They regularly inform the Treasury about market developments. STVs enjoy two exclusive rights compared with other operators: to be present in non-competitive bidding rounds and to strip and reconstitute OATs.

[38] Inflation indexed OAT's are issued either as indexed to French Consumer Price Index (CPI) excluding tobacco published monthly by National Institute For Statistics and Economic Studies (INSEE) or the Harmonized Euro-zone Price Index (HICP) excluding tobacco. They have become very popular among investors as they provide hedging against losses due to increases in the inflation.

[39] Normally one new line of 10 year OAT is issued each semester that is then auctioned of monthly. Depending on market conditions the Treasury decides on additional fixed, floating rate or indexed OAT issues.

[40] France was the first sovereign borrower in Europe to authorize the stripping of government securities. This reflects the French Treasury's concern to meet market needs by diversifying its product range. At the start of 1999, more than 70% of all OATs were eligible for stripping.

II.7.6. German Sovereign Debt Securities

Table 8: German Sovereign Debt Securities

Types of Debt Instruments	Issuance Method	Maturity Composition	Currency	Coupons	Strips	Investor Base	Secondary Market
Treasury Discount Papers-Bubills	Monthly Auctions[41]	6 months	Euro	Discounted	N.A.	Primarily institutional investor	N.A
Federal Treasury Financing Papers	Tap issuance Sales in the open market	12-24 months	Euro	Discounted	N.A.	Except credit institutions any other investor	N.A.
Federal Savings Notes Type A Type B	Tap issuance Sales in the open market	TypeA 6 years TypeB 7 years	Euro	TypeA Annual fixed-rate TypeB: at maturity	N.A.	Individuals and non-profit organisations	N.A.
Federal Treasury Notes (Schaetze)	Quarterly auctions only for Auction Group (BIAG)	2 years		Annual fixed-rate	N.A.	Domestic and global investors	German Stock Exchanges
Five Year Federal Notes (Bobls)	Auctions only for BIAG	5 years	Euro	Fixed-rate annual	N.A.	Individuals wholesale clients	German Stock Exchanges
Federal Bonds (Bunds)42	Auctions only to BIAG	Long term mostly 10 and 30 years	Euro	Fixed-rate annual	Strippable	Domestic and international investors	German Stock Exchanges
Inflation Linked Bonds[43]	Syndicate	10 years	Euro	Annual	N.A.	Private-institutional	N.A.

Source: This table has been constructed using data provided by the German Finance Agency http://www.deutsche_finanzagentur.de; German Central Bank www.bundesbank.de/kredit (05.07.2006).

[41] Bond Issues Auction Group (BIAG) is determined by the German Finance Agency among financial institutions according to the rules and regulations set by the German Banking Act as well as EC Directives. In addition to that they must have purchased at least 0.05% of the total issue amounts allotted in auctions in one calendar year. For detail see www.deutsche-finanzagentur.de (05.07.2006).

[42] Bunds can be issued by the Federal Government (Bundesanleihen), the Federal Post Office (Postanleihen), the Federal Railway (Bahnanleihen), the Bundeslaender (Laenderanleihen) and the Unityfund (Fonds Deutsche Einheit).

[43] The first inflation indexed bond in Germany was issued on 8 March 2006. It is adjusted to changes in the unrevised harmonised index of consumer prices (HICP) excluding tobacco of the Eurozone.

The German debt securities market has developed into one of the major markets in the world. The government debt securities market has experienced a boom following the unification of the two German states in 1990. Today it is the second largest market within the EU and fourth largest worldwide. The general government debt in Germany has been around 57-60 % of GDP throughout 1996 to 2002. After 2002 it showed an increase reaching 67.7% of GDP in 2005. The outstanding debt of Germany in 2004 was about 1.451 billion € going up to 1.520 billion € at the end of 2005. Most of German debt securities are considered as benchmark securities in the global financial markets due to their high issue volumes, high liquidity in the secondary market and high hedging possibility they offer in the derivative markets.

II.7.7. Greek Sovereign Debt Securities

Due to the increase in government's borrowing requirements, the Greek market has grown rapidly in the last three years. The bond market deregulation, which brought transparency, liquidity and product diversification as well as the establishment of a secondary market, played a major role in the growth.

Table 9: Greek Sovereign Debt Securities

Types of Debt Instruments	Issuance Method	Maturity Composition	Currency	Coupons	Strips	Investor Base	Secondary Market
Treasury Bills	Auction	3,6 12 months	Euro	Discounted	N.A.	Domestic/ international	HDAT[44] and OTC
Floating RateNotes	Auction	3,5, 7 years	Euro	Floating rate annual	N.A.	Domestic/ international	HDAT and OTC

Source: This table has been constructed using data provided by Bank of Greece at http://www.bankofgreece.gr/en/publications (27.05.2006).

[44] HDAT is the Greek electronic trading platform for government debt securities established within the premises of the Central Bank of Greece.

II.7.8. Irish Sovereign Debt Securities

Table 10: Irish Sovereign Debt Securities

Types of Debt Instruments	Issuance Method	Maturity Composition	Currency	Coupons	Strips	Investor Base	Secondary Market
Exchequer Notes	Direct sale	7-365 days	Euro	Discounted	N.A.	Retail Investors	Irish Stock Exchange
Section 69 Multi-currency Notes	Direct placement	Less then 1 year	Euro	Discounted	N.A	Portfolio investors	Irish Stock Exchange
Central Treasury Notes	Syndicate	Less then 1 year	Euro	Discounted	N.A	Institutional investors	Irish Stock Exchange
Irish Government Bonds	Multiple price two tier auction, first competitive, second only for market makers at average auction price	3-15 years	Euro	Fixed or floating-rate annual	N.A.	Domestic and international investors	MTS Ireland Irish Stock Exchange OTC EuroMTS

Source: This table has been constructed using data provided by National Treasury Agency of Ireland at http://www.ntma.ie/home.html (30.05.2006).

The Irish debt market is one of the smallest within the Euro area. The market's limited volume, lack of debt and the relative shortage of participating agents make it difficult for Ireland to compete in the Euro zone[45]. Ireland is experiencing very high GDP growth rates like 5% within the last decade and is facing financial surpluses. Due to that, Ireland has a low public debt/GDP ratio among the EU countries even if this ratio has shown some increase after 1999. The amount of total government debt in nominal terms was about 43 billion € since 2002.

[45] The National Treasury Management Agency (NTMA) established in 1990 to manage the National Debt within the promises of the Finance Ministry and being responsible for issuance and management of public debt had to take radical steps to raise the efficiency of its debt securities. To achieve that, foreign currency debt has been eliminated, the outstanding balance has been shifted to a small number of highly liquid issues and following the conversion to the Euro, the price/yield calculation conventions has been brought in harmonisation with the Euro-zone standards.

II.7.9. Italian Sovereign Debt Securities

Table 11: Italian Sovereign Debt Securities

Types of Debt Instruments	Issuance Method	Maturity Composition	Currency	Coupons	Strips	Investor Base	Secondary Market
Treasury Bills-BOT	American auction twice a month46	3,6,12 months	Euro	Discounted	N.A.	Domestic and global investors	MTS Italy[47] OTC
Treasury Certificates-CTZ	First round Dutch auction second round for the Specialists	18-24 months	Euro	Discounted	N.A.	Retail investors	MTS Italy OTC
Certificati di Credito del Tesoro-CCT	Dutch auction	7 years	Euro	Floating-rate semi-annual	N.A	Domestic and global investors	MTS Italy OTC
Bonds- BTP	Dutch Auction	3,5,10 and 30 years	Euro	Fixed-rate semi-annual	Strippable, Strips are traded at MCS[48]	Resident and non-residents	MTS Italy OTC
Inflation indexed Bonds-BTPi	Syndicate and auction	3,5,10 and 30 years	Euro	Inflation indexed-rate semi-annual	N.A.	Retail and institutional investors	MTS Italy OTC

Source: This table has been constructed using data provided by Jose Manuel Amor, (ed.), **Government Bond Markets in the Euro Zone,** West Sussex: John Willey&Sons, 2002, pp.177-193.

[46] At the end of the year the Treasury sets the annual auction calendar which contains information about the issuance program of the coming year. In addition to that quarterly announcements are made containing more detailed information about securities and amounts to be issued. The auction process begins some days before the scheduled auction, when the Treasury announces the details of the upcoming issue, including the amount to be auctioned. After the auction is announced, but before it takes place, investors begin trading the yet-to-be issued security in what is called the when-issued-market. Transactions in this market are agreements to exchange securities and funds on the day the new security is settled (although considerable portions of when-issued positions are unwound before the issue date). The when-issued market allows new Treasury issues to be efficiently distributed to investors and provides useful information to potential bidders about the prices the Treasury may receive at the upcoming auction.

[47]The MTS Italy includes a retail market called Mercato Telematico delle Obbligazioni e dei Titoli di Stato (MOT) where orders for a minimum of 1.000 Euros are accepted. For details see http://www.mtsspa.it (25.06.2006).

[48] Mercato di Coupon Stripping (MCS) is a new segment established in 1998 where only strips are traded.

II.7.10. Luxembourg Sovereign Debt Securities

The debt issuance of the government in Luxembourg is not very important, therefore it was difficult to obtain detailed data. Luxembourg has the smallest debt within the Euro-zone with about 6% of its GDP.

Table 12: Luxembourg Sovereign Debt Securities

Types of Debt Instruments	Issuance Method	Maturity Composition	Currency	Coupons	Strips	Investor Base	Secondary Market
Treasury Bonds (OLUX)	Competitive auctions on monthly basis	Medium – long term	Euro	Fixed-rate annual	N.A.	International investors	Luxembourg Stock Exchange Euronext
Treasury Bills[49]	Competitive auctions	Short term	Euro	Discounted	N.A.	Retail investors	Luxembourg Stock Exchange Euronext

Source: This table has been constructed using data provided by the Central Bank of Luxembourg at http://www.bcl.lu/en/publications/index.html (20.07.2006).

[49] The Treasury bills issued by the government are not actually reimbursable funds collected by the government. Instead, these bills enact long-term commitments vis-à-vis international financial institutions. These bills do not carry interest and they are paid if and when they are due. On 31 October 2004, outstanding bills totalled 14.6 million €.

II.7.11. Portuguese Sovereign Debt Securities

Portugal has one of the lowest public debt/GDP ratios among the member states. Its sovereign debt market has developed over the last years.

Table 13: Portuguese Sovereign Debt Securities

Types of Debt Instruments	Issuance Method	Maturity Composition	Currency	Coupons	Strips	Investor Base	Secondary Market
Bonds (OTs)	Competitive auction or syndicate to the primary dealers	3,5,10 and 15 years	Euro	Fixed annual or semi-annual	N.A.	Domestic and global investors	Lisbon Stock Exchange[50] MTS Portugal[51]
Bills (BTs)	Competitive auction or syndicate	91,182 and 364 days	Euro	Discounted	N.A.	Mainly domestic retail investors	Lisbon Stock Exchange MTS Portugal

Source: This table has been constructed using data provided by the Portuguese Treasury at http://www.igcp.pt/index.php (20.07.2006).

[50] Lisbon Stock Exchange has two markets. The first is a retail market working on an electronic platform. The second is the Electronic Special Market (MEOG) designed for wholesale trades.

[51] The Portuguese Government decided on a restructuring of the secondary markets in the year 2000. Followingly the wholesale market mainly among market makers has been transformed to the MTS trading platform establishing the MTS Portugal.

II.7.12. Spanish Sovereign Debt Securities

Table 14: Spanish Sovereign Debt Securities

Types of Debt Instruments	Issuance Method	Maturity Composition	Currency	Coupons	Strips	Investor Base	Secondary Market[52]
Treasury Bills	Competitive auction	3,6,12 and 18 months	Euro	Discounted		Mainly individual investors	SENAF[53] MTSSpain[54] EuroMTS Brokertech[55]
Government Bonds	Competitive, second round for market makers	3 and 5 year	Euro	Fixed-rate annual coupons	Strippable	Domestic and global investors	SENAF MTSSpain Brokertech
Government Obligations	Competitive auction followed by a second round for market makers	10, 15 and 30 years	Euro	Fixed-rate annual coupons	Strippable	Domestic and global investors	SENAF MTSSpain Brokertech

Source: This table has been constructed using data provided by Jose Manuel Amor, (ed.), **Government Bond Markets in the Euro Zone,** West Sussex: John Willey&Sons, 2002, pp.21-25; MTSSpain at http://www.mtsspain.com (10.10.2006).

[52] The secondary market for Spanish Treasury debt is known as Mercado de Deuda Publica Anotada (MDPA). The MDPA conducts trading through three systems. The first two are reserved for market members, while the third is for transactions between market members and their clients. The first member system is a "blind market" electronic trading system conducted without knowledge of the counterparty's identity, while the second system channels all the remaining transactions between market members. The structure of the Spanish market is quite similar to the U.S. market. For further detail see: Antonio Diaz, John Merrick and Eliseo Navarro, "Spanish Treasury Bond Market Liquidity and Volatility Pre-and Post-European Monetary Union", **Working Paper**, November 2004, p.4.

[53]SENAF-Sistema Electronico de Negociacion de Activos Financieros (Electronic Trading Sytem of Financial Assets) is the electronic platform for trading Spanish public debt securities. For further detail see http://www.senaf.net (15.06.2006).

[54] MTS Spain is a domestic wholesale electronic trading system for Spanish government debt. For further information see http://www.mtsspain.com (10.10.2006).

[55] Brokertech Global was founded in 1999. A European and an American company forming a joint trading platform use technology developed by the Swedish company OM Group. Trading on Brokertech started in June 2000. In May 2003 the platform was bought by ICAP. For further detail see http://www.icap.com/e-broking/brokertec (12.10.2006).

The Spanish government debt securities market is one of the biggest in the Euro-zone with government debt of 390,277 billion € in 2005[56].

This section provided detailed information about the government debt securities markets in the Euro-zone countries. The following section is devoted to the empirical analysis in order to determine the co-integrating relations among these markets.

[56] Spain's debt securities market has undergone important changes since the 1988 Securities Market Act which established a new framework including the book-entry market in public debt, introduced the public debt market maker system in 1991 and created the strips market in public debt in July 1997. Those structural changes have yielded that the Spanish market has obtained a place among the largest and liquid markets within the Euro area.

III. EMPIRICAL ANALYSIS OF COINTEGRATION BETWEEN THE EURO-ZONE GOVERNMENT DEBT SECURITIES MARKETS

As stated in the introduction, one of the aims of this paper is to determine the level of cointegration among the Euro-zone government debt securities markets. The rest of this section is devoted to the empirical analysis of data to decide on cointegration. First the terms correlation, convergence and cointegration are discussed, then follows the literature review, the methodology and the empirical part.

III.1. Convergence versus Cointegration

A correlation analysis tries "to measure the strength or degree of linear association between two variables"[57]. Thus, the correlation between two variables measures the intensity of the relationship and it is a number between –1 and 1. The correlation coefficients obtained from the analysis give the strength of the association. With respect to bond markets, the correlation coefficients measure the degree of integration between the markets. Correlation between the bond markets may be the result of different factors such as diversified portfolio holdings of international investors, the similarities in risk perception of these investors, the behaviour of investors in times of financial instabilities, the effects of global factors on domestic interest rates.

Convergence describes the situation where two variables move together towards a common path whereas, cointegration implies the case where in the long-run an equilibrium relationship exist between the variables[58]. As stated, convergence and cointegration are different empirical phenomena. "The fact that two variables may be co-integrated does not imply that these variables are converging, merely that an equilibrium (stationary) relationship exists between two non-stationary variables. Similarly, where evidence

[57] Chris Brooks, **Introductory Econometrics for Finance**, Cambridge: Cambridge University Press, 2004, p.23.

[58] Mairead Devine, " The Cointegration of International Interest Rates: A Review", **Technical Paper**, Central Bank of Ireland, January 1997, p.8.

indicates that two variables are converging, this does not imply that a co-integrating relationship automatically exists between the two"[59]. Whereas a converging relation can be limited to short-run movements only, a co-integrating relation provides evidence of both short- and long-run movements.

A large number of researches tried to show evidence about the contribution of the common currency to cointegration. The following analysis tries to clarify the situation with respect to the co-movement of government bond markets in the investigated countries. Even if there are numerous researches on this subject, the contribution of this paper will be that Turkey is added to the analysis of cointegration in the next section.

III.2. Literature Review

The increased importance of financial markets encouraged researchers to investigate the linkages between the markets and the outcomes of financial integration. The uniqueness of the Euro on the other hand, has given impetus for such research to be concentrated on the EU countries in order to find out its effects on the integration of the Euro-zone financial markets.

DeGennaro, Kunkel and Lee used monthly interest rates on long-term government bonds of Canada, Japan, Germany, the United Kingdom and the United States for the period from January 1967 to December 1990 to search for cointegration[60]. First the data was tested for unit root then the multivariate cointegration tests were used based on maximum likelihood estimation of fully specified multivariate models. To test for cointegration they imposed the no-trend restriction. The results of the test found little evidence of cointegration in the sample period for the five interest rate series. In order to confirm their findings they used the Stock-Watson cointegration test, which provided some, but not substantial evidence of cointegration.

[59] Ibid., p.8.

Clare, Maras and Thomas tried to determined if the government bond markets of the UK, the USA, Germany and Japan were integrated in the long-run applying cointegration analysis using the Salamon Brothers Total Return Government Bond Indices[61]. Their findings indicated that the government bond markets of the selected countries did not show comovement over the investigated period between January 1978 to April 1990.

Pagano and Thadden[62] investigated the level of integration among the markets for Euro-area sovereign and private sector bonds following the monetary unification in the 1999-2004 period. They tried to demonstrate that an integrated market both for public as well as private Euro-area bonds have emerged but these bonds remained imperfect substitutes eventhough impressive changes have occurred. One of their major findings was that the corporate issuance has increased considerably. Both the primary and the secondary markets have shown important developments with respect to issuance and volume of trading. They documented that the changes in the markets have fostered convergence in government bond yields in the transition to EMU. They also claimed that yield spreads showed a clear tendency of comovement. Finally they commented on possible future developments like the joint bond issuance by Euro-area countries.

Kim, Lucey and Wu[63] investigated during the 1998-2003 period the government bond markets of the existing and new-entrant EU countries[64]. All-maturity total returns on

---

[60] Ramon P. De Gennaro, Robert A.Kunkel and Junsoo Lee, "Modeling International Long-term Interest Rates", **Financial Review**, 29, 1994, p.577.

[61] Andrew D.Clare, Michael Maras and Stephen H.Thomas, "The Integration and Efficiency Of International Bond Markets", **Journal of Business Finance and Accounting**, 22(2), March 1995, p.314.

[62] Marco Pagano and Ernst-Ludwig v. Thadden, "The European Bond Markets under EMU", **Oxford Review of Economic Policy**, November 2004, p.2.

[63] Suk Joong Kim, Brian M.Lucey and Eliza Wu, "Dynamics of Bond Market Integration between Established and New European Union Countries", **Journal of International Financial Markets, Institutions and Money,** 2005,p.3.

[64] The member countries included were Belgium, France, Germany, Ireland, Italy, the Netherlands, the UK and new-entrants included were Czech Republic, Poland, Hungary.

Morgan Stanley Capital International Inc. (MSCI) Government Bond Indices data were used[65]. They examined the dynamic nature of the linkages between these markets using dynamic cointegration, Kalman filtering method and a bivariate version of Engle's dynamic conditional correlation model. They came up with consistent evidence of cointegration among government bond markets of the established EU members and the accession countries.

Berben and Jansen[66] investigated the increase in financial market integration in nine European countries and the US in the period 1980-2003. They looked on conditional cross-country correlation both in the stock and bond markets. Using a series of bi-variate GARCH[67] models with a smoothly time-varying correlation they concluded on strong evidence of greater co-movement for both stock markets and government bond markets. Their findings suggested that the integration process among the international financial markets was not only a result of global factors like advances in information technology, financial innovation, greater trade independence and convergence of inflation rates but country-specific factors like market size, differences in economic policies and financial market regulations, differences in transaction and information costs also played an important role. They also concluded that the monetary union established in 1999 with the introduction of the Euro had little impact on integration whereas during the period prior to that (1996-1998) bond markets have shown increased correlation. For the stock markets the Euro has hardly been influential.

---

[65]Morgan Stanley Capital International Inc. (MSCI) is a leading provider of equity (international and US), fixed income and hedge fund indices. For detail see www.msci.com (25.06.2006).

[66] Robert-Paul Berben and W.Jos Jansen, "Bond Market and Stock Market Integration in Europe", **DNB Working Paper**, No:60, November 2005, p.2.

[67] GARCH (Generalised Autoregressive Conditional Heteroscedasticity) Models. For further detail see Brooks, p.452 cont.

Yang [68] used a recursive cointegration technique for detecting the existence of cointegration among the bond markets of 6 EU countries namely Germany, France, UK, Belgium and Netherlands[69]. His study was based on 192 monthly observations of J.P. Morgan total return government bond indices for the 1988-2003 period. Using an empirical analysis based on Vector Autoregression (VAR) models and Johansen[70] cointegration test, he concluded on weak evidence of a stable long-run relationship. The contemporaneous correlation between EU markets is found to be higher than that of any other markets outside Europe, which indicates a higher degree of integration. He concluded that EU markets are generally interdependent without a distinctive leadership.

Previous studies generally showed that following the introduction of the Euro, European primary and secondary bond markets have become increasingly integrated. Financial market integration not only resulted from single currency and legislation but also from other factors such as improvements in technology and internationalisation of production through foreign direct investments. Studies on cointegration regarding bond markets obtained different results. Some of them concluded on the existence of cointegration between European bond markets but others claimed that these markets were rather independent.

Inspired by the above-mentioned articles, this study is aimed at finding out the cointegrating relations among the EU countries' sovereign debt markets. The empirical analysis is composed of two parts. In the first part the 1996-1998 period is investigated to provide information about the pre-Euro era. In this part, data for 4 Euro-area countries is used. France, Germany, Italy, Spain are selected as they are the major well-developed

[68] Jian Yang, "Government Bond Market Linkages: Evidence from Europe", **Applied Financial Economics,** 2005, p.600.

[69] The co-integrating relations are estimated recursively from a likelihood function. For further detail see Henrik Hansen and Soren Johansen, "Some Tests for Parameter Constancy In Co-integrated VAR-Models", **Econometrics Journal**, V.2, 1999, p.306-333.

[70] For further detail see Richard I.D.Harris, **Using Cointegration Analysis in Econometric Modelling**, Prentice Hall, London, 1995, p.77 cont.

markets of the EU. One new-entrant country Poland having one of the most developed bond markets among the Central and Eastern European Countries (CEEC) [71] is added to the analysis. In addition to the above-mentioned reasoning, countries are chosen mainly with respect to the availability of data for the mentioned period. In the second part the 2001-2005 period is investigated to find out the situation in the pan-Euro era. In this part Greece is added to the Euro-zone countries and Hungary is added to the new-entrants.

III.3. Methodology

In the following pages, the relation between Euro-zone sovereign debt markets and two new entrant countries is investigated using cointegration analysis. The methodology used for the analysis is the Engle and Granger two step methodology[72]. The first step is to test that the series are stationary, which means that they all are I (1) or I (2), etc. To determine stationarity the Augmented Dickey-Fuller (ADF) t-tests are used. The second step includes the pair-wise regression of the residuals. The test statistics are then compared to the Augmented Engle-Grager (AEG)[73] critical values to decide on cointegration, which shows that non-stationary time series are moving together in the long-run. Finally the Johansen method is applied in order to assess the results.

III.3.1. Stationarity

In order to use cointegration analysis, first the time series data, composed of daily government bond indices values, is tested for stationarity.

"A stationary series can be defined as one with a constant mean, constant variance and constant auto-covariance for each given lag"[74]. Thus, a stochastic process is said to be

[71] The new entrant countries of the Central and Eastern European Countries are made up of the Czech Republic, Estonia, Hungary, Malta, Latvia, Lithuania, Poland, Slovakia, Slovenia and Cyprus.

[72] For details see Brooks, p.393.

[73] For details see Robert F.Engle and Byung Sam Yoo, "Forecasting in Integrated Systems", **Journal of Econometrics 35,** 1987, p.143-159.

[74] Brooks, p.367.

stationary if its mean and variance are constant over time and the value of the covariance between the two time periods depends only on the distance or gap or lag between the two time periods and not the actual time at which the covariance is computed.

One of the most popular stationarity tests is the unit root test. In a unit root process, the null hypothesis $\phi=1$ in the below formula is tested,

$$y_t = \phi\, y_{t-1} + u_t \qquad -1 \leq \phi \leq 1 \tag{1}$$

where u_t is a white noise disturbance term[75]. In this model if ϕ is equal to 1, the series are said to have a unit root which implies non-stationarity. For practical reasons, generally the below stated equation is tested,

$$\Delta y_t = \psi\, y_{t-1} + u_t \tag{2}$$

with the null hypothesis of $\psi=0$ against one sided alternative $\psi<0$ since (ϕ -1= ψ). The null hypothesis $\psi=0$ means that there is a unit root implying that the time series data is non-stationary. The alternative hypothesis is $\psi<0$, meaning that the time series data is stationary.

The original test of Dickey-Fuller (DF) assumes uncorrelated u_t's, but they suggested another test known as Augmented Dickey Fuller (ADF) test, which can be used in correlated u_t cases. This test requires the estimation of the following regression.

$$\Delta Y_t = \beta_1 + \beta_2 t + \psi\, Y_{t-1} + \sum \alpha_i\, \Delta Y_{t-i} + \varepsilon_t \tag{3}$$

By adding enough lagged differences of Y, the error term ε_t is ensured to be serially uncorrelated. ADF also tests for $\psi=0$ in the null hypothesis against alternative $\psi<0$ like the original DF test and uses the same critical values[76]. In the ADF test, if the test

[75] White noise implies a series with constant mean and variance, and zero autocovariances.

[76] These critical values were later extended by MacKinnon and were used extensively in econometric software packages.

statistic is bigger in absolute value than the reported MacKinnon critical values, then the null hypothesis of non-stationarity is rejected in favour of stationarity.

III.3.2. Cointegration

One of the well-known and widely used methods for estimating co-integrated systems is the Engle-Granger method which is build on a single equation and conducted in 2 steps. The first step includes the stationarity test mentioned above. The second step includes the test of the residuals from the regression equation for stationarity.

Let X_t and Y_t be non-stationary time series, both having one unit root so that they are I(1). When we regress one on the other, we have

$$Yt = \beta_1 + \beta_2 X_t + u_t \quad (4)$$

which is called co-integrating regression and slope parameter β2 is called co-integrating parameter[77]. Rearranging we get

$$u_t = Y_t - \beta_1 - \beta_2 X_t \quad (5)$$

If the residuals of the co-integrating regression, u_t, are found to be stationary when the unit root test is applied, then we can conclude that the series are co-integrated[78]. In short, two time series are co-integrated if they are integrated of the same order and the residual terms from the regression of one on the other is stationary. Two co-integrating series can deviate from their relationship in the short run but will not drift too far apart over the long run, thus cointegration can be seen as a long term relationship or an equilibrium phenomenon.

---

[77] Gujarati, p.822.

[78] However, as now the stationarity of the estimated residuals are tested for unit root, different critical values than the ADF critical values are used. As Engle and Granger have calculated new critical values for this application this test is known as the Engle-Granger (EG) test. But MacKinnon and Engle-Granger ciritcal values are actually very close to each other.

The model used for the cointegration analysis in this paper is

$$\text{Ln } Y_t = \beta_1 + \beta_2 \ \ln X_t + u_t \qquad (6)$$

Thus, the residuals are obtained through

$$u_t = \ln Y_t - \beta_1 - \beta_2 \ \ln X_t \qquad (7)$$

and the null hypothesis and the alternative hypothesis for the unit root test are

$H_0 : u_t \approx I(1)$

$H_1 : u_t \approx I(0)$

Hence, if the null hypothesis is not rejected, which means that the residuals have one unit root, then there is no cointegration. If however, the null hypothesis is rejected, then the residuals are stationary and there is cointegration.

An additional method for testing co-integrating systems is the Johansen technique based on Vector Autoregressions (VARs). A VAR with k lags containing g variables ($g \geq 2$) could be set up as[79]:

$$y_t = \beta_1 y_{t-1} + \beta_2 y_{t-2} + \ldots\ldots\ldots + \beta_k y_{t-k} + u_t \qquad (8)$$

$$g \times 1 \quad g \times gg \times 1 \quad g \times gg \times 1 \quad g \times gg \times 1 \quad g \times 1$$

To use the Johansen test, the VAR equation above should be turned into a vector error correction model (VECM) as

$$\Delta y_t = \Pi \ y_{t-k} + \Gamma_1 \Delta y_{t-1} + \Gamma_2 \Delta y_{t-2} + \ldots\ldots\ldots + \Gamma_{k-1} \Delta y_{t-(k-1)} + u_t \qquad (9)$$

where $\Pi = \sum_{i=1}^{k} \beta_i - I_g$ and $\Gamma_i = \sum_{j=1}^{i} \beta_j - I_g$

[79] Brooks, p.403.

For the Johansen test the Π matrix is examined and the cointegration is decided upon looking at the rank which is equal to the number of the characteristic roots (eigenvalues λ_i) that are different from zero. There are two tests related to the eigenvalues which are:

$$\lambda_{trace} = - T \tag{10}$$

and

$$\lambda_{max} = - T \ln (1- \lambda_{r+1}) \tag{11}$$

where r implies the number of co-integrated vectors and λ_i is the estimated value for the eigenvalues of the matrix Π.

For the λ_{trace} test the null hypothesis is that the number of co-integrating vectors is less than or equal to r against the alternative that there are more than r.

For the λ_{max} test the null hypothesis is that the number of co-integrating vectors is r against r+1.

Thus, the trace test looks for,

$H_0 : r = 0$

$H_1 : r > 0$

whereas the Maximum-Eigenvalue test looks for

$H_0 : r = 1$

$H_1 : r > 1$

If the test statistics are greater than the critical values, the null hypothesis is rejected that there are r co-integrating vectors[80]. The first step is about testing the null hypothesis that there is no co-integrating vector. If this is not rejected the test is not continued and it will be concluded that there is no cointegration. But if it is rejected the test continues until the null is no longer rejected.

III.4. Data

For analysis, the J.P. Morgan Bond Indices data is used. For the EU countries the J.P. Morgan All Maturity Government Bond Indices (JPM GBI), for Poland and Hungary the J.P. Morgan Emerging Market Bond Index Global (JMP EMBI Global) are chosen. Data is obtained from Bloomberg ®[81].

JPM GBI are constructed including all local and foreign currency denominated issues, which have more than one year maturity[82]. The JPM EMBI Global is calculated including U.S.-dollar-denominated Brady bonds, Eurobonds, traded loans, and local market debt instruments issued by sovereign and quasi-sovereign entities with maturities of at least 2,5 years. Both indices are market value weighted total return indices, which include reinvestment of coupon payments and expressed in US Dollar terms[83].

---

[80] The critical values are calculated by Johansen and Juselius. See Soren Johansen and Katarina Juselius "Maximum Likelihood Estimation and Inference on Cointegration with Applications to the Demand for Money", **Oxford Bulletin of Economics and Statistics 52,** 1990, p.167 cont.

[81] Bloomberg® is one of the major global data providers. The Bloomberg Terminal TM provides real time and historic financial and market data for corporations, professionals and individuals all around the world. For further information see http://www.bloomberg.com (13.05.2006).

[82]J.P. Morgan Securities Inc., Fixed Income Research, "J.P.Morgan Government Bond Indices", New York: September 1997, p.2. http://www.jpmorgan.com (15.05.2006).

[83] The index data in US Dollar terms is calculated converting all input values like the par value, market value etc. into USD. Detail informations about the calculation methods are available on J.P.Morgan Securities Inc. publications mentioned in the footnotes above.

As the composition and construction of JPM GBI and EMBI Global are not exactly the same, this could result in some discrepancies on the outcomes however, as no other bond indices data, which covered all of the selected countries could be obtained, such effects are assumed to be negligible.

The first part includes the 28.06.1996-31.12.1998 period for which data was available for all the countries that we wanted to cover, giving us 656 daily data for each country. At 28.06.1996 all indices are set to 100 and normalised through $(x_{t+1}*100)/x_{t.}$

In the second part the 01.01.2001-23.11.2005 period is covered delivering 1278 daily data. At 01.01.2001 all indices is set to 100 and the data is normalised as mentioned above.

III.5. Analysis of Data

The analysis is separated into two parts.

III.5.1. Part One

In Part One the 28.06.1996-31.12.1998 period for France, Germany, Italy, Spain, and Poland are analysed in order to determine the level of cointegration during the pre-Euro period. Appendix 5 shows the index data of the selected EU countries.

III.5.1.1. Descriptive Statistics

Table-15 shows the summary statistics[84] of daily returns of country indices.

[84] The summary statistics provide summed-up information about the distribution of the time series data. The mean indicates the value around which all the values taken by the variables are equally distributed. The standard deviation shows the dispersion of the data. For a normal distribution the skewness is expected to be "0" and the kurtosis to be "3". Thus the estimated numbers provide information about the shape of the data used. Jarque-Bera is also a test about normality and it is expected to be "0" for normal distribution. If Jarque-Berra is < 0, the normal distribution of the residuals is rejected but if it is >0 the normal distribution of the residuals cannot be rejected. The results of Jarque-Berra are supported by the probability results.

Table 15: Summary Statistics of Index Returns

	FRANCE	GERMANY	ITALY	POLAND	SPAIN
Mean	0.000268	0.000215	0.000448	0.000457	0.000361
Median	0.000174	0.000115	0.000373	0.000464	0.000351
Maximum	0.025058	0.023488	0.022408	0.040344	0.022766
Minimum	-0.023690	-0.023298	-0.026804	-0.051728	-0.024541
Std. Dev.	0.005474	0.005597	0.005394	0.005815	0.005370
Skewness	0.283355	0.214550	-0.074958	-0.954107	0.062622
Kurtosis	4.746829	4.509890	4.491970	19.43345	4.254002
Jarque-Bera	91.90253	67.14111	61.27021	7458.313	43.27864
Probabilty	0.000000	0.000000	0.000000	0.000000	0.000000
Sum	0.175134	0.140302	0.293128	0.298892	0.236167
Sum Sq. Dev.	0.019565	0.020458	0.019000	0.022084	0.018829
Observations	654	654	654	654	654

Source: Own calculations.

France, Germany, Italy and Spain display similar data whereas Poland is differentiated from them. Appendix 6 displays the country log returns.

III.5.1.2. Historical Correlation of Daily Log Returns

Historical correlations of the daily returns, which show whether and how strongly pairs of variables are related, are given in Table-16. All EU countries have correlation coefficients around 0,96 and 0,83 whereas Poland has negative correlation coefficients.

Table 16: Historical Correlation of Index Returns

	FRANCE	GERMANY	ITALY	POLAND	SPAIN
FRANCE	1.000000				
GERMANY	0.968134	1.000000			
ITALY	0.849349	0.833255	1.000000		
POLAND	-0.116371	-0.110143	-0.058255	1.000000	
PORTUGAL	0.937594	0.937792	0.841985	-0.114596	
SPAIN	0.925098	0.925438	0.903617	-0.102641	1.000000

Source: Own calculations.

III.5.1.3. Unit Root Test (Stationarity) in Level and in 1st Difference

The ADF test is used in the analysis to test for a unit root in series. The null hypothesis is $\delta=0$ against one sided alternative $\delta<0$. Test statistics of each series are compared with MacKinnon critical values. No trend but intercept is included and optimum numbers of lags are determined by Akaike information criterion (AIC).

Table 17: Test Results for Unit Root

Variable	Case	Lags	Level	Case	Lags	1st Difference
France	NoTrend	0	0.178	No Trend	0	-24.498
Germany	No Trend	0	-0.151	No Trend	0	-24.701
Italy	No Trend	1	0.016	No Trend	0	-22.987
Poland	No Trend	17	-1.149	No Trend	16	-6.1736
Spain	No Trend	0	0.208	No Trend	0	-24.649

Source: Own calculations.
Note: MacKinnon critical values with intercept and without trend are -3.44, -2.86 and -2.56 for 1%, 5% and 10% significance levels, respectively.

In level, none of the series is stationary since the test statistics are smaller in absolute terms than the MacKinnon critical values. In this case, the first difference is tested for stationarity. According to the test results of 1st difference, since all are larger in absolute value than the MacKinnon critical values, the null hypothesis of non-stationarity is rejected in favour of stationarity. Thus it is concluded that series have one unit root.

III.5.1.4. Cointegration Tests

As known, two time series are co-integrated if they are integrated of the same order and the residual terms from a regression of one on the other is stationary. The series are tested for unit roots and it is found out that they all have one unit root. Now the stationarity of the residual terms from the pair wise regressions of each series will be checked using ADF test to conclude about cointegration between the series. The model is:

$$\text{Ln } Y_t = \beta_1 + \beta_2 \ln X_t + u_t \quad (13)$$

$$u_t = \ln Y_t - \beta_1 - \beta_2 \ln X_t \quad (14)$$

Since the cointegration analysis is conducted using pair wise regressions, including 5 countries 10 pair-wise regressions are obtained. The ADF test is run including intercept and choosing AIC. The results are compared with the critical values.

Table 18 : ADF Cointegration Test Results

Variable	Case	Lags	Level	5%
France-Germany	No Trend	3	-1.250	No
Italy-Germany	No Trend	9	-1.460	No
Italy-France	No Trend	8	-1.717	No
Poland-France	No Trend	10	-1.841	No
Poland-Italy	No Trend	10	-2.262	No
Poland-Germany	No Trend	10	-1.586	No
Poland-Spain	No Trend	10	-2.030	No
Spain-Germany	No Trend	1	-1.632	No
Spain-France	No Trend	4	-2.162	No
Spain-Italy	No Trend	7	-1.272	No

Source: Own calculations.
Note: MacKinnon critical values without trend and with intercept are -3.44, -2.86 and -2.56 for 1%, 5% and 10% significance levels, respectively.

Given that the series are I(1), it is possible to conclude for existence of cointegration if the ADF test statistics for the pair-wise regression residuals are larger than the critical values in absolute terms. The unit test above showed that it was not possible to determine cointegration between the included countries' bond markets at 5% significance level. When trend is included in the analysis results about cointegration do not change.

Looking at the period 1996-1998, just before the establishment of the EMU, it can be concluded from the results that EU member country bond markets don't have co-integrating relations.

To assess the ADF test results the Johansen method is employed as a second test. For the Johansen test multi-country data is used. The biggest issuer countries France, Germany, Spain and Italy are included in the test. The Johansen test results are given below.

Table 19 : Johansen Test Results (France-Germany-Spain-Italy)

		Trend		No Trend	
	H_0	Trace Statistics	Maximum-Eigenvalue Statistics	Trace Statistics	Maximum-Eigenvalue Statistics
FRANCE	r = 0	57.323	30.937	53.828	30.892*
GERMANY	r ≤ 1	26.385	12.948	22.935	13.523
ITALY	r ≤ 2	13.436	9.654	9.411	6.727
SPAIN	r ≤ 3	3.782	3.782	2.683	2.683

Source: Own calculations.
Note: The 5% critical values for the trace test are 63.87, 42.91, 25.87, 12.51 and for the maximum eigenvalue test are 32.11, 25.82, 19.38,12.51 for the trend case. For the no trend case the 5% critical values for the trace test are 54.07, 35.19, 20.26, 9.16 and for the maximum eigenvalue test are 28.58,22.29, 15.89,9.16. (*) denotes significance at 5% level. Optimum number of lags as given by AIC is 2.

Table 20: Coefficient Estimates (France-Germany-Spain-Italy)

FRANCE	GERMANY	ITALY	SPAIN	CONSTANT	TREND
1.000	-0.718 (0.056)	-0.019 (0.072)	-0.302 (0.119)	---	-6.82e-06 (9.9e-06)
1.000	-0.695 (0.052)	-0.029 (0.070)	-.0324 (0.124)	0.231 (0.053)	---

Source: Own calculations.

Both the trace and the maximum-eigenvalue tests do not indicate cointegration among the covered countries for the trend case. When Poland is added to the analysis, the results of both tests show that no cointegration exists among these markets.

Findings of both the ADF and the Johansen tests confirm that there are no co-integrating relations between the government debt securities markets of the included countries during the 1996-1998 period.

III.5.2. Part Two

In Part Two, the 01.01.2001- 23.11.2005 period for France, Germany, Greece, Italy, Portugal, Spain, Poland, and Hungary are included in the analysis in order to decide on the level of cointegration in the post-Euro period. Appendix 7 shows the index data of the countries.

III.5.2.1. Descriptive Statistics

Table-21 shows the descriptive statistics of daily log returns of indices. Looking at the data we can see that except Hungary and Poland, all EU countries display similar outcomes. Appendix 8 displays the country log returns.

Table 21: Summary Statistics of Index Returns

	FRANCE	GERMANY	GREECE	HUNGARY	ITALY	POLAND	PORTUGAL	SPAIN
Mean	0.000411	0.000405	0.000437	0.000223	0.000431	0.000297	0.000418	0.000427
Median	0.000401	0.000360	0.000503	0.000165	0.000488	0.000169	0.000453	0.000418
Maximum	0.025406	0.025682	0.025291	0.025252	0.025445	0.017130	0.024958	0.025309
Minimum	-0.025883	-0.026010	-0.025812	-0.024814	-0.026042	-0.021299	-0.025752	-0.025948
Std. Dev.	0.007145	0.007146	0.007156	0.002397	0.007207	0.003510	0.007098	0.007206
Skewness	-0.139009	-0.127891	-0.127630	0.406842	-0.141644	-0.317991	-0.107768	-0.141513
Kurtosis	3.523822	3.567523	3.509257	25.54814	3.492998	7.151147	3.516023	3.516378
Jarque-Bera	18.71251	20.61857	17.26609	27087.35	17.20223	938.4084	16.64013	18.44998
Probabilty	0.000086	0.000033	0.000178	0.000000	0.000184	0.000000	0.000244	0.000099
Sum	0.524282	0.517184	0.557499	0.284805	0.550812	0.378862	0.533418	0.545240
Sum Sq. Dev.	0.065143	0.065157	0.065339	0.007334	0.066283	0.015723	0.064285	0.066267
Observations	1277	1277	1277	1277	1277	1277	1277	1277

Source: Own calculations.

III.5.2.2. Historical Correlation of Daily Returns

Historical correlation data also shows that the EU countries are highly correlated except Hungary, Poland and Turkey. For the Euro-zone countries, correlation coefficients are around 0,98 – 0,99. Poland and Hungary show lower correlation coefficients.

Table 22: Historical Correlation of Index Returns

	FRANCE	GERMAN	GREECE	HUNGAR	ITALY	POLAND	PORTUGAL	SPAIN
FRANCE	1.000000							
GERMANY	0.990332	1.000000						
GREECE	0.993882	0.985363	1.000000					
HUNGARY	0.258702	0.255444	0.258373	1.000000				
ITALY	0.994796	0.989711	0.993939	0.264389	1.000000			
POLAND	0.419187	0.414524	0.423251	0.372059	0.427979	1.000000		
PORTUGAL	0.986708	0.988262	0.988196	0.250513	0.988771	0.408430	1.000000	
SPAIN	0.990688	0.992070	0.990821	0.257560	0.992688	0.422651	0.993678	1.000000

Source: Own calculations.

III.5.2.3. Unit Root Tests in Level and in 1st Difference

The ADF test choosing AIC is run and the test results are compared with the critical values. The series are found to be non-stationary.

Table 23: Test Results for Unit Root

Variable	Case	Lags	Level	Case	Lags	1st Difference
France	No Trend	0	-0.834	No Trend	3	-18.103
Germany	No Trend	0	-0.825	No Trend	0	-36.714
Greece	No Trend	4	-0.779	No Trend	3	-18.072
Hungary	No Trend	16	-2.539	No Trend	16	-7.3040
Italy	No Trend	4	-0.707	No Trend	2	-22.025
Poland	No Trend	1	-1.595	No Trend	0	-32.963
Portugal	No Trend	0	-0.908	No Trend	3	-17.847
Spain	No Trend	4	-0.732	No Trend	3	-18.039

Source: Own calculations.
Note: MacKinnon critical values with trend and intercept are -3.43, -2.86 and -2.56 for 1%, 5% and 10% significance levels, respectively.

III.5.2.4. Cointegration Tests

As the data for the included countries are integrated of 1st order, stationarity of the residuals from the pair-wise regressions of each series are checked using the ADF test to

conclude about cointegration between the series. With 8 countries investigated 28 pair-wise regression results are obtained. The regression model is the same as used in part one.

Table 24: ADF Cointegration Test Results

Variable	Case	Lags	Level	5%
France-Germany	No Trend	9	-2.836*	No
Greece-France	No Trend	4	-3.520	Yes
Greece-Germany	No Trend	4	-3.261	Yes
Greece-Italy	No Trend	3	-1.134	No
Greece-Spain	No Trend	11	-1.925	No
Hungary-France	No Trend	9	-2.875	Yes
Hungary-Germany	No Trend	9	-2.860	Yes
Hungary-Greece	No Trend	9	-2.856*	No
Hungary-Italy	No Trend	9	-2.821*	No
Hungary-Portugal	No Trend	3	-3.003	Yes
Hungary-Spain	No Trend	9	-2.880	Yes
Italy-France	No Trend	3	-1.815	No
Italy-Germany	No Trend	4	-1.972	No
Poland-France	No Trend	0	-3.185	Yes
Poland-Germany	No Trend	0	-3.188	Yes
Poland-Greece	No Trend	0	-3.038	Yes
Poland-Hungary	No Trend	3	-2.033	No
Poland-Italy	No Trend	0	-3.234	Yes
Poland-Portugal	No Trend	0	-3.011	Yes
Poland-Spain	No Trend	0	-3.199	Yes
Portugal-France	No Trend	6	-1.442	No
Portugal-Germany	No Trend	18	-1.104	No
Portugal-Greece	No Trend	6	-1.265	No
Portugal-Italy	No Trend	4	-0.558	No
Portugal-Spain	No Trend	18	-0.301	No
Spain-France	No Trend	8	-3.123	Yes
Spain-Germany	No Trend	6	-2.534	No
Spain-Italy	No Trend	21	0.910	No

Source: Own calculations.
Note: MacKinnon critical values with intercept are -3.43, -2.86 and -2.56 for 1%, 5% and 10% significance levels, respectively. (*) denotes significance at 10% level.

Considering significance at 5%, the test results obtained are summarised below.

- Cointegration is determined among the sovereign debt securities markets of Greece-France, Greece-Germany and Spain-France.

- Hungary's market shows cointegration with France, Germany, Portugal and Spain.

- Poland's sovereign debt securities market is co-integrated with France, Germany, Greece, Italy, Portugal and Spain.

The cointegration analysis is carried out using the Johansen method. First France, Germany and Spain are included in the test.

Table 25: Johansen Test Results (France-Germany-Spain)

		Trend		No Trend	
	H_0	**Trace Statistics**	**Maximum-Eigenvalue Statistics**	**Trace Statistics**	**Maximum-Eigenvalue Statistics**
FRANCE	**r = 0**	53.151*	41.052*	61.103*	33.199*
GERMANY	**r ≤ 1**	12.098	8.156	27.903*	20.059*
SPAIN	**r ≤ 2**	3.942	3.942	7.843	7.843

Source: Own calculations.
Note: The 5% critical values for the trace test are 42.91, 25.87, 12.51 and for the maximum eigenvalue test are 32.11, 25.82, 19.38,12.5 for the trend case. For the no trend case the 5% critical values for the trace test are 35.19, 20.26, 9.16 and for the maximum eigenvalue test are 22.29, 15.89, 9.16. (*) denotes significance at 5% level. Optimum number of lags as given by the AIC is 8.

Table 26: Coefficient Estimates (France-Germany-Greece-Italy-Spain)

FRANCE	GERMANY	SPAIN	CONSTANT	TREND
1.000	-0.564 (0.028)	-0.433 (0.027)	---	2.88e-06 (8.7e-07)
1.000	-0.587 (0.034)	-0.406 (0.033)	-0.024 (0.005)	---

Source: Own calculations.
Note: Values in the parantheses are the standard errors. T-value of the trend is 3.31.

As trend t-value is found to be statistically significant, we consider the trend case and accept that these three countries are cointegrated. As a next step France, Germany, Greece, Italy and Spain are included in the test.

Table 27: Johansen Test Results (France-Germany-Greece-Italy-Spain)

		Trend		No Trend	
	H_0	Trace Statistics	Maximum-Eigenvalue Statistics	Trace Statistics	Maximum-Eigenvalue Statistics
FRANCE	**r = 0**	101.771*	49.972*	105.428*	42.497*
GERMANY	**r ≤ 1**	51.798	30.233	62.930*	33.239*
GREECE	**r ≤ 2**	21.565	11.448	29.691	15.365
ITALY	**r ≤ 3**	10.117	6.462	14.326	8.944
SPAIN	**r ≤ 4**	3.655	3.655	5.381	5.381

Source: Own calculations.
Note: The 5% critical values for the trace test are 88.80, 63.87, 42.91, 25.87, 12.51 and for the maximum eigenvalue test are 38.33, 32.11, 25.82, 19.38,12.5 for the trend case. For the no trend case the 5% critical values for the trace test are 76.97, 54.07, 35.19, 20.26, 9.16 and for the maximum eigenvalue test are 34.80, 28.58, 22.29, 15.89, 9.16. (*) denotes significance at 5% level. Optimum number of lags as given by the AIC is 7.

Table 28: Coefficient Estimates (France-Germany-Greece-Italy-Spain)

FRANCE	GERMANY	GREECE	ITALY	SPAIN	CONSTANT	TREND
1.000	-0.548	0.012	-0.020	-0.442	---	3.88e-06
	(0.031)	(0.039)	(0.020)	(0077)		(1.1e-06)
1.000	-0.621	-0.089	-0.012	-0.270	-0.020	---
	(0.032)	(0.047)	(0.038)	(0.093)	(0.004)	

Source: Own calculations.
Note: Values in the parantheses are the standart errors. The t-value of the trend is 3.52.

Similarly, as trend t-value is found to be statistically significant, we consider that at 5% significance both the trace as well as the maximum eigenvalue tests confirm that cointegration exist among the included countries.

In order to see the relation between the new entrant EU countries and the old ones the Johansen test is carried out including France, Germany, Spain, Hungary and Poland. The results confirmed that cointegration existed between the included countries for the trend case.

Table 29: Johansen Test Results (France-Germany-Spain-Hungary-Poland)

		Trend		No Trend	
	H_0	Trace Statistics	Maximum-Eigenvalue Statistics	Trace Statistics	Maximum-Eigenvalue Statistics
FRANCE	r = 0	127.209*	77.542*	137.319*	72.211*
GERMANY	r ≤ 1	49.667	19.463	65.108*	29.429*
SPAIN	r ≤ 2	30.203	14.567	35.678*	18.195
HUNGARY	r ≤ 3	15.636	9.094	17.482	11.846
POLAND	r ≤ 4	6.541	6.541	5.635	5.635

Source: Own calculations.
Note: The 5% critical values for the trace test are 88.80, 63.87, 42.91, 25.87, 12.51 and for the maximum eigenvalue test are 38.33, 32.11, 25.82, 19.38,12.5 for the trend case. For the no trend case the 5% critical values for the trace test are 76.97, 54.07, 35.19, 20.26, 9.16 and for the maximum eigenvalue test are 34.80, 28.58, 22.29, 15.89, 9.16. (*) denotes significance at 5% level. Optimum number of lags as given by the AIC is 5.

Table 30: Coefficient Estimates (France-Germany-Spain-Hungary-Poland)

FRANCE	GERMANY	SPAIN	HUNGARY	POLAND	CONSTANT	TREND
1.000	-0.413 (0.037)	-0.587 (0.038)	0.009 (0 003)	0.012 (0003)	---	1.82e-06 (7.0e-07)
1.000	-0.395 (0.041)	-0.603 (0.041)	0.008 (0.004)	0.018 0.003)	-0.127 (0.019)	---

Source: Own calculations.
Note: Values in the parantheses are the standart errors. The t-value of the trend is 2.60.

Starting the analysis, the expectation was that, at least after the introduction of the Euro, the government debt securities markets would tend to be more co-integrated.

In the first part of the analysis during the 1996-1998 period, results showed that no cointegration among the sovereign debt markets existed.

In the second part, the results of the ADF tests indicated that cointegration occurred among the bond markets of some countries, especially the new entrant countries' markets following the introduction of the Euro. But it was not possible to claim that all of the markets were cointegrated. The outcomes of the Johansen test provided that among the bond markets cointegration existed.

There is a debate still continuing among researchers and academicians whether the EMU will be able to establish a single debt securities market, one similar to the USA market or some segmentation will remain. Commonly accepted idea is that a level of complete harmonisation would be reached in the future. The empirical study above provides a support for the idea that the sovereign debt securities markets tend to show signs of co-movement considering the Johansen method.

In the following chapter, detailed information about the Turkish sovereign debt securities market is provided, an empirical study is run in order to determine if Turkish markets are co-integrated with the Euro-zone markets and the results are analysed.

IV. TURKISH DEBT ISSUANCE MARKET AND ITS INTERACTION WITH THE EURO-ZONE MARKETS

Being a country that applied for full-membership to the EU at the end of a long-lasting process, which started in 1959, Turkey is aiming to get integrated with the new system established in Europe following the EMU[85]. The roadmap for Turkey to follow on its way to full-membership was put down by the Accession Partnership[86] and the National Program[87]. In an era where Turkey is progressing towards a full integration with the EU, in this section Turkey's relations with the Euro-zone countries with regard to the government debt securities markets is investigated.

IV.1. Turkish Government Debt Securities Market

Turkish fixed income securities market is dominated by government issues since long. The last corporate bond matured around the beginning of the 1990's and no new

[85] Following Turkey's application for membership, the Ankara Agreement that created an association between Turkey and the EEC was signed on 12 September 1963. The Ankara Agreement consisted of three phases: a five-year preparation period, a transition period at the end of which a Customs Union should be completed and a final period. The first phase ended in 13 November 1970. The Additional Protocol was signed at the end of this phase and took effect in 1973. However, as Turkey failed to fulfill its obligations determined by the Additional Protocol, the application has been suspended between 1978 and 1988. Following the military coup in 1980 relations have totally been stopped till 1987 where Turkey renewed its application for becoming a full member. This application has not been accepted by the EEC and finalization of the Customs Union as a first step has been recommended. In 1993 negotiations related to the Customs Union have started and were finalized on 1 January 1996 forming a Customs Union between Turkey and the EU.

[86] The Accession Partnership is a road map for Turkey for determining the priorities for the progress that needs to be undertaken towards meeting the EU's accession criteria. The purpose of the Accession Partnership is to bring together under a single framework the priority areas that need to be worked on, which were described in the Commission's 2000 Regular Report concerning the progress Turkey had made on the road to European Union membership, the financial opportunities provided to Turkey for implementing these priorities and the conditions for this assistance.

[87] The National Programme prepared for the adoption of the *Acquis Communautaire* indicates in detail how the candidate country envisages to implement the Accession Partnership priorities and to prepare for integration with the EU. In this way, the National Programme complements the Accession Partnership. It includes a timetable for the achievement of objectives and, when necessary, indicates the human and financial resources to be allocated.

issues followed, as the private sector could not compete with the government, whose major financing source was domestic borrowing. In June 1991, the first organised market for debt securities was established within the premises of the Istanbul Stock Exchange (ISE). The market developed quickly from a daily trading volume of 2 million USD in 1993 to 1.048 million USD in 2000, declining to 419 million USD in 2001 following the financial crises, afterwards with continued increase reaching to 1.560 million USD in 2005[88].

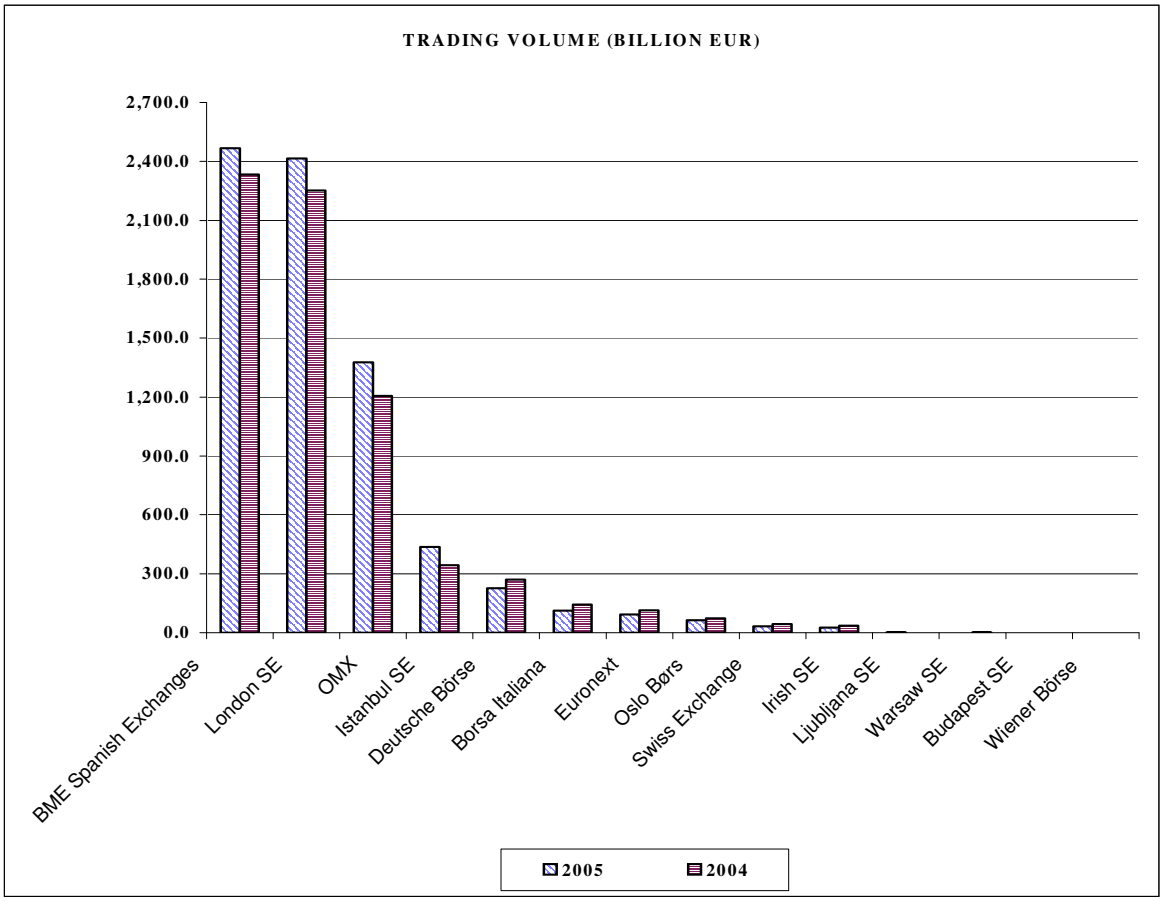


Figure 2: Trading Volume of Some Major Stock Exchanges
Source: FIBV Annual Statistics, www.world-exchanges.org (19.07.2006).

[88] Istanbul Stock Exchange, Data Sets, Total and Daily Average Traded Values Realised in the Bonds and Bills Market, http://www.ise.gov.tr (25.06.2006).

Turkish government debt securities as well as the market displays important similarities to Euro-zone government debt securities markets with respect to the types of securities, the issuance procedures and the market organisation however, major differences exist in other areas.

With regard to the trading volume, the ISE Bonds and Bills Market is in competition with the Deutsche Börse and the Borsa Italiana as can be seen from Figure 2.

IV.1.1. Types of Debt Securities

Informations about major government debt instruments issued by the Turkish Treasury are given below.

IV.1.1.1. Treasury Bills

They are short-term securities sold on discount with 3, 6, 9 and 12-month maturity. Especially in times of economic uncertainties bills are mostly preferred instruments by investors as they provide flexibility with respect to portfolio diversification.

IV.1.1.2. Government Bonds

They have maturities between 1–5 years. They are either zero-coupon securities or have floating/ fixed rate coupons. The zero coupon bonds generally have maturities up to 3 years. As the maturity lengthens up to 5 years, coupon-bearing bonds are issued. Coupon payments are generally semi-annual or quarterly, very rarely yearly.

Floating rates are generally linked to inflation, auction yields or LIBOR in case of foreign currency denominated or foreign currency indexed bonds. They are usually sold with a pre-determined risk premium over the benchmark index or yield.

Foreign currency denominated bonds and inflation-indexed bonds are also issued. Foreign currency indexed bonds pay their coupon and principle in Turkish Lira but their value is indexed to the exchange rate mainly of the US Dollar or the Euro. There are also

foreign currency denominated bonds in which case all the coupons and the principle are paid in foreign currency. Their coupon payments are made quarterly, semi- annually or annually. There are government bonds, which are indexed to the wholesale price index or consumer price index plus some pre-determined spread.

The Treasury also uses revenue-sharing certificates and asset-backed securities on special occasions.

IV.1.1.3. Strips

Coupon bearing bonds can be stripped and the capital and the coupons can be traded separately. The Treasury announces the strippable securities.

IV.1.1.4. Eurobonds

In order to be sold to international investors, eurobonds are denominated in foreign currency. They are coupon-bearing securities, their yield is almost always linked to the most liquid security in the domestic market of the face currency[89]. The Treasury mainly issues USD or Euro denominated eurobonds whereas the denomination in Japanese Yen has also been used.

IV.1.2. The Organisation of Debt Issuance (The Primary Market)

Government debt securities are mostly issued through auctions. The Central Bank of Turkey (CBT) acts as the fiscal agent of the Treasury and handles the auction. The Treasury announces the timetable of auctions at the beginning of every month. Auctions are held generally on Tuesdays where the value date is Wednesday (T+1). Day count convention is Actual/364 in the auctions. Both Dutch auctions as well as the multi-price

[89] For US denominated Eurobonds the US Treasury bond, for EURO denominated Eurobonds the German Bund rate plus some margin determines the yield.

auctions are used. Usually a second round is held where bids are accepted at the average auction price.

The primary dealership system has been introduced in May 2000. However, as during the financial crises at the end of 2000 and the beginning of 2001, the primary dealers failed to fulfil their obligations due to the very high levels of interest rate fluctuations and the shortage of cash in the market, the application has been suspended till September 2002. Using the experience gained during the crises, the principles of the system have been newly arranged and the system has been re-introduced[90].

IV.1.3. Methods of Trading (The Secondary Market)

Main market participants in the secondary market trading are banks, brokerage houses (together called intermediary institutions) and the CBT. Intermediary institutions must have a license to operate in the market. Secondary market trading is supervised by the Capital Markets Board of Turkey (CMB). Banks are also subject to the supervision of the Banking Regulation and Supervision Agency (BRSA). As of 30 January 2006, 41 banks and 108 brokerage houses exist in the market. Among those banks, 12 licensed as Primary Dealers, who have to quote continuously two way prices in selected four benchmark securities. They have the right to submit non-competitive bids (bids with an average price) in government auctions.

The CBT is another major participant in the secondary market. It also uses the ISE repo market for open market operations.

[90] Obligations of the primary dealers are: to purchase at least 5% of the domestic borrowing instruments issued by the Treasury in each three-month period, and at least 3% of those issued in any month; to quote their buying and selling prices for instruments specified by the Treasury continuously on the Istanbul Stock Exchange Bond and Bill Market, in line with certain conditions, in order to ensure liquidity in the secondary markets for domestic borrowing instruments, and to carry out the research required by the Treasury in connection with the general economy and the financial markets.

IV.1.3.1. OTC Trading

Until 1991, all secondary market trading took place in the over-the-counter market. Today only 35% of all trades are conducted in the OTC.

OTC trading takes place through an unorganised dealer market. Market participants are banks and brokerage houses. Individuals and other institutional investors are users of the OTC market. However, mutual funds and investment trust companies have to use the organised market. All OTC transactions are agreed on the telephone or on electronic communication networks which are operated by data vendor companies such as Reuters and Bloomberg.

OTC transactions must be registered with the ISE within 30 days after the trade date however; they are generally registered within one week. The registration is conducted using the terminals of the ISE where, essential information like the parties, trade price, and nominal amount etc. about the trade is required. Registered trades are declared to public by weekly ISE bulletins. Intermediary institutions are required to pay registration fee proportional to their trading volume. Registration fees for the OTC are higher than the transaction fees of the ISE.

IV.1.3.2. Istanbul Stock Exchange Bonds and Bills Market

Established in June 17th, 1991, ISE Bonds and Bills Market is the only organised, fully electronic market for fixed income securities trading and repo/reverse repo transactions. It aims to provide a transparent and efficient secondary market. Since 1999 the market functions over a wide-area network, enabling market members to carry out remote trading. The automated system allows the exchange to offer a wider spectrum of orders and market types for fixed income securities.

IV.2. Cointegration between the Euro-zone and Turkish Debt Securities Markets

Having given detailed information about the Turkish debt securities market, its relation with the Euro-zone government debt securities markets will be investigated in the following pages. In order to do this, the same methods used in section three of the study are employed and Turkey is added to the analysis.

The J.P. Morgan Emerging Market Bond Index Global (JMP EMBI Global) data for Turkey is obtained both for the 28.06.1996-31.12.1998 and the 01.01.2001-23.11.2005 periods. All indices data is normalised as explained in section three.

IV.2.1. Part One

First the 28.06.1996-31.12.1998 period is investigated. Comparing the Euro-zone and Turkish descriptive statistics data it can be seen that Turkey is differentiated from the Euro-zone countries. The same can be observed when the historical correlation values of index returns are considered[91].

The Turkish data is tested for stationarity using the ADF unit root method and it is confirmed that the data has one unit root in level and none in first difference.

Table 31: Test Results for Unit Root

Variable	Case	Lags	Level	Case	Lags	1 st Difference
Turkey	No Trend	15	-2.554925	No Trend	15	-4.022218

Source: Own calculations.
Note: MacKinnon critical values with trend and intercept are -3.43, -2.86 and -2.56 for 1%, 5% and 10% significance levels, respectively.

Once it has been determined that the Turkish data is stationary, the ADF test on the residuals of the pair-wise regressions is run to decide on cointegration.

Table 32: ADF Cointegration Test Results

Variable	Case	Lags	Level	5%
Turkey-France	No Trend	17	-2.543571	No
Turkey-Germany	No Trend	17	-2.325738	No
Turkey-Italy	No Trend	14	-2.389023	No
Turkey-Poland	No Trend	15	-2.521082	No
Turkey-Portugal	No Trend	14	-2.224520	No
Turkey-Spain	No Trend	14	-2.295233	No

Source: Own calculations.
Note: MacKinnon critical values without trend and intercept are -3.43, -2.86 and -2.56 for 1%, 5% and 10% significance levels, respectively.

According to the ADF results Turkey displays no cointegration with the included countries in the 1996-1998 period. The Johansen test is run including France, Germany, Italy, Spain and Turkey.

Table 33: Johansen Test Results (France-Germany-Italy-Spain-Turkey)

		Trend		No Trend	
	H_0	Trace Statistics	Maximum-Eigenvalue Statistics	Trace Statistics	Maximum-Eigenvalue Statistics
FRANCE	**r = 0**	71.126	31.722	66.965	31.964
GERMANY	**r ≤ 1**	39.403	16.384	35.000	15.768
SPAIN	**r ≤ 2**	23.018	10.727	19.231	10.290
ITALY	**r ≤ 3**	12.291	8.5471	8.940	6.710
TURKEY	**r ≤ 4**	3.743	3.7439	2.229	2.229

Source: Own calculations.
Note: The 5% critical values for the trace test are 88.80, 63.87, 42.91, 25.87, 12.51 and for the maximum eigenvalue test are 38.33, 32.11, 25.82, 19.38,12.5 for the trend case. For the no trend case the 5% critical values for the trace test are 76.97, 54.07, 35.19, 20.26, 9.16 and for the maximum eigenvalue test are 34.80, 28.58, 22.29, 15.89, 9.16. (*) denotes significance at 5% level. Optimum number of lags as given by the AIC is 2.

[91] The descriptive statistics of daily log returns and historical correlation data for Turkey together with the EU countries are given in the appendices 1-4.

Table 34: Coefficient Estimates (France-Germany-Italy-Spain-Turkey)

FRANCE	GERMANY	ITALY	SPAIN	TURKEY	CONSTANT	TREND
1.000	-0.710 (0.059)	0.020 (0.079)	-0.361 (0.127)	-0 019 (0.017)	---	-2.59e-06 (1.1e-05)
1.000	-0.701 (0.055)	0.024 (0.078)	-0.379 (0.129)	0.020 (0.017)	-0.362 (0.118)	---

Source: Own calculations.
Note: Values in the parentheses are the standard errors.

The results of both the trace and the maximum eigenvalue tests show that no cointegration is determined between Turkey and the included Euro-zone countries.

Thus both the ADF and the Johansen test results showed that no cointegration could be determined between Turkey and the included EU countries for the 1996-1998 period.

IV.2.2. Part Two

In this part the 01.01.2001-23.11.2005 period is examined in order to determine the cointegrating relations between Turkey and the EU countries. First the data has been checked for unit root and it has been determined that the data is stationary.

Table 35: Test Results for Unit Root

Variable	Case	Lags	Level	Case	Lags	1 st Difference
Turkey	No Trend	12	-0.753002	No Trend	11	-9.253649

Source: Own calculations.
Note: MacKinnon critical values with trend and intercept are -3.43, -2.86 and -2.56 for 1%, 5% and 10% significance levels, respectively.

As the data is found to be stationary, the ADF test on the residuals of the pair-wise regressions is run to decide on cointegration. The test results show that no cointegration exists between Turkey and the included countries.

Table 36: ADF Cointegration Test Results

Variable	Case	Lags	Level	5%
Turkey-France	No Trend	0	-2.483488	No
Turkey-Germany	No Trend	0	-2.460258	No
Turkey-Greece	No Trend	0	-2.413687	No
Turkey-Hungary	No Trend	0	-2.165174	No
Turkey-Italy	No Trend	0	-2.523571	No
Turkey-Poland	No Trend	0	-2.626260*	No
Turkey-Portugal	No Trend	0	-2.342570	No
Turkey-Spain	No Trend	0	-2.456266	No

Source: Own calculations.
Note: MacKinnon critical values with intercept are -3.43, -2.86 and -2.56 for 1%, 5% and 10% significance levels, respectively. (*) denotes significance at 10% level.

For the Johansen test France, Germany and Italy are chosen as they are the biggest issuers in the EU and Turkey is added to the analysis. Both the trace and the maximum eigenvalue tests indicate that no cointegration exists.

Table 37: Johansen Test Results (France-Germany-Italy-Turkey)

		Trend		No Trend	
	H_0	Trace Statistics	Maximum-Eigenvalue Statistics	Trace Statistics	Maximum-Eigenvalue Statistics
FRANCE	**r = 0**	37.545	20.255	44.638	19.073
GERMANY	**r ≤ 1**	17.290	8.835	25.565	13.703
ITALY	**r ≤ 2**	8.454	5.459	11.862	7.902
TURKEY	**r ≤ 3**	2.995	2.995	3.959	3.959

Source: Own calculations.
Note: The 5% critical values for the trace test are 63.87, 42.91, 25.87, 12.51 and for the maximum eigenvalue test are 32.11, 25.82, 19.38,12.5 for the trend case. For the no trend case the 5% critical values for the trace test are 54.07, 35.19, 20.26, 9.16 and for the maximum eigenvalue test are 28.58, 22.29, 15.89, 9.16. (*) denotes significance at 5% level.

Table 38: Coefficient Estimates (France-Germany-Italy-Turkey)

FRANCE	GERMANY	ITALY	TURKEY	CONSTANT	TREND
1.000	-0.789 (0.087)	-0.218 (0089)	-0.008 (0004)	---	1.05e-05 (4.4e-06)
1.000	-0.892 (0.108)	0.108 (0.107)	0.003 (0.005)	-0.022 (0016)	---

Source: Own calculations.
Note: Values in the parentheses are the standard errors.

To see if Turkey is cointegrated with the new entrant countries Hungary and Poland, the three countries are included in the analysis and no cointegration was found.

Table 39: Johansen Test Results (Hungary-Poland-Turkey)

		Trend		No Trend	
	H0	**Trace Statistics**	**Maximum-Eigenvalue Statistics**	**Trace Statistics**	**Maximum-Eigenvalue Statistics**
HUNGARY	**r = 0**	35.766	16.825	26.448	12.122
POLAND	**r ≤ 1**	18.941	10.701	14.325	8.289
TURKEY	**r ≤ 2**	8.239	8.239	6.0361*	6.0361*

Source: Own calculations.
Note: The 5% critical values for the trace test are 42.91, 25.87, 12.51 and for the maximum eigenvalue test are 25.82, 19.38,12.5 for the trend case. For the no trend case the 5% critical values for the trace test are 35.19, 20.26, 9.16 and for the maximum eigenvalue test are 22.29, 15.89, 9.16. (*) denotes significance at 5% level.

Thus both the ADF and the Johansen test results indicate that in the 2001-2005 period no cointegration existed between Turkey and the EU markets.

IV.3. The Outlook for the Turkish Debt Issuance Market

The results of the analysis done for Turkey showed that cointegrating relation between the Turkish and the Euro-zone government debt securities markets were missing.

In section three of the study, relations among the Euro-zone countries and the new entrant countries was investigated. Comparing the countries pair-wisely, the ADF test indicated that co-integrating relations existed only among some countries. However, using multi-country analysis, the Johansen tests showed that cointegrating relations existed among the included countries. Both tests found that cointegrating relations occurred between the old and the new EU countries.

In order to be able to compete with the Euro-zone debt securities markets and to attain co-movement with these markets Turkey primarily has to fulfil the economic requirements of the EU as set by the Maastricht Criteria. Looking at data available as of December 2005, the outlook for Turkey is as follows:

Table 40: The Maastricht Criteria and Turkey's Compliance

Maastricht Criteria	EMU (End of 2005)	Turkey (End of 2005)
The inflation rate must not be more than 1.5 % above the average of the lowest three inflation rates in the EMS.	Yearly average of Euro-zone HICP 2.2 %.	Yearly Consumer Price Index (CPI) 7.7 %[92].
The long-term interest rates must be no more than 2 per cent above the average of the lowest three member countries' rates.	EU 12 yearly average long-term interest rate is 3.42.	Turkish domestic debt securities have maturities up to 5 years. Medium (1-5) and long-term (5 years and longer) Eurobonds are issued in the international markets. The three-year average for Turkey's 30-year Eurobond yield averaged about 10.63% against a reference value of 6.4%[93].
The country must have maintained its exchange rate within the narrow band of fluctuation of the ERM II for at least two years, without realignment.	As known the Euro-zone countries have adopted the Euro. The new entrant countries join the ERM II[94] in the preparation period for the Euro. From the old EU members who have not joined the EMU, Denmark joined the ERM II. The UK and Sweden however are not in yet.	Turkey is applying a floating exchange rate regime. The reference currency for Turkey is the USD.
The budget deficit must be no larger than 3 per cent of GDP, its National Debt must not exceed 60 per cent of GDP.	There are sometimes discrepancies even within the Euro-zone countries with respect to the budget deficit or debt ratios however, as long as it remains temporal it is not seen as much of a problem.	Turkey's budget deficit is around 3.9 % of the GDP, which is about to reach the limits. The Public Debt ratio is about 55.8 % of the GDP. The public debt criterion is momentarily the only criteria Turkey can meet.

Source: The table is constructed using data from Europe, Gateway to the EU http://europa.eu/index_en; OECD http://www.oecd.org; the CBT http://www.tcmb.gov.tr (31.06.2006)

[92] The Central Bank of Turkey www.tcmb.gov.tr (31.06.2006).

[93] Caner Bakır, "Turkey : En Route to Meet the Challenging Maastricht Criteria?", **Studia Europea**, L. 2-3, 2005, p.235

[94] The Exchange Rate Mechanism (ERM) is a system introduced by the European Community in March 1979, as part of the European Monetary System (EMS). The system allowed the local currencies to fluctuate between pre-determined margins. The purpose was to reduce exchange rate volatility in the preparation for EMU. But it did not function and was replaced by ERM II in 1999. For the new entrant countries ERM II determines the range of fluctuation and they must maintain those limits successfully for two year before they can adopt the Euro.

In order to enforce financial discipline and to achieve stability and sustainability in public finances, the EU has adopted the Stability and Growth Pact (SGP)[95] as an important part of the macroeconomic framework of the EMU. The fact that the exchange rate could not be used as an adjustment mechanism anymore would imply a greater role for fiscal measures at national level to help economies adjust to asymmetric shocks. Therefore the governments were expected to care for the national budget which was expected to be in balance or in surplus. Thus, in addition to the Maastricht Criteria, Turkey will be bound by the requirements of the SGP in order to keep stability and sustainability in public finances.

As of end 2005, Turkey is not able to meet the Maastricht criteria except for the public debt to GDP ratio. Two basic problematic issues are the inflation rate and the exchange rate. As known, Turkey has been able to decrease the rate of inflation from 86.4 % in December 1998 to 10.14 % in December 2005. Inflation targeting followed by tight monetary policy according to the final stand-by agreement with the International Monetary Fund (IMF) is still being applied.

The high level of current account deficit could constitute a problem for the exchange rate stability. In recent years Turkey is facing an inflow of foreign exchange for short-term investment purposes. Capital investments are very sensitive to changes in the economic and political situations in the country, which might increase their risk aversion. The unexpected reversals might have negative effects on the exchange rate mechanism and on stability[96].

---

[95] The Stability and Growth Pact was adopted in 1997 to strengthen the budgetary controls, to administer the excessive budget deficits, to encourage the co-ordination of economic policies and to attain the fiscal discipline. It took effect on 1 January 1999 in parallel to the introduction of the Euro.

[96] Under the assumption that the exchange rate fluctuations will remain limited, foreign investors are attracted to the high real interest rates in Turkey. As long as the economic outlook is well "hot money" remains. However, as soon as the outlook starts to worsen, so that foreign investors believe that they might be facing some volatility in the domestic market, they try to get out of the market by selling their bonds and buying foreign currency in order to transfer it to their home accounts. This was the case experienced during the 2000-2001 crises in Turkey. The recent developments, which resulted in the increase of domestic interest rates followed by the increasing exchange rates, demonstrate that same things are happening.

IV.4. Some Proposals for the Turkish Market on the Way to the EU

Whereas cointegration could not be found for Turkey, looking at the two new entrant countries Poland and Hungary, the empirical studies showed that they have attained increased level of cointegration with the Euro-zone debt securities markets eventhough they have not joined the EMU yet. Thus, the financial markets of the two new-entrant countries have become integrated with the EMU financial markets. The benefits from financial market integration on the macro level would be stability, strengthening and development. On the micro level, decreasing financing costs of the government, declining risk premium of the country, lengthening of the maturity composition of debt instruments and availability of a larger investor base could be mentioned.

The financial sectors of the two accession countries are relatively small compared to other member countries and they are dominated by the banking sector. The banking sector however, is mostly composed of foreign-owned institutions as a result of privatisation and mergers and acquisitions realised in recent years. Foreign ownership in these countries is above 65% and is expected to rise further[97]. The debt market is dominated by government debt securities, which are hold by banks and foreign investors. Thus the dominance of foreign investors in the debt market could be a major factor to explain the cointegrating relations.

In recent years interest from EU countries in the Turkish financial market has been growing rapidly. Some mergers and acquisitions occurred in the banking sector. The foreign investment in Turkish government debt instruments increased significantly. But the Turkish market is still away from establishing comovement with the EU markets.

In section two, detailed information about the government debt securities markets of the Euro-zone countries was given. Turkey could adapt debt market applications used in these countries in order to progress towards cointegration with their markets:

- As explained in the second part of the paper, most of the EU countries have started a re-organisation process long before the adoption of the Euro. Most of the countries have established new departments to be responsible of public debt management and introduced new systems to increase the efficiency of registry as well as of custody and settlement services. Turkey could evaluate the structure of its primary and secondary markets, settlement and custody services, determine the missing or lacking points and adjust accordingly.

- It is important that the Treasury increases the average maturity of its debt securities, which is one of the major requirements of the Maastricht criteria. This will lower the cost of borrowing on the one hand and will allow for better debt management on the other hand. Thus issuance could be concentrated in liquid benchmark securities. Through buy-back and swap operations illiquid securities should be removed from the market. As following the Euro the competition in the EU government debt securities markets increased, liquid Turkish benchmark securities would attract international investors.

- In most of the Euro-zone countries inflation indexed securities are issued and the investors welcome them as they provide a hedging possibility against changes in the inflation rate. Turkey could use a similar method to attract both the domestic as well as the foreign investors.

- There are different trading platforms in the Euro-zone. Some of them function nationally and some internationally. In order to increase the attractiveness of the secondary market, international trading platforms can be encouraged to enter the Turkish market.

- In Turkey today only the auction system is used. Direct placement and tapping methods could be used in order to increase the investor base. In the Finnish market

[97] Christian Thimann (Ed.), **Financial Sectors in the EU Accession Countries**, Frankfurt: European Central Bank, July 2002, p.6.

short-term securities and also serial bonds are sold using continuos tapping via private investment banks. The Treasury announces daily price for the security and banks match investors' orders. This is advantageous for the small-scale investors as they can anytime purchase securities at a price determined by the Treasury plus some commission. They are not concerned about the price calculation. The Treasury could use a similar method in Turkey where the small investors are in general suspicious about banks and brokerage houses.

- In Italy a system called as the "when-issued-market" is used for securities which are announced by the Treasury to be auctioned off at the pre-determined auction date in a pre-determined amount. Investors can trade in these yet-to-be-issued securities. In this way the Treasury can see the demand in the market and the price bidders are willing to accept. A similar system does not exist in Turkey yet but it could be applied. This would be beneficial for the debt agency as it will have price and demand information before the auction and can accordingly adjust the conditions of the issue to maximise the volume and to minimise cost.

- Turkey could prepare its debt securities market for the Euro. Thus issuance of Euro indexed or Euro-denominated securities must be considered seriously. Issuing in Euro Turkey would be faced with higher competition but also with a much larger investor base.

- As mentioned in section two, Austrian Treasury is using an issuance program for short-term securities in the form of bearer bills as an alternative to other money market instruments. Issuance is done either through auction or tapping. The face currency can be any currency, the governing law is the English law. Settlement is done via global agencies CEDEL and Euroclear. The bills have A-1/P-1 rating of Standar&Poor's and

Moody's respectively[98]. All the mentioned specifications attract domestic as well as global investors. Turkey could consider a similar system.

- In Greece bond trading on the Athens Exchanges is done on dirty price. Also in the ISE Bonds and Bills Market trades are matched on dirty price but for convenience of market participants accrued interest is calculated and disseminated via data vendor screen as well as ISE's own trading screens. The convention in most EU countries is that trading is done on clean price. Trading on the ISE could also be done on clean price, as this would help foreign participants to evaluate the market better.

- Usually in liquid and deep markets the debt securities are highly diversified, as issuers are willing to match special requirements of investors. This is a situation we see for example in the Spanish, Italian, German and French markets. Usually new instruments are developed as a result of investors' demands. Thus before introducing new instruments the Turkish Treasury should first determine the demand for such products in order to guarantee its success.

- Hedging possibilities are one of the major factors attracting investors to a market. Thus, Turkey must establish liquid, transparent, efficient and secure futures and options markets Also emphasis must be put on derivatives products and markets.

[98] There are global investment companies like the Standar&Poor's or Moody's who are providing ratings for all securities but also for countries, institutions, corporates. etc. Each company uses a different scaling system which to evaluate the riskiness. The rating are available to public and are used by investors in making investment decisions.

V. CONCLUSION

The purpose of this study was to determine the level of cointegration between the Euro-zone sovereign debt securities markets and the interaction of the Turkish market with these markets. Finding out the currently level of the relation, some ideas, which would help to develop the Turkish market further and to progress towards comovement, were proposed.

In section two the current situation of the Euro-zone markets and the effects of the monetary union on these markets were discussed. Also, information was provided on the specifications and applications of government debt securities markets in the Euro-zone countries in general. This section ended with country specific applications.

The third section included the empirical analysis of cointegration among some of the EU countries. Government bond indices data of selected EU countries was used for the cointegration analysis. In the empirical part, first the Engle-Granger two step methodology and then the Johansen cointegration methods were used to decide on the co-integrating relations.

The analysis was made up of two parts. In the first part the pre-Euro period between 1996-1998 was investigated. The test results indicated that during the 1996-1998 period, just before the establishment of EMU, the EU member country's sovereign debt securities markets did not have co-integrating relations.

In the second part of section three, the period between 2001-2005 was investigated and the effects of the Euro on the level of cointegration have been tested. The results of the ADF tests were mixed:

- Cointegration was determined among the sovereign debt securities markets of Greece-France, Greece-Germany and Spain-France.

- Hungary's market showed cointegration with France, Germany, Portugal and Spain.

- Poland's sovereign debt securities market was co-integrated with France, Germany, Greece, Italy, Portugal and Spain.

The Johansen test results also indicated that cointegration existed among the included countries. In order to see the relations between the new entrant EU countries and the old ones the test was run including France, Germany, Hungary and Poland. The results indicated that cointegration existed between the old and the new entrant countries.

Section four included informations about the Turkish government debt securities market. The specifications and applications of the primary and secondary markets were given in detail. Then an empirical study was run in order to determine the relation between the Euro-zone and the Turkish markets. Same methods used in section three were employed and the 1996-1998 and 2001-2005 periods were tested separately. Test results indicated that Turkey was not cointegrated with the Euro-zone and also with the new entrant countries.

Looking at the research on cointegration which were mentioned in the literature part, the findings of this paper shows similarities with the results of Kim, Lucey and Wu. They investigated the government debt securities markets of the existing and new-entrant EU countries for the 1998-2003 period and came up with consistent evidence of cointegration among government debt securities markets of the established EU members and the accession countries. Berben and Jansen also investigated the increase in financial market integration in nine European countries and the US in the period 1980-2003. They concluded on strong evidence of greater co-movement for both stock markets and government debt securities markets.

On the other hand, the findings were in contradiction with the results of Yang who concluded on weak evidence of a stable long-run relationship among the debt securities markets of 6 EU countries namely Germany, France, UK, Belgium and Netherlands for the 1988-2003 period.

The financial sectors of the two accession countries Poland and Hungary are relatively small compared to other member countries and they are dominated by the banking sector. The banking sector however, is mostly composed of foreign-owned institutions as a result of privatisation and mergers and acquisitions realised in recent years. Foreign ownership in these countries is above 65% and is expected to rise further. The debt market is dominated by government debt securities, which are hold by banks and foreign investors. Thus the dominance of foreign investors in the debt market could be a major factor to explain the cointegrating relations.

The situation in Turkey is not similar to the situation in these two new entrant countries. In recent years, interest from EU countries in the Turkish financial market has been growing. Some mergers and acquisitions also occurred in the Turkish banking sector. The foreign investment in Turkish government debt instruments increased significantly in recent years. But, due to differences in the economic structure, the size of the Turkish market, the different market practices, the Turkish debt securities market is still away from establishing comovement with the Euro-zone markets. Adapting debt market applications, which were mentioned in the previous section Turkey could progress towards cointegration with the Euro-zone government debt securities markets.

Turkey would benefit from cointegration with the Euro-zone markets. The economy would be more stable and less open to asymmetric shocks. The dept securities market would flourish attracting a large investor base. The Treasury would have better conditions for borrowing and for efficient debt management. As the dept securities markets are accepted as an integral part of the economy attaining cointegration with the Euro-zone in this market could help Turkey in developing cointegration with the EU. Even if it might take a long time for Turkey to become a full-member of the European Union, success in attaining the developments in the government debt securities markets would bring the Turkish economy to a much more stable and efficient stage.

APPENDIX

Appendix 1: Summary Statistics of Index Returns for Some EU Countries and Turkey (1996-1998)

	FRANCE	GERMANY	ITALY	POLAND	PORTUGAL	SPAIN	TURKEY
Mean	0.000268	0.000215	0.000448	0.000457	0.000343	0.000361	0.000235
Median	0.000174	0.000115	0.000373	0.000464	0.000326	0.000351	0.000229
Maximum	0.025058	0.023488	0.022408	0.040344	0.025262	0.022766	0.118703
Minimum	-0.023690	-0.023298	-0.026804	-0.051728	-0.025543	-0.024541	-0.131296
Std. Div.	0.005474	0.005597	0.005394	0.005815	0.005349	0.005370	0.011530
Skews	0.283355	0.214550	-0.074958	-0.954107	0.074110	0.062622	-1.969521
Kurtosis	4.746829	4.509890	4.491970	19.43345	4.904068	4.254002	58.78584
Jarque-Bera	91.90253	67.14111	61.27021	7458.313	99.39283	43.27864	85226.46
Probabilty	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Sum	0.175134	0.140302	0.293128	0.298892	0.224210	0.236167	0.153622
Sum Sq. Dev.	0.019565	0.020458	0.019000	0.022084	0.018684	0.018829	0.086809
Observations	654	654	654	654	654	654	654

Source: Own calculations.

Appendix 2: Historical Correlation of Index Returns Some EU Countries and Turkey (1996-1998)

	FRANCE	GERMANY	ITALY	POLAND	PORTUGAL	SPAIN	TURKEY
FRANCE	1.000000						
GERMANY	0.968134	1.000000					
ITALY	0.849349	0.833255	1.000000				
POLAND	-0.116371	-0.110143	-0.058255	1.000000			
PORTUGAL	0.937594	0.937792	0.841985	-0.114596	1.000000		
SPAIN	0.925098	0.925438	0.903617	-0.102641	0.928301	1.000000	
TURKEY	-0.092781	-0.088891	-0.038689	0.338719	-0.073661	-0.047662	1.000000

Source: Own calculations.

Appendix 3: Summary Statistics of Index Returns Some EU Countries and Turkey (2001-2005)

	FRANCE	GERMANY	GREECE	HUNGARY	ITALY	POLAND	PORTUGAL	SPAIN	TURKEY
Mean	0.000411	0.000405	0.000437	0.000223	0.000431	0.000297	0.000418	0.000427	0.000648
Median	0.000401	0.000360	0.000503	0.000165	0.000488	0.000169	0.000453	0.000418	0.000749
Maximum	0.025406	0.025682	0.025291	0.025252	0.025445	0.017130	0.024958	0.025309	0.050762
Minimum	-0.025883	-0.026010	-0.025812	-0.024814	-0.026042	-0.021299	-0.025752	-0.025948	-0.063279
Std. Dev.	0.007145	0.007146	0.007156	0.002397	0.007207	0.003510	0.007098	0.007206	0.009022
Skewness	-0.139009	-0.127891	-0.127630	0.406842	-0.141644	-0.317991	-0.107768	-0.141513	-1.474312
Kurtosis	3.523822	3.567523	3.509257	25.54814	3.492998	7.151147	3.516023	3.516378	15.39010
Jarque-Bera	18.71251	20.61857	17.26609	27087.35	17.20223	938.4084	16.64013	18.44998	8630.871
Probabilty	0.000086	0.000033	0.000178	0.000000	0.000184	0.000000	0.000244	0.000099	0.000000
Sum	0.524282	0.517184	0.557499	0.284805	0.550812	0.378862	0.533418	0.545240	0.827379
Sum Sq. Dev.	0.065143	0.065157	0.065339	0.007334	0.066283	0.015723	0.064285	0.066267	0.103872
Observation	1277	1277	1277	1277	1277	1277	1277	1277	1277

Source: Own calculations.

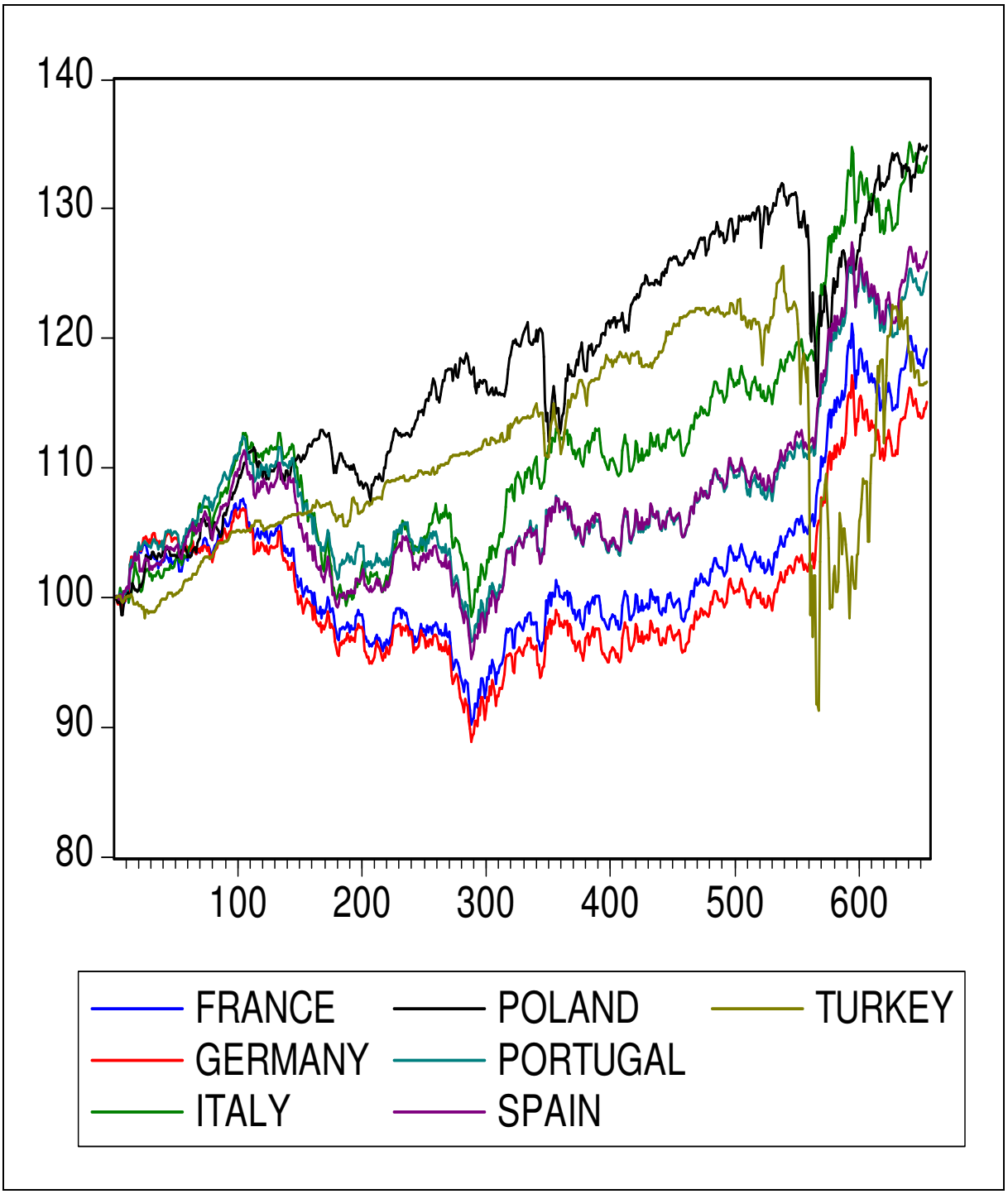
Appendix 4: Historical Correlation of Index Returns Some EU Countries and Turkey (2001-2005)

	FRANCE	GERMANY	GREECE	HUNGARY	ITALY	POLAND	PORTUGAL	SPAIN	TURKEY
FRANCE	1.000000								
GERMANY	0.990332	1.000000							
GREECE	0.993882	0.985363	1.000000						
HUNGARY	0.258702	0.255444	0.258373	1.000000					
ITALY	0.994796	0.989711	0.993939	0.264389	1.000000				
POLAND	0.419187	0.414524	0.423251	0.372059	0.427979	1.000000			
PORTUGAL	0.986708	0.988262	0.988196	0.250513	0.988771	0.408430	1.000000		
SPAIN	0.990688	0.992070	0.990821	0.257560	0.992688	0.422651	0.993678	1.000000	
TURKEY	0.083514	0.103112	0.084856	0.013715	0.089431	0.174699	0.101714	0.104769	1.000000

Source: Own calculations.

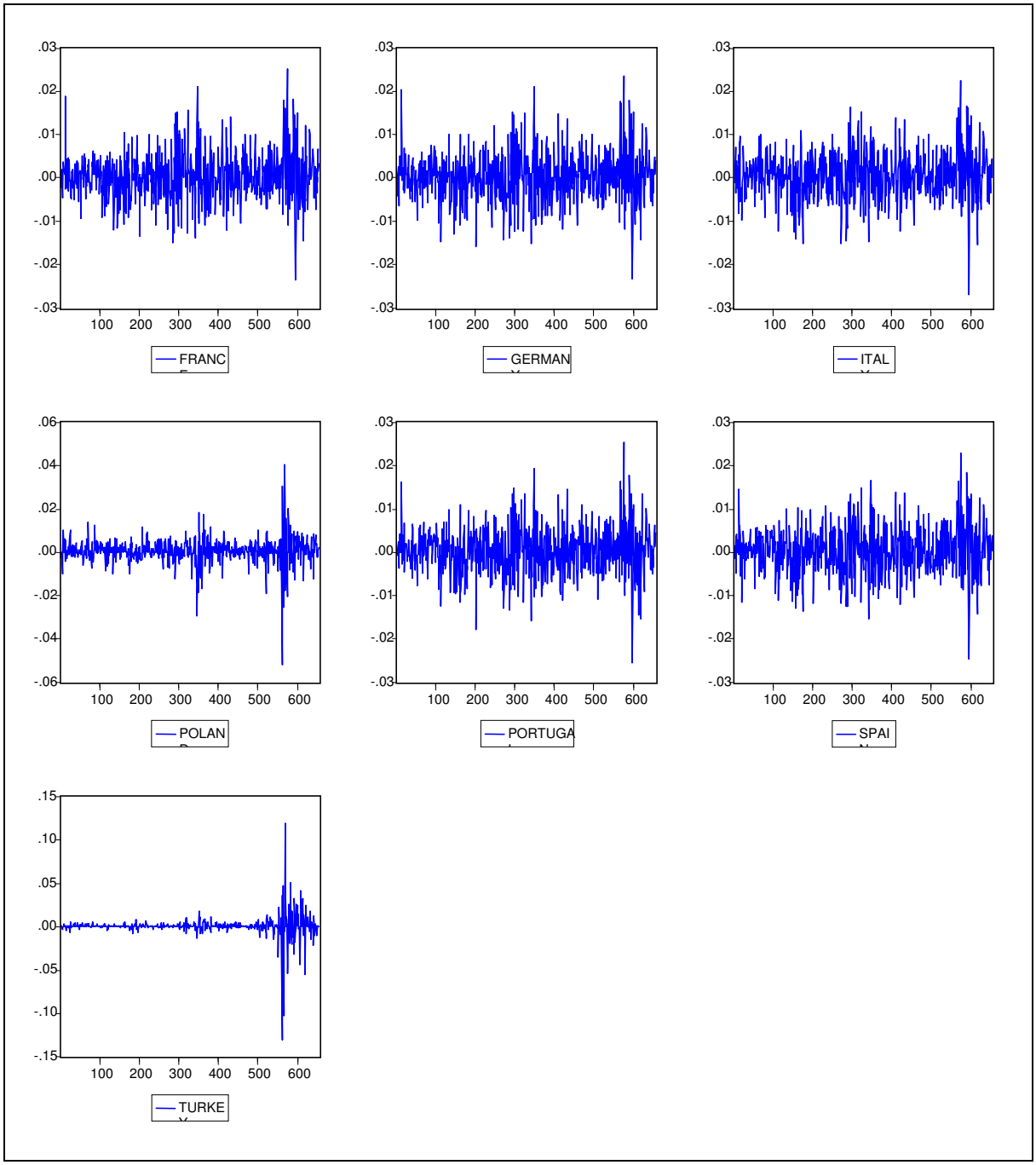
Appendix 5: Graph of Indices of Some EU Countries and Turkey

(1996-1998)



Source: Own calculations.

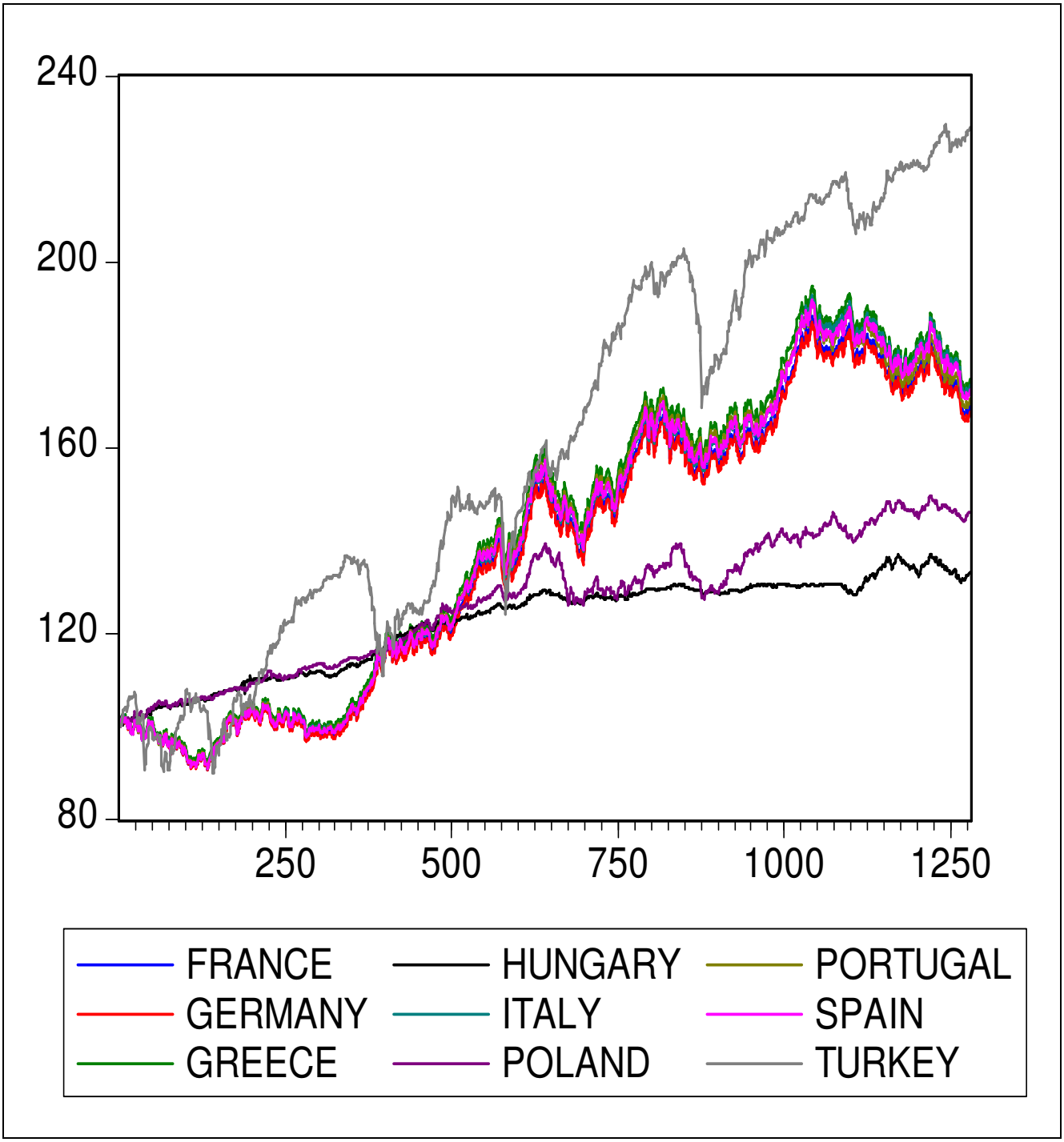
Appendix 6: Graphs of Index Returns for Some EU Countries and Turkey (1996-1998)



Source: Own calculations.

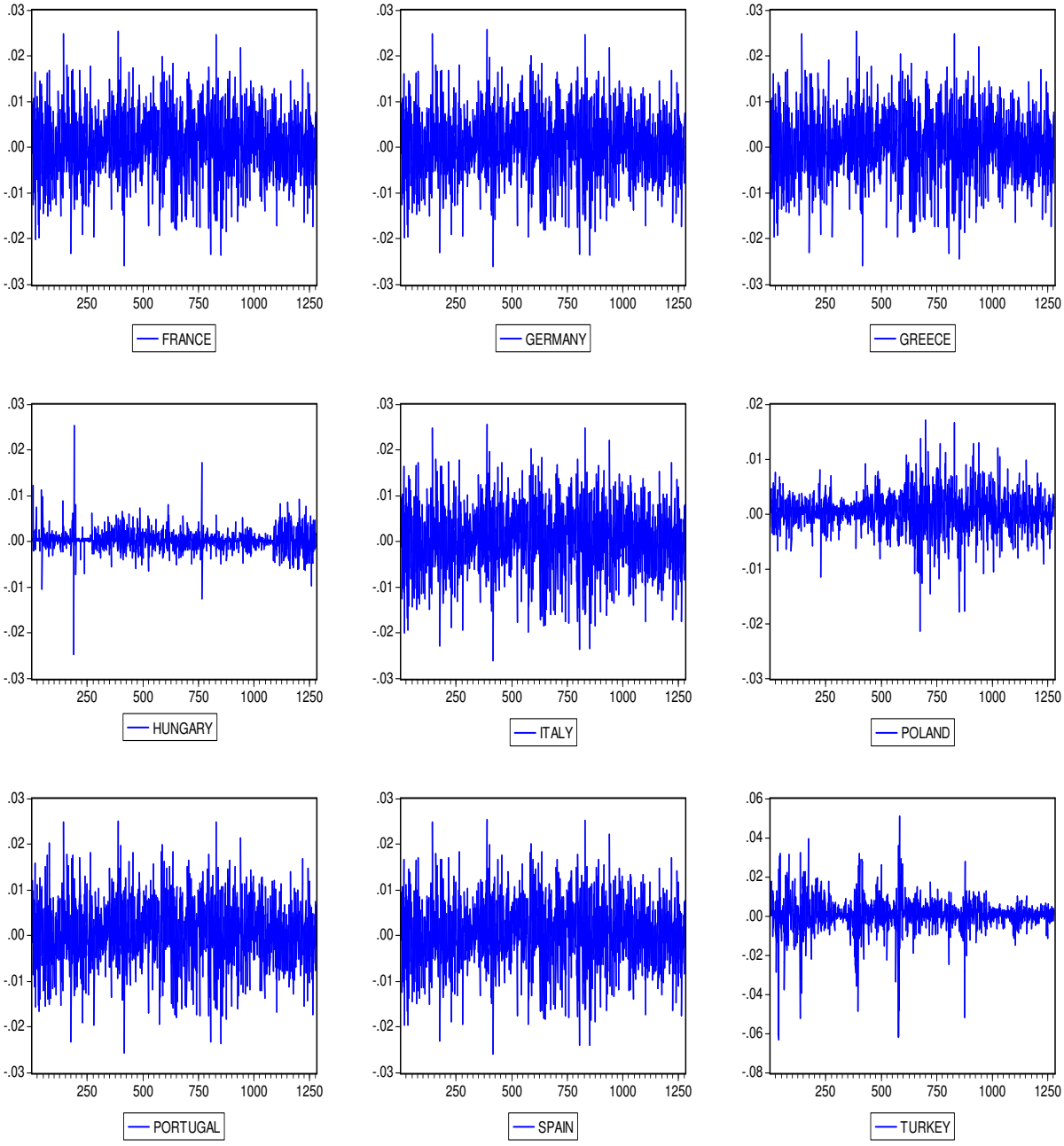
Appendix 7: Graph of Indices of Some EU Countries and Turkey

(2001-2005)



Source: Own calculations.

Appendix 8: Graphs of Index Returns of Some EU Countries and Turkey (2001-2005)



Source: Own calculations.

REFERENCES

Books

Amor, Jose Manuel (ed.). **Government Bond Markets in the Euro Zone**. West Sussex: John Wiley & Sons Ltd., 2002.

Barro, Robert and Vittorio Grilli. **European Macroeconomics**. Honk Kong: MacMillan, 1994.

Brooks, Chris. **Introductory Econometrics for Finance**. Cambridge: Cambridge University Press, 2002.

Danmark Nationalbank. **Danish Government Borrowing and Debt 2005**. Copenhagen. 2006.

De Grauwe, Paul. **Economics of Monetary Union.** Oxford: Oxford University Press, 2000.

Deutsche Bundesbank. **Annual Report 2002**. Frankfurt a.M.: 21.03.2003 Press. 2002.

Dornbusch, Rudiger and Stanley Fischer. **Macroeconomics**. North America: McGraw& Hill, 1994.

European Central Bank. **The Euro Bond Market**. Frankfurt: July 2001.

European Central Bank. **The Euro Bond Market Study**. Frankfurt: December 2004.

European Central Bank. **The Implementation of Monetary Policy in the Euro Area**. Frankfurt: February 2005.

Fabozzi, Frank J. and Choudhry, Moorad (Ed). **Handbook of European Fixed Income Securities**. New Jersey: John Willey&Sons Incorporated, 2004.

Fabozzi, Frank J.(Ed). **Handbook of Fixed Income Securities.** New York: McGraw&Hill, 2001.

Garbade, Kenneth. **Securities Markets.** New York: Mac Graw& Hill, 1982.

Gujarati, N.Damodar. **Basic Econometrics.** New York: McGraw& Hill, 2003.

Harris I.D.Richard. **Using Cointegration Analysis in Econometric Modelling**. London: Prentice Hall, 1995.

OECD. **Debt Management and Government Securities Markets in the 21st Century**. Paris: 2002.

Sunderasen, Suresh M.. **Fixed Income Markets and Their Derivatives.** Cincinnati: South-Western College Publishing, 1997.

The World Bank and The International Monetary Fund. **Developing Government Bond Markets, A Handbook**. Washington D.C.: 2001.

Thimann, Christian (Ed.). **Financial Sectors in the EU Accession Countries.** Frankfurt: European Central Bank, July 2002.

Articles

Bakır, Caner. “Turkey : En Route to Meet the Challenging Maastricht Criteria?”, **Studia Europaea.** L, 2-3. 2005.

Berben, Robert-Paul and W.Jos Jansen. " Bond Market and Stock Market Integration in Europe", **Danish National Bank Working Paper**. November 2005.

Bernoth, Kerstin, Juergen von Hagen and Ludger Schuknecht. “The Determinants of the Yield Differentials in the EU Government Bond Market”, **Centre For European Integration Studies**. Bonn: July 2003.

Borowski, Jakup. “Potential Benefits of Poland’s EMU Accession”, **Focus on Transition.** 1/2003.

Clare, D.Andrew, Michael Maras and Stephen H.Thomas. “The Integration and Efficiency of International Bond Markets”, **Journal of Business, Finance and Accounting.** Vol.22 No.2. March 1995.

De Genaro, Ramon P., Robert A.Kunkel and Junsoo Lee. " Modelling International Long-term Interest Rates", **Financial Review.** No 29.1994.

De Grauwe, Paul and Gunther Schnabl. “EMU Entry Strategies for New Members”, **Intereconometrics.** No 39(5). September/October 2004.

Diaz, Antonio, John Merrick and Eliseo Navarro. “Spanish Treasury Bond Market Liquidity and Volatility Pre-and Post-European Monetary Union”, **Working Paper**. First Version: December 2003, This Version: November 2004.

Dumoulin, G.Hubert and Mogens Kruse. “The Regulatory and Supervisory Framework for Fixed Income Markets in Europe”, **World Bank Policy Research Working Paper.** No 3308. May 2004.

Dvorak, Thomas and Chris R.A.Geigerat. “Are the New and Old EU Countries Financially Integrated”, **ECB Report**. 2004.

Engle, Robert F. and Byung Sam Yoo. “Forecasting and Testing in Co-integrated Systems”, **Journal of Econometrics.** No 35. 1987.

Hansen, Henrik and Soren Johansen. “Some Tests for Parameter Constancy In Co-integrated VAR-Models”, **Econometrics Journal.** V.2.1999.

Horvath, Roman and Lubos Komarek.. "Optimum Currency Area Theory. An Approach for Thinking About Monetary Integration", **Warwick Economic Research Papers.** No.647. August 2002.

Johansen, Soren. and Katarina Juselius. “Maximum Likelihood Estimation and Inference on Cointegration with Applications to the Demand for Money”. **Oxford Bulletin of Economics and Statistics 52**. 1990.

Kim Suk, Joong, Brian M.Lucey and Eliza Wu. “Dynamics of Bond Market Integration between established New European Union Countries”, **Journal of International Financial Markets,Institutions and Money**. 2005.

Keloharju, Matti, Markku Malkamaeki, Kjell G.Nyborg and Kristian Rydqvist. ”A Descriptive Analysis of the Finnish Treasury Bond Market 1991-99”, **LTA**. 3/2002.

Mundell, Richard A., "Theory of Optimum Currency Areas", **The American Economic Review.** Vol.51 No.4. September 1961.

Ministry of the Economy, Finance and Industry. “French Government Securities 1998/1999”, **Annual Report**. April 1999.

Santillan, Javier, Marc Bayle and Christian Thygesen. “The Impact of the Euro on Money and Bond Markets”, **European Central Bank Occasional Paper Series.** No:1. Frankfurt: July 2000.

OECD, “Options for Reforming The Finnish Tax System”, **Economics Department Working Paper.** No.319. February 2002.

Pagano, Marco and Ernst-Ludwig von Thadden. "The European Bond Markets Under EMU", **Oxford Review of Economic Policy**. November 2004.

Ricci, Luigi A.. "A Model of Optimum Currency Area", **IMF Working Paper.**WP/97/76. June 1997.

Yang, Jian. "Government Bond Market Linkages: Evidence from Europe", **Applied Financial Economics**. No:15.2005.

Yüceol, Hüseyin Mualla. "Optimal Para Alanı Teorisi Üzerine Bir Değerlendirme: Teori, Uygulama ve Politika", **Pivolka.** 3(12). 2004.

Other Resources

Antczak, Malgorzata, Malgorzata Markiewicz and Joanna Siwinska. "Fiscal Pressures on the Road to EMU". *Center for Social and Economic Research Paper*. http://www.case.com.pl/plik--10070787.pdf (20.12.2006).

Almunia, Joaquin. "The Euro and the New Member States". **Kangaroo Group Lunch Debate**. 13 September 2005.

Bank of Greece http://www.bankofgreece.gr/en/publications (27.05.2006).

Belgian Debt Agency. http//:www.debtagency.be/en (22.05.2006).

Blanco, Roberto. "The Euro-area Government Securities Markets. Recent Developments and Implications for Market Functioning". **BIS Autumn Central Bank Economist's Meeting**. Madrid: Bank of Spain Research Department. Document No:0120. October 2001.

Bloomberg®. http//: www.bloomberg.com (13.05.2006).

Brokertech Global. http://www.icap.com/e-broking/brokertec (25.07.2006).

Danmark Nationalbank. http//:www.nationalbanken.dk (26.05.2006).

Devine, Mairead. "The Cointegration of International Interest Rates: A Review". **Technical Paper**. Economic Analysis, Research and Publications Department. Central Bank of Ireland, January 1997.

Dutch State Treasury Agency, http://www.dutchstate.nl/index.cfm (15.06.2006).

Europe, Gateway to the EU. http://europa.eu/index_en (31.06.2006).

European Central Bank. http//:www.ecb.int/home. (31.06.2006).

EuroMTS LTD.. http//:www.euromts-ltd.com (26.06.2006).

Euronext N.V.. http//:www.euronext.com (07.07.2006).

Eurostat. http//:ec.europa.eu/eurostat (27.07.2006).

FIBV Annual Statistics. http//:www.world-exchanges.org (19.07.2006).

Finnish State Treasury. http://www.valtiokonttori.fi/public (15.06.2006).

French Treasury. http://www.aft.gov.fr/cft_en_21/debt_management_51 (19.06.2006).

German Central Bank at http://www.bundesbank.de (05.07.2006).

German Treasury. http//:www.deutsche-finanzagentur.de (05.07.2006).

Istanbul Stock Exchange. http://www.ise.gov.tr (25.06.2006).

ICAP. http://www.icap.com/e-broking/brokertec (12.10.2006).

J.P.Morgan Securities Inc.. J.P.Morgan Government Bond Indices. New York: September 1997.http://www.jpmorgan.com (15.05.2006).

MTSItaly. http://www.mtsspa.it (25.06.2006).

MTS Spain. http://www.mtsspain.com (10.10.2006).

Morgan Stanley Capital International Inc. ("MSCI"). http//:www.msci.com (30.05.2006).

National Treasury Agency of Ireland. http://www.ntma.ie/home.html (30.05.2006).

OECD, http://www.oecd.org (31.06.2006).

Oesterreichische Kontrollbank AG. http://www.oekb.at/bin/file.bin (27.07.2006).

Portuguese Treasury. http://www.igcp.pt/index.php (20.07.2006).

SENAF. http://www.senaf.net (15.06.2006).

The Central Bank of Luxembourg. http://www.bcl.lu/en/publications (20.07.2006).

The Central Bank of Turkey. http://www.tcmb.gov.tr (31.06.2006).

T.C. Başbakanlık Hazine Müsteşarlığı. http://www.hazine.gov.tr (25.06.2006).

Wiener Börse. http://ww.wienerborse.at/marketplace_products/segmentation (13.07.2006).

The World Bank. http//:www.worldbank.org (15.06.2006).

Voronkova, Svitlana. "Institutional Trading, Trading Mechanisms and Equity Market Integration: Essay on the Polish Stock Market". **Thesis submitted to the European University Viadrina.** June 2004.