ISCTE Business School
Instituto Universitário de Lisboa

Finance Department

DRIVERS OF THE PIIGS' STOCK MARKET RETURNS: A MACROECONOMIC APPROACH

João Sardinha

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Supervisor:
Prof. Doutor José Dias Curto
Quantitative Methods Department

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Aos meus queridos pai e mãe por todo o apoio ao longo de toda a vida.

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ABSTRACT

Following the global financial crisis of 2008 and consequent economic downturn, the recent European sovereign-debt crisis brought to the fore five euro area Member States, the so-called PIIGS. On the other hand, empirical finance suggests that stock market returns are related to macroeconomic variables. In this thesis, the dynamics between a large set of macro variables and the stock market returns in the PIIGS are examined, between January, 1999 and March, 2011. From a perspective of multifactor models, the degree of integration of these five markets is also analyzed, given that the set employed comprises both country-specific and global macro variables. In addition to the analysis of the explanatory ability of all the macro variables considered at once, the "best" explanatory model for each country is selected via OLS stepwise regression, making it possible to identify which macro variables are more closely related to each stock market returns. The empirical results suggest these stock markets to be mildly segmented and strongly related to the U.S. Treasury 10-year bond yield. A puzzling finding consists in the nature of the relationship between the U.S. Treasury 10-year bond yield and the stock market returns of the PIIGS.

Key words: Multifactor models; Macroeconomic variables; International stock returns; Financial markets.

JEL classification: C22, G15

RESUMO

Na sequência da crise financeira global de 2008 e consequente desaceleração económica, a recente crise da dívida soberana Europeia pôs em evidência cinco Estados Membros da zona euro, os então apelidados PIIGS. Por outro lado, os estudos empíricos em finanças sugerem que a rentabilidade do mercado de acções está relacionada com variáveis macroeconómicas. Nesta tese, as dinâmicas entre um conjunto alargado de variáveis macro e a rentabilidade do mercado de acções dos PIIGS são examinadas, entre Janeiro de 1999 e Março de 2011. Numa perspectiva de modelos multifactoriais, o nível de integração destes cinco mercados é também analisado, dado que o conjunto utilizado inclui simultaneamente variáveis macro específicas de cada país e variáveis macro globais. Para além da análise à capacidade explicativa de todas as variáveis macro consideradas em simultâneo, é ainda seleccionado o "melhor" modelo explicativo para cada país através de regressão stepwise dos MQO, sendo assim possível identificar quais as variáveis macro mais intimamente relacionadas com as rentabilidades de cada mercado de acções. Os resultados empíricos sugerem que estes mercados de acções são parcialmente segmentados e altamente relacionados com a rentabilidade das obrigações do Tesouro a 10 anos dos E.U.A. Um resultado curioso consiste na natureza da relação entre a rentabilidade das obrigações do Tesouro a 10 anos americanas e as rentabilidades dos mercados de acções dos PIIGS.

Palavras-chave: Modelos multifactoriais; Variáveis macroeconómicas; Rentabilidade de mercados de acções internacionais; Mercados financeiros.

Classificação JEL: C22, G15

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LIST OF ABBREVIATIONS

APT	Arbitrage Pricing Theory
ATHEX	Athens Exchange
BD	German
BS	Bond Spread
BY	Bond Yield
CAPM	Capital Asset Pricing Model
DJ	Dow Jones
EBITDA	Earnings Before Interest, Taxes, Depreciation, and Amortization
ECB	European Central Bank
EMU	Economic and Monetary Union
EPS	Earnings per share
Eq.	Equation
EU	European Union
FED	Federal Reserve
FROB	Fund for Ordered Bank Restructuring
FTSE MIB	Financial Times Stock Exchange Milano Italia Borsa
FX	Foreign Exchange Rate
G-7	Group of Seven
GDP	Gross Domestic Product
GNP	Gross National Product
IBEX	Iberia Index
IMF	International Monetary Fund
IPO	Initial Public Offering
ISEQ	Irish Stock Exchange Quotient
MS	Money Supply
MSCI	Morgan Stanley Capital International
NAMA	National Asset Management Agency
NYSE	New York Stock Exchange
OECD	Organisation for Economic Co-operation and Development
OLS	Ordinary Least Squares
PDV	Present Discounted Value

PER	Price Earnings Ratio
PIIGS	Portugal, Ireland, Italy, Greece and Spain
PSI	Portuguese Stock Index
RESET	Regression Specification Error Test
S&P	Standard and Poor's
TS	Trade Sector
U.K.	United Kingdom
UR	Unemployment Rate
U.S.	United States
Vs.	Versus

1. INTRODUCTION

A major area of interest in financial economics lies in the question: What forces drive stock market returns? Giving birth to asset pricing theory, the capital asset pricing model (CAPM) of William Sharpe (1964) and John Lintner (1965) was a milestone in trying to answer that question as it states that expected asset returns are linearly related to their betas, moving up or down together with the expected return on a mean-variance-efficient market portfolio. Not ignoring its huge success and the fact that the CAPM is still widely used in finance, many empirical problems have been found and are well documented in Fama and French (2004).

Different asset pricing models have been developed. Intuitively and from common observation that share prices tend to fluctuate with economic news, Chen et al. (1986) started, in a more serious way, a new branch of finance which tries to understand the relation between stock markets and the macroeconomy. In the spirit of the Arbitrage Pricing Theory (APT) of Ross (1976), Chen et al. (1986) explored if a set of macroeconomic state variables could proxy for the pervasive risk factors that systematically influence stock market returns. The authors concluded that, indeed, industrial production, the risk premium, the term structure, expected and unexpected inflation were significant in explaining the expected returns of U.S. stock portfolios.

As it is expressed in Homa and Jaffee (1971), a very straightforward way of explaining why macroeconomic variables can be related to stock markets consists in regarding the price of a common stock in terms of the Present Discounted Value (PDV) of its expected dividends:

$$PDV_0 = \sum_{t=0}^{\infty} \frac{D_0\,(1+g_t)^{\,t}}{(1+R_t+\pi_t)^t}\ , \tag{1}$$

Where

D_0 is the level of current dividends,

g_t is the expected growth rate of dividends at time *t*,

R_t is the riskless rate at time *t*,

π_t is the risk premium at time *t* associated with the uncertainty of the future cash flow payments.

Therefore the price of a common stock is determined by two variables, the level and growth rate of dividends (firms' expected cash flows) which are discounted at the riskless rate increased by the risk premium (discount factors). Through simple and intuitive financial theory, macro factors that likely exert important effects on those two variables and also affect future investment opportunities and consumption behavior are strong candidates of having a significant influence on asset pricing.

This particular area of academic research has produced a quite extensive volume of empirical studies, which paved the way for the *a priori* selection of a set of "standard" macro variables potentially linked to stock market returns. Rapach et al. (2005) tested the predictability of stock returns in 12 industrialized countries using the following macro variables, the long-term government bond yield, the term spread, inflation rate, industrial production, money supply, and unemployment rate. In doing so, they considered both in-sample and out-of-sample tests of predictability for horizons of 1, 3, 12, and 24 months. The main conclusion was that interest rates (long-term government bond yield) stood out as being the most consistent and reliable predictor of aggregate stock returns across countries, especially at shorter horizons, besides the fact that inflation rate, money supply, and the term spread having also revealed predictive power in some cases.

Flannery and Protopapadakis (2002) estimated a model of U.S. equity returns, in which both the realized returns and their conditional volatility could vary with 17 macroeconomic announcements. The authors presented evidence that five out of the 17 macro variables were strong candidates for risk factors, two nominal variables (inflation rate and money supply) and three real variables (the balance of trade, employment, and housing starts). That conclusion was based on the following observations: the inflation rate affected only the aggregate stock market returns, the three real variables significantly raised the returns' conditional volatility, the money supply was the only variable that had a significant impact both on the returns and their conditional volatility, and all the five macro variables significantly increased stock market trading volume on the days they were publicly announced.

Pesaran and Timmermann (1995) examined the predictability of U.S. stock returns including in the prediction model a set of macroeconomic indicators, the 1-month T-bill rate, the 12-month T-bond rate, rate of inflation, industrial output, and the money supply. The success of the different models, which used different combinations of the variables, as measured by comparing the forecast values against the actual values of excess returns on the S&P 500 index supported the idea that the predictability of stock returns is linked to the business cycle. The variables most frequently included in the forecasting models were the 1-month T-bill rate, monetary growth and industrial production. Another conclusion made by the study was that periods with high market volatility appeared to have had higher predictability of excess stock returns, especially during the 1970s, which was a period of time that had experienced a large shock to the economy (oil price shock in 1974).

Ferson and Harvey (1994) studied the ability of several measures of global economic risks to explain the fluctuations in the national stock markets of 18 countries. The global economic risk variables used were the returns on a world equity market portfolio (MSCI world index), a measure of exchange risk (trade-weighted U.S. dollar price of the currencies of the G-10 countries), the spread between the 3-month Eurodollar deposit rate and the 3-month Treasury bill yield, the price of crude oil, and global measures for inflation, real short term interest rates and industrial production growth, defined as weighted averages of those variables in the G-7 countries. The main results showed that the world market portfolio was by far the most important factor in explaining, ex-post, the variance of each country aggregate stock market excess return. However, a multifactor model expanded to include exchange rates, oil prices and inflation as risk factors substantially lowered the average pricing errors when compared to a model based only on the world market index. Only the world market portfolio and the exchange risk variables displayed significant average return premiums.

Currently, one of the main concerns for market participants and a key downside risk to economic activity is related to the eurozone sovereign-debt crisis. The benchmark bond yields of some selected euro area Member States had been on a rising trend since September 2009 and had reached record highs never seen before since the adoption of the common currency (European Commission, 2011a). The selected euro area countries are Portugal, Ireland, Italy, Greece and Spain, and the financial markets started to use the acronym "PIIGS" when referring to these five peripheral euro area Member States. Leaving no doubt about the severity of this crisis, government bond spreads over German bunds reached unsustainable high levels, up to the point at which borrowing from the funding markets was made unbearable for Greece, Ireland and Portugal. As a consequence, these countries have requested financial assistance from the EU and the IMF (IMF, 2011).

With this background, where the PIIGS are in the spotlight of an European sovereign-debt crisis, the main objective of this thesis is to investigate, from a set of "standard" macroeconomic variables, which macro variables (if any) are able to explain the variation in the stock market returns of the aforementioned countries. It must be noted that the focus is not in proposing a model of expected stock returns, and therefore whether the macro factors examined are priced is beyond the scope of the study. In order to address this task, quarterly stock returns of the PIIGS main national indexes from 1999 to 2011 are analyzed employing a regression framework.

An important issue regarding financial markets is their level of world integration. The significant process of political, economic and legislative harmonization between European countries seems to be a good reason to expect a higher degree of European markets financial integration. Relevant developments towards that direction can be: the end of the 1980s had seen the lifting of the majority of restrictions on the free movement of capital flows; the establishment of Economic and Monetary Union (EMU) and the introduction of the single currency in 1999 eliminated an important source of risk to intra-euro-area security transactions, namely the exchange rate; the cross-border trading between European capital markets increased significantly, leading to a decrease in the portfolio home bias.

Addressing that issue at the euro area level, Baele et al. (2004) presented a good survey of the literature and confirmed earlier evidence that euro area equity markets have been showing a rising degree of integration over the last years. Applying different specific measures of integration, the authors documented three important empirical proofs. The cross-sectional dispersion of stock index returns across individual countries declined at a faster pace, being surpassed by the dispersion of all sector returns in 2000, which suggested that cross-country stock index correlations have increased. Local equity returns sensitivity, or "betas", to two common factors, aggregate euro area and U.S. equity market returns, increased gradually over time and was interpreted as a higher level of integration within the eurozone but also globally with the world main stock markets. The proportion of local return variances explained by euro area equity market shocks exceeded the proportion explained by U.S. shocks since 1992 (the Treaty of Maastricht), suggesting that regional eurozone integration proceeded more quickly than integration into the global markets.

In regard to the level of integration in the PIIGS' stock markets and in a similar vein to Samitas and Kenourgios (2007), the set of country-specific macro variables earlier referred is augmented with U.S. and German macroeconomic variables as proxies for global factors, as well as with the oil price and the exchange rate global risk factors. Hence, the study adds to the literature on asset pricing in two key directions. Firstly, a large set of macro variables is used in the five so-called PIIGS, making it possible to examine if common cross-country patterns of return explanation emerge, or if the explanatory power of certain macro variables is only specific to a particular country. Secondly, in the context of mild segmentation models (Bekaert and Harvey, 1995) the stock return variations are explained by both local and global risk factors, which is a way to assess the integration level of these five countries as expressed by the relative explanatory importance of the local vs. global factors.

The next sections are organized as follows. Section 2 gives a brief insight into the stock markets in the PIIGS. Section 3 introduces the background of the global crisis impact at the European level, the counter-cyclical euro area government measures, its consequences on public finances and the main macroeconomic developments in the PIIGS. Sections 4 and 5 present the econometric methodology and the data used in the empirical research, respectively. Finally, section 6 contains the main empirical results and the last section shows the concluding remarks.

2. STOCK MARKETS IN THE PIIGS – A BRIEF CHARACTERIZATION

Equity markets in the euro area grew substantially in the 1990s. The strong increase in market capitalization was linked to the privatization of state-owned companies and new listings of companies in the technology, media, and telecommunications sector which led to a rise in IPO's. As Baele et al. (2004) put it, an equity culture in Europe was developed with a rising market participation by households and institutional investors, even though worldwide stock markets being currently in bear market territory, still owing to the global financial crisis of 2008. More specifically, the stock markets of the five countries PIIGS all belong to the Morgan Stanley Capital Index for Developed Markets, albeit with some heterogeneity in terms of size and liquidity, as can be seen in Table 1, concerning the main national indexes of the PIIGS.

TABLE 1

Stock market indexes of the PIIGS

	PSI 20	ISEQ Overall	FTSE MIB	Athex Composite	IBEX 35
Securities number	20	50	40	40	35
Currency	Euro	Euro	Euro	Euro	Euro
Market Capitalization (October 10, 2011)	52.514 BLN	66.983 BLN	307.263 BLN	22.375 BLN	409.412 BLN
Turnover	31,604,104	11,589,870	1,046,387,923	23,379,973	1,639,848,004
PER*	12.803	15.381	32.524	9.934	16.501
Dividend Yield*	8.324	3.619	4.322	5.312	5.115
EBITDA*	686.388	146.274	2,956.172	242.998	3,152.201
EPS*	0.301	0.282	0.960	-0.296	1.602
Cash-Flow/share*	1.522	0.326	2.190	1.146	3.343

Source: Bloomberg *Average value

When comparing these five markets, the Spanish and Italian stock exchanges stand out for their higher levels of market capitalization and daily turnover. On the other hand, the Irish, Portuguese and Greek markets can be considered relatively small stock exchanges. For instance, whereas the IBEX 35 accounts for a market with a capitalization of around € 400 billion, the Athex Composite represents about € 22 billion.

Trying to provide a simple characterization of the companies traded in these markets, the highest average dividend yield for listed companies is registered in Portugal and is mainly explained by a one company really high value. Once again, the Spanish and Italian companies stand out for having the highest values of both Earnings per share (EPS) and cash-flow per share. Even though, the Spanish companies having a Price Earnings Ratio (PER) about half of what is seen in the FTSE MIB.

An interesting aspect of the Irish and Spanish stock markets is the greatest share of the financial sector in their overall market capitalization, with the financial companies representing 40% and 30% of the Irish and Spanish market capitalizations, respectively. The Irish stock exchange is also, together with the Portuguese market, the most highly concentrated, with the top ten companies accounting for 85% and 90% of the total market capitalization in both stock exchanges, respectively.

3. THEORETICAL FRAMEWORK

After World War II, European politicians started to act towards an economic and political unification between countries in Europe, laying the foundations of the European Union as we know it today. A single set of institutions, such as the European Commission, European Council and European Parliament was formed, the Maastricht Treaty on European Union was signed in 1992, and the Single Market was formally completed with the objective of creating an area without internal frontiers where people, goods, services and capital can move freely.

After substantial steps taken to achieve a convergence of national economic policies based on budgetary discipline and price stability, on January 1, 1999, the Economic and Monetary Union (EMU) was formed by eleven EU countries. Since then, all of the Member States started to share a single monetary policy conducted by the European Central Bank (ECB), the euro was introduced as their official currency, the exchange rates between euro area countries have been irrevocably fixed and all EMU members have their government bills and bonds denominated in euro.

More recently, the global financial crisis that was intensified by the collapse of Lehman Brothers in the last quarter of 2008 left a serious worldwide economic crisis – The Great Recession. The world economic activity had the sharpest contraction since the Great Depression of the 1930s and the euro area was no exception, registering a 4.1% GDP decrease in 2009 (European Commission, 2011a).

Responding both to the financial crisis and to the economic downturn, the ECB relaxed its monetary policy setting its key rate to the lowest level ever and the governments undertook a comprehensive set of emergency measures within an EU-coordinated framework.

Firstly, measures were taken in support of systemically important financial institutions with serious liquidity problems and enormous asset write-downs. Based on the adoption of the concerted European Action Plan, euro area governments stepped in with bank rescue schemes targeted at the liabilities side of banks' balance sheets. Government guarantees for bank funding, increased coverage of the retail deposit insurance schemes, recapitalization through injections of government capital and nationalization as a measure of last resort were the national actions taken (Petrovic and Tutsch, 2009). The assets side of banks' balance sheets was also targeted with either the removal of impaired assets or insuring them.

However, some countries were forced to go deeper in the public support to their national banking sector. Ireland created the National Asset Management Agency (NAMA) for the purpose of exchanging risky loans from domestic banks for government securities. Similarly, the Spanish Fund for Ordered Bank Restructuring (FROB) was established to provide help in the restructuring process of troubled banks, through mergers with another institutions, funds granting or assets purchasing. At the end of 2009, Ireland was one of the euro area countries that suffered a pronounced increase in the government debt by 6.7% of GDP and was by far the euro area government that took on more implicit contingent liabilities of about 172% of GDP (Riet, 2010).

Secondly, with the aim of avoiding a deep recession and support the real economy, the European Economic Recovery Plan was launched with a budgetary impulse of € 200 billion, which accounted for 1.5% of EU GDP (European Commission, 2008). A short-term fiscal impulse was put in practice both through the operation of automatic fiscal stabilizers and discretionary fiscal policy measures mainly directed at households' purchasing power, public investment and businesses. Generally, this economic stimulus carried out by euro area governments took the form of tax cuts (revenue side) and subsidies (expenditure side) leading to a revenue shortfalls and higher spending ratios situation.

The facts that in 2010, real GDP grew by 1.8% in the euro area while the previous year was characterized by an economic recession, together with an European economic outlook that confirms a recovery path, as is projected by the European Commission in the Spring 2011 Economic Forecast, demonstrate the effectiveness of the expansionary fiscal policies. However, the flip side of the coin was a sharp deterioration in euro area public finances and increased risks to longer-term fiscal sustainability.

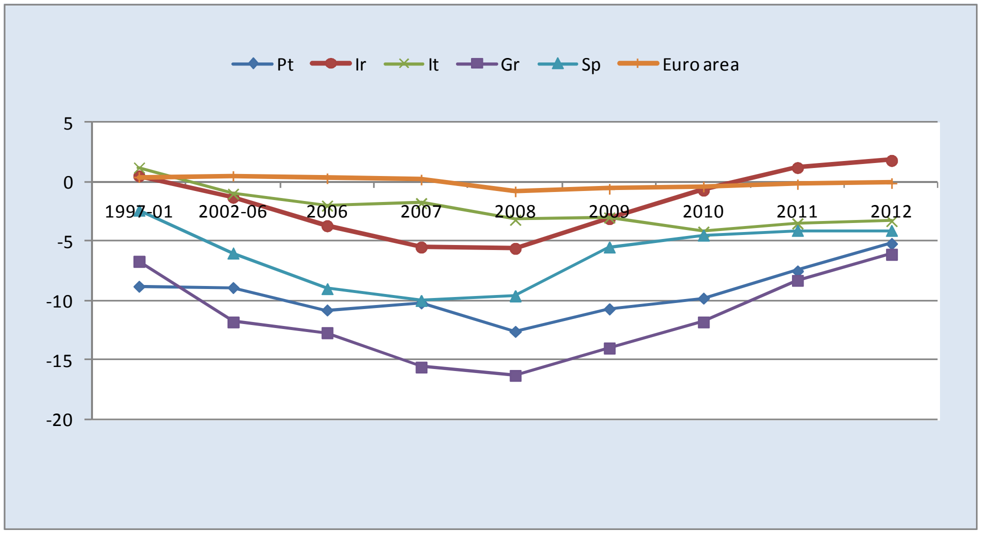
After having been close to balance in 2007, euro area government budget shifted to a 6.3% of GDP deficit in 2009 and the government debt-to-GDP ratio followed a rising path, expected to reach 88.5% of GDP in 2012 (European Commission, 2011a), with both the indicators well above the reference values of the Treaty. On top of that, substantial credit risks were transferred from the private banking sector to the public sector and financial markets reacted strongly in two directions. On the one hand, an increase in investors' risk aversion determined a "flight to safety" from more risky financial securities into government assets. On the other hand, a parallel "flight to quality" was observed as financial markets started to discriminate more clearly among sovereign issuers based on each country perceived default risk and creditworthiness. This reaction marked a turning point: before the global financial crisis, euro area government bond yields moved closely together, whereas in the post-crisis period some Member States, especially those with a worst budgetary outlook, have seen their sovereign bond spreads vis-à-vis the German benchmark being widened in an unprecedented way (Riet, 2010).

Therefore, in the aftermath of the financial crisis and consequent worsening of the macroeconomic environment, the eurozone sovereign-debt crisis has emerged as some euro area countries face serious risks to their solvency. First, the adverse developments in the fiscal position as expressed by the rising government budget deficits and debt. Second, a negative feedback loop between lower or negative output growth and increasing debt-to-GDP ratios which leads to a faster accumulation of government debt. Third, the substantial public support to financial institutions and the possibility of further banking problems may bring the need to finance either new capital injections or contingent liabilities if the government guarantees are called. Fourth, these countries have been financing their sizeable new debt issuance under severe market conditions, as the "flight to quality" phenomenon determined higher risk premiums on government bond yields and thus increased debt servicing costs.

This current situation poses a significant threat to the smooth functioning of EMU while the sustainability of euro area public finances has been endangered, leading to higher risks in what concerns price stability, long-term output growth and economic divergences across euro area countries. In respect to these developments, financial markets upward pressure on sovereign bond yields was particularly strong in the PIIGS (Portugal, Ireland, Italy, Greece and Spain) which are perceived to be in a similar vulnerable position. Hence, one question arises: what do these five countries have in common?

First of all, they're all Member States of EMU and therefore share a common currency, a single monetary policy and cannot promote export-led recoveries through exchange rate devaluations. These are the countries that have been diverging from the euro area as a whole over the last decade. During the upswing prior to the world financial crisis persistent external imbalances were built up being particularly large in Greece, Portugal and Spain with current account deficits that averaged over 7% of GDP from 2002 to 2007 (Barnes, 2010). In Figure 1 it can be seen the widening of external imbalances in these deficit countries when compared to the aggregate euro area position, reaching an all-time high difference in 2007.

Figure 1: Current-account balance (as a percentage of GDP)



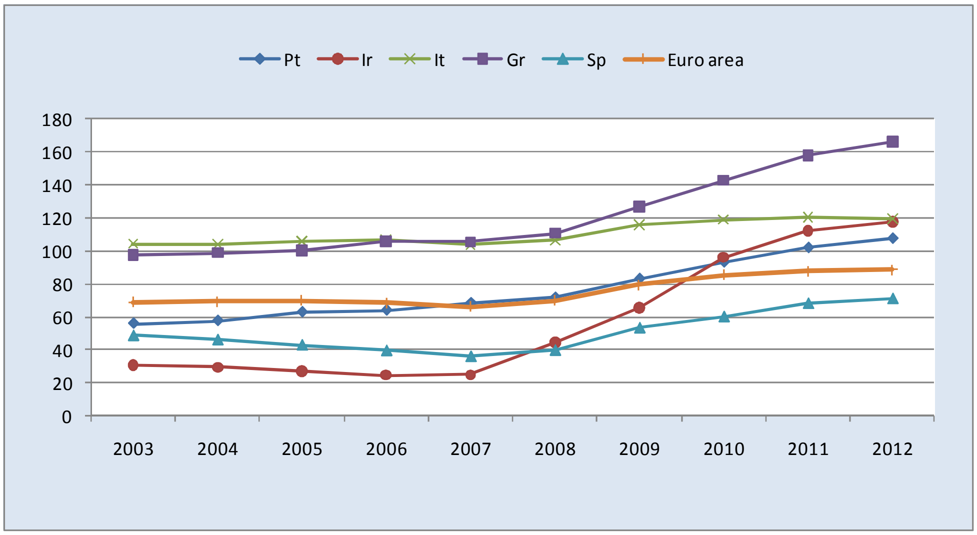
Source: European Commission
Note: The ratios for the years 1997-01 and 2002-06 are 5-year averages and for the years 2011 and 2012 are forecasts

According to Barnes (2010), these imbalances led to an accumulation of net foreign liabilities of over 70% of GDP in Greece, Portugal and Spain by 2008, which were explained by a number of underlying economic pressures. First, the period of economic catch-up with above-average growth in Greece, Ireland, Spain, and to a lesser extent Portugal, boosted a strong domestic demand which fuelled imports till 2007 and depressed their balance of goods and services. Second, low real interest rates, emerging through two channels, namely (i) a rising inflation and (ii) the Monetary Union credibility which caused a cross-country convergence of market interest rates, particularly reducing credit spreads and nominal borrowing costs in these countries, led to a strong credit growth. Third, a loss of both price competitiveness and productivity growth linked to structural rigidities in the product and labor market regulations.

Although, the cases of Italy and Portugal were more specific with a combination of low growth, weak competitiveness and current account deficits. In Portugal, a disproportionate reliance on consumption, a poor export performance and real wage increases not followed by sufficient labor productivity gains, in part reflecting a spillover effect from high public sector wage growth, seems to have been the main reasons (OECD, 2010). In Italy, a dismal productivity and economic growth together with a lack of wage moderation and an absence of price decreases depressed its export performance. Italian problems are related to the reorganization of industrial production and structural problems (OECD, 2011).

Nonetheless, the unprecedented credit boom that took place after the establishment of EMU created another imbalance, an excessive borrowing both in the public and private sectors which culminated in a dramatic rise of government debt after the unfolding of the global crisis as private debt could not be serviced and became public debt (Gros and Alcidi, 2011). This fact is shown in Figure 2 below.

Figure 2: General government gross debt-to-GDP ratio



Source: European Commission
Note: The ratios for the years 2011 and 2012 are forecasts

In fact, these peripheral euro area countries are significantly indebted, yet their indebtedness levels vary to a certain extent from one country to another and so is the heterogeneity of their economies. As suggested by Gros and Alcidi (2011), three subgroups emerge within the PIIGS, while Portugal and Greece face more of an insolvency problem, Ireland and Spain foreign debt was mainly channeled to finance an excess of housing investment, and Italy should be in a more comfortable situation whose foreign imbalances are much smaller.

On average, Greece ran budget deficits of 5.4% of GDP and Portugal was never able to bring its deficit down the reference value of 3% of GDP in accordance with the Treaty and the Stability and Growth Pact, over the period from 2002 to 2007 (Barnes, 2010). Reflecting the big size of the government sector in their economies, it is reasonable to argue that their fiscal positions contributed to the current account deficits both countries face. Another key feature shared is an extremely low rate of national savings well below the euro area average of 18.7% of GDP in 2010. Portugal recorded a low 9.2% of GDP and Greece a mere 2.8% of GDP (European Commission, 2011a) which indicates two aspects, these two economies are highly dependent on foreign capital, and the capital inflows have been mainly financing domestic consumption (Gros and Alcidi, 2011). Elucidating the fragile economic situation of Portugal and Greece, the European Economic Forecast projected by the European Commission in Spring 2011 anticipates that these two countries will be the only euro area cases facing a GDP growth fall in 2011.

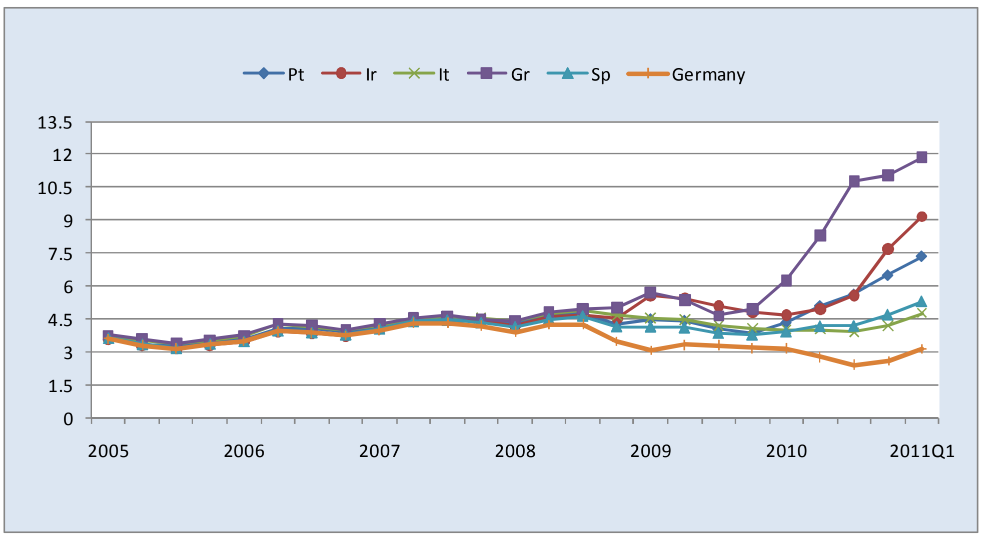
By historical standards, Ireland and Spain level of savings rate has been less divergent when compared to the aggregate euro area, albeit the strong economic performance of these two countries, in the period running up to the crisis, has been mostly based on unsustainable drivers: an over-reliance on the construction sector triggered by low real interest rates and leading to a rapid credit expansion (Barnes, 2010). The conditions for the emergence of housing bubbles were created in addition with a private sector becoming highly indebted. Domestic banks' exposure to property-related lending was high, the absolute size of bank assets enormous, which reached 320% of GDP during 2006, in Ireland (European Commission, 2011b) and the worst scenario did materialize. After the onset of the global financial crisis an over-supply of properties determined the bursting of the housing market bubble and subsequent collapse in prices. As a consequence, large risks were raised to the solvency of Irish and Spanish banks arising from a severe deterioration in the quality of their assets, rampant non-performing loans and a funding structure very dependent on borrowing from international capital markets. Against this backdrop, the authorities of both countries put into practice support measures for the financial sector of quite sizeable proportions, as earlier mentioned in this section. A financial meltdown was prevented, yet the solvency of their sovereigns became highly linked to developments in the banking system. From an average of small budget surpluses, the fiscal balances deteriorated markedly to government deficits of 32.4% of GDP and 9.2% of GDP, in Ireland and Spain, respectively in 2010 (European Commission, 2011a). Despite the fact of having to deal with the viability of the banking sector and extremely high unemployment rates, the economic forecast for these two countries is more in line with the euro area average, expecting a domestic rebalancing of economic activity from construction to more productive sectors.

Italy differentiates itself from those subgroups, having national savings rate as high as Ireland or Spain but with smaller external imbalances. The Italian financial sector is rather conservative, and although the historical background of high levels of public debt-to-GDP ratio above 100% (Figure 2), a larger part of it is held mainly domestically implying a lower exposure to external financing (Gros and Alcidi, 2011). These facts anticipate a less dramatic economic recovery.

The existence of large imbalances meant that these countries have had to manage the Great Recession from a vulnerable fiscal starting position. Even though the budgetary consolidation policies and structural reforms already implemented by the national governments together with the ECB role as a last resort source of funding, market nervousness about the sustainability of public finances in the PIIGS still remains.

The developments in the debt markets associated with successive sovereign credit rating downgrades resulted in a substantial increase of interest rates on public debt, which is illustrated by the widening of long-term government bond yields against German bunds, in Figure 3.

Figure 3: Ten-year government bond yields



Source: Datastream

In light of the unfavorable developments in sovereign bond markets three countries became unable to refinance themselves at rates compatible with long-term fiscal sustainability. On May 2, 2010, an agreement has been reached for a joint euro area / IMF financing package of € 110 billion in stability support to Greece (European Commission, 2010a). A few months later, on November 28, 2010, a financial assistance programme for Ireland, amounting to € 85 billion was agreed with the European Commission and the IMF, in liaison with the ECB (European Commission, 2011b). The last country requesting external help was Portugal, finally attaining an agreement on May 3, 2011, with Troika, a cooperation between the

European Commission, ECB and IMF, on a financial package of € 78 billion (European Commission, 2011c). Funding from these agreements is conditional on the implementation of an Economic Adjustment Programme aimed at the correction of imbalances and structural problems identified, towards an economic sustainable growth and a stable financial sector.

4. ECONOMETRIC METHODOLOGY

As already said, this empirical study aims to analyze the explanatory power of a set of "standard" macro variables on stock returns in the specific markets of the so-called PIIGS. To achieve the objective a multiple linear regression model is estimated, where the stock returns for each individual country (dependent variable) are regressed on a constant and all the macroeconomic variables under study (independent variables). Phillips (1986) addressed some theoretical aspects of this type of regressions involving the characteristics of the economic time series employed. Once again, the influence of the variables on pricing (i.e., on expected returns) is beyond the scope of the thesis and thereby, in the spirit of Bilson et al. (2001), a regression framework of ex-post stock returns is used assuming that both global and local factors account for the variation in realized returns. The standard OLS regression model takes the form,

$$R_{it} = \alpha_i + \sum_{m=1}^{N} \beta_{im} F_{mt}^{G} + \sum_{j=1}^{K} \gamma_{ij} F_{ijt}^{L} + \varepsilon_{it}, \tag{2}$$

Where

α_i is the intercept parameter for country *i*,

R_{it} is the stock index return for the i^{th} country at time *t*,

β_{im} is the slope coefficient of the m^{th} global factor for country *i*,

F_{mt}^{G} is the m^{th} gobal risk factor at time *t*,

γ_{ij} is the slope coefficient of the j^{th} local factor for country *i*,

F_{ijt}^{L} is the j^{th} local risk factor in respect to the i^{th} country at time *t*,

ε_{it} is a disturbance term for country *i* at time *t*.

The stock index returns in the PIIGS are assumed to be a linear function of *N* global risk factors and *K* local risk factors. This in-sample analysis test the null hypothesis, in which the factors have no explanatory power for stock market returns (β_{im} = 0 or γ_{ij} = 0), conversely under the alternative hypothesis, the factors do have explanatory power for stock returns

($\beta_{im} \neq 0$ or $\gamma_{ij} \neq 0$). To assess the ability of each macro variable, the commonly used regression diagnostics are examined: the *t*-statistic associated with each coefficient estimated in Eq. (2), as well as the *F-statistic* and the goodness-of-fit measure *R*-square, both indicators of statistical significance of the overall model.

Four additional methodological aspects should be stressed. First, there are no expectations in the model since the relations between stock returns and the macro variables are tested contemporaneously, accepting that macroeconomic information is incorporated into stock market prices immediately.

Second, Eq. (2) is estimated for each country, using EVIEWS software, where all the macro explanatory variables are included in the analysis, as a first stage of the empirical study. No particular emphasis is put on the *R*-square and *F*-statistic measures of the overall model, due to the large number of explanatory variables used which can obviously be criticized for data mining.

Third, in order to identify the "best" model of stock return variation for each country, Eq. (2) is performed via stepwise OLS regressions estimated by SPSS software. The stepwise model-building procedure is mechanically performed by the software in the following manner: (i) all independent variables are sequentially tested, one at a time, in the regression equation; (ii) explanatory variables with *p*-values greater than 5% are excluded from the model ensuring the "best" sequence of independent variables that makes R^2 increase the fastest; (iii) a final model is achieved whereby only the statistically significant macro variables are retained. The assumption behind the stepwise regression method is that some input variables in a multiple linear regression lack a powerful explanatory effect on the dependent variable and thus it makes sense to select a specific model only comprised of statistically significant variables.

Fourth, in order to detect the presence of the three most important specification errors, in the final model obtained via stepwise method, the following specification tests are used. White's test for heteroskedasticity which considers under the null hypothesis that the variance of the errors is constant. Durbin-Watson test for first order autocorrelation which tests the null hypothesis that the residuals are not autocorrelated. The Ramsey RESET test for the functional form, in which the null hypothesis that the model is correctly specified is tested, using powers of fitted values from two to three.

5. DATA

In this study of equity returns for the five euro area countries PIIGS, the major national stock market price indexes were chosen as follows:

- the PSI 20 in Portugal;
- the ISEQ Overall in Ireland;
- the FTSE MIB in Italy;
- the Athex Composite in Greece;
- the IBEX 35 in Spain.

The index data consists of quarterly closing prices not adjusted for dividends.

With regard to the *a priori* selection of the macroeconomic variables, this task was based on the extant literature and thus the following set of "standard" macro variables was considered:

- Bond Spread (BS);
- Bond Yield (BY);
- Money Supply (MS);
- Gross Domestic Product (GDP);
- Trade Sector (TS);
- Unemployment Rate (UR);
- Oil Price (OIL);
- Foreign Exchange Rate EUR-USD (FX).

A summary of the macro variables is presented in Table 2. The data was obtained through Thomson Reuters Datastream. The empirical analysis between stock returns and macroeconomic variables in the PIIGS starts on January 1, 1999 and ends in March 31, 2011, resulting in 49 quarterly data observations. The only exception is Greece, but just in relation to three local variables considered, due to data availability: both the real GDP and TS variables were only available from January 1, 2000 to March 31, 2011; the UR variable was available from January 1, 1999 to December 31, 2010. The reason for the choice of January 1, 1999 to be the initial historical observation was determined so as to coincide with the introduction of the euro, an event that while eliminating the exchange rate risk, also affected the structure of the financial system in the euro area (Baele et al., 2004). However, it should be noted that Greece became a participating Member State of the euro area at a slightly later date on January 1, 2001.

TABLE 2

Glossary and Definitions of Variables

	Local Factors		Global Factors	
Variable	Symbol	Definition	Symbol	Definition
Bond Spread	**BS**	BS (*t*) = Harmonised Government 10-year bond yield (*t*) - German Harmonised Government 10-year bond yield (*t*), for period *t*		
Bond Yield	**BY**	Harmonised Government 10-year bond yield	**USBY**	U.S. Treasury Benchmark 10-year bond yield
			BDBY	German Harmonised Government 10-year bond yield
Money Supply	**MS**	M1 aggregate at current prices not seasonally adjusted	**USMS**	U.S. M0 aggregate at current prices seasonally adjusted, measured in U.S. dollars (converted to Euro values using the FX)
			BDMS	German M3 aggregate at current prices seasonally adjusted
Gross Domestic Product	**GDP**	Real GDP at constant prices seasonally adjusted	**USGDP**	U.S. real GDP at constant prices seasonally adjusted, measured in U.S. dollars (converted to Euro values using the FX)
			BDGDP	German real GDP at constant prices seasonally adjusted
Trade Sector	**TS**	TS (*t*) = Exports (*t*) + Imports (*t*), for period *t* (Exports and Imports of goods and services at constant prices seasonally adjusted)	**USTS**	U.S. TS at constant prices seasonally adjusted, measured in U.S. dollars (converted to Euro values using the FX)
			BDTS	German TS at constant prices seasonally adjusted
Unemployment Rate	**UR**	Harmonised Unemployment rate not seasonally adjusted (unemployment as a percent of the total labor force)	**USUR**	U.S. Harmonised Unemployment rate seasonally adjusted (unemployment as a percent of the total labor force)
			BDUR	German Harmonised Unemployment rate not seasonally adjusted (unemployment as a percent of the total labor force)
Oil Price			**OIL**	U.S. dollar London Brent Crude Oil Price Index per barrel (converted to Euro values using the FX)
Foreign Exchange Rate			**FX**	Euro price of U.S. $

The reason behind the choice: (i) of the M1 aggregate for the local factor and the U.S. M0 and German M3 aggregates for the global factors, concerning the MS variable, and (ii) of some time series being seasonally adjusted and others not, has to do with the data availability in the Datastream Database.

The basic series are ultimately denominated in Euro values, therefore, the empirical work takes the perspective of euro area investors rather than international investors, and are then computed based on the first difference in the natural logarithm levels of the dependent variable and all the independent variables. In this way, considering p_t and p_{t-1} the values of the variable of interest, in periods *t* and *t-1*, respectively, (X_t) is the continuously compounding rate of change in the values between two quarters, expressed as follows:

$$X_t = 100 \times [Ln(p_t) - Ln(p_{t-1})] \tag{3}$$

As mentioned before, the dependent variables consist of the major stock index quarterly returns (not adjusted for dividends) for the five countries under analysis and the independent variables correspond to the quarterly change in the macro variables employed. Both the dependent and independent variables are computed as expressed in Eq. (3). In order to know some statistical characteristics of the variables, Tables 3 - 7 display the correlations among them all for each country and, even though the focus is on the OLS regression analysis presented in Section 6, the significance of the correlation coefficients between the stock returns and the macro variables can offer some insights about the conclusions to be drawn.

As can be seen from Table 3, the PSI 20 returns are significantly correlated with the local variables BS, GDP and TS, and with the global variables USBY, BDBY, USMS and BDMS. In Table 4 for Ireland, there is a significant statistical correlation between the ISEQ Overall and the local variables BS and UR, and the global variables USBY, BDBY, USMS, BDMS, BDGDP, BDTS and USUR. Turning to the correlation matrix for Italy, a statistically significant correlation is found between the FTSE MIB and the local factors BS, GDP and TS, and the global factors USBY, BDBY, USMS, BDMS, BDGDP, BDTS and USUR (see Table 5). Looking at Table 6 for Greece, the local factors BS and BY, and the global factors USBY, BDBY and USMS are significantly correlated with the Athex Composite. Finally in Table 7, it is shown that the Spanish IBEX 35 is significantly correlated with the following local variables, BS, TS and UR, and with the global variables USBY and BDGDP.

Specifically regarding the correlations between the macro variables, there are several statistically significant correlations among them, which is to be expected since the local and global macro variables employed, except for the oil price and the exchange rate, consist in the same macroeconomic indicators, although belonging to different countries. As an illustration of it, the GDP local factor is always correlated with the BDGDP global factor, with the exception of Greece, and the USBY exhibits a strong positive correlation with the BDBY. The BS and BY variables are also strongly correlated given they both use the Government 10-year bond yield series. This should result in collinearity which tends to weaken the statistical significance of the coefficient estimates on these variables, as explanatory factors of stock returns, which is presented in Section 6. A similar problem is mentioned in Chen et al. (1986).

TABLE 3

Correlation matrix of the variables for Portugal

Variable	PSI 20	BS	BY	USBY	BDBY	MS	USMS	BDMS	GDP	USGDP	BDGDP	TS	USTS	BDTS	UR	USUR	BDUR	OIL	FX
PSI 20	1																		
BS	**-0.281**	1																	
BY	0.038	**0.436**	1																
USBY	**0.425**	-0.095	**0.298**	1															
BDBY	**0.268**	-0.121	**0.598**	**0.506**	1														
MS	-0.033	0.000	-0.069	-0.035	0.012	1													
USMS	**-0.255**	**0.284**	-0.034	**-0.341**	-0.223	0.137	1												
BDMS	**-0.250**	0.216	0.028	**-0.279**	-0.157	0.019	0.030	1											
GDP	**0.292**	**-0.279**	0.159	0.094	**0.325**	-0.011	**-0.262**	-0.066	1										
USGDP	-0.101	**0.336**	**0.258**	-0.168	0.016	**0.249**	**0.680**	-0.016	0.065	1									
BDGDP	0.184	-0.028	**0.272**	-0.025	**0.350**	0.068	**-0.422**	0.048	**0.409**	0.014	1								
TS	**0.355**	**-0.257**	0.088	0.046	**0.287**	0.101	**-0.540**	-0.010	**0.635**	-0.128	**0.652**	1							
USTS	-0.011	**0.280**	**0.332**	-0.195	0.127	0.233	**0.478**	-0.077	0.217	**0.919**	**0.272**	0.145	1						
BDTS	0.111	0.112	0.238	-0.042	0.212	0.207	**-0.379**	0.001	**0.462**	0.126	**0.715**	**0.646**	**0.400**	1					
UR	0.052	0.041	-0.210	-0.121	-0.232	**-0.348**	-0.006	-0.145	**-0.340**	**-0.259**	-0.221	-0.193	**-0.280**	-0.231	1				
USUR	-0.204	0.078	**-0.310**	-0.127	**-0.382**	0.004	**0.344**	0.226	**-0.293**	-0.036	**-0.624**	**-0.460**	**-0.286**	**-0.679**	0.075	1			
BDUR	-0.113	-0.101	**-0.370**	-0.058	**-0.301**	-0.152	**0.286**	-0.138	-0.157	-0.023	**-0.506**	**-0.448**	-0.189	**-0.403**	0.222	0.176	1		
OIL	0.109	-0.047	0.196	-0.068	**0.426**	**0.353**	-0.167	0.020	**0.342**	0.183	**0.473**	**0.574**	**0.401**	**0.576**	-0.216	**-0.334**	**-0.393**	1	
FX	-0.145	**0.349**	0.228	-0.210	-0.032	0.216	**0.731**	0.019	0.029	**0.992**	-0.057	-0.183	**0.887**	0.053	-0.209	0.054	-0.006	0.146	1

Note: This table reports the coefficients of correlation between each pair of variables. Bold entries denote significance at the 10% level as measured by *t*-statistics. All variables are rates of change. Data frequency is on a quarterly basis. PSI 20 = stock market index for Portugal; BS = bond spread; BY = bond yield; USBY = U.S. bond yield; BDBY = German bond yield; MS = money supply; USMS = U.S. money supply; BDMS = German money supply; GDP = real GDP; USGDP = U.S. real GDP; BDGDP = German real GDP; TS = trade sector; USTS = U.S. trade sector; BDTS = German trade sector; UR = unemployment rate; USUR = U.S. unemployment rate; BDUR = German unemployment rate; OIL = oil price; FX = foreign exchange rate.

TABLE 4

Correlation matrix of the variables for Ireland

Variable	ISEQ OVERALL	BS	BY	USBY	BDBY	MS	USMS	BDMS	GDP	USGDP	BDGDP	TS	USTS	BDTS	UR	USUR	BDUR	OIL	FX
ISEQ OVERALL	1																		
BS	**-0.333**	1																	
BY	0.033	**0.421**	1																
USBY	**0.535**	-0.087	**0.408**	1															
BDBY	**0.328**	-0.089	**0.500**	**0.527**	1														
MS	0.136	**-0.312**	-0.180	0.164	-0.140	1													
USMS	**-0.402**	**0.300**	0.079	**-0.368**	-0.206	-0.110	1												
BDMS	**-0.378**	0.130	-0.040	**-0.332**	-0.199	0.096	0.036	1											
GDP	0.194	-0.150	-0.072	-0.030	**0.294**	-0.047	**-0.277**	**-0.344**	1										
USGDP	-0.129	0.130	0.168	-0.227	0.061	-0.168	**0.676**	-0.029	0.115	1									
BDGDP	**0.279**	-0.167	-0.030	-0.071	**0.343**	-0.248	**-0.423**	0.011	**0.410**	0.019	1								
TS	0.068	-0.093	0.076	0.018	0.245	0.018	-0.025	**-0.417**	**0.582**	**0.332**	**0.345**	1							
USTS	-0.042	0.069	0.114	-0.251	0.165	-0.244	**0.464**	-0.091	0.249	**0.914**	**0.294**	**0.451**	1						
BDTS	**0.225**	-0.186	-0.089	-0.076	0.239	-0.052	**-0.404**	0.007	**0.379**	0.102	**0.721**	**0.370**	**0.398**	1					
UR	**-0.250**	**0.367**	0.156	0.086	-0.225	-0.253	0.250	0.113	**-0.445**	-0.056	**-0.501**	**-0.536**	-0.247	**-0.586**	1				
USUR	**-0.352**	0.266	-0.144	-0.090	**-0.388**	-0.096	**0.340**	**0.284**	**-0.496**	-0.037	**-0.595**	**-0.479**	**-0.301**	**-0.684**	**0.669**	1			
BDUR	0.097	-0.019	-0.179	-0.053	**-0.313**	0.218	**0.280**	-0.169	-0.051	-0.039	**-0.492**	-0.185	-0.211	**-0.385**	0.083	0.142	1		
OIL	0.189	-0.211	-0.121	-0.040	**0.450**	-0.106	-0.191	0.061	0.248	0.207	**0.579**	0.154	**0.444**	**0.665**	**-0.440**	**-0.442**	**-0.438**	1	
FX	-0.180	0.170	0.159	-0.264	0.006	-0.172	**0.728**	0.012	0.040	**0.991**	-0.056	0.264	**0.880**	0.027	0.014	0.058	-0.020	0.159	1

Note: This table reports the coefficients of correlation between each pair of variables. Bold entries denote significance at the 10% level as measured by *t*-statistics. All variables are rates of change. Data frequency is on a quarterly basis. ISEQ OVERALL = stock market index for Ireland; BS = bond spread; BY = bond yield; USBY = U.S. bond yield; BDBY = German bond yield; MS = money supply; USMS = U.S. money supply; BDMS = German money supply; GDP = real GDP; USGDP = U.S. real GDP; BDGDP = German real GDP; TS = trade sector; USTS = U.S. trade sector; BDTS = German trade sector; UR = unemployment rate; USUR = U.S. unemployment rate; BDUR = German unemployment rate; OIL = oil price; FX = foreign exchange rate.

TABLE 5

Correlation matrix of the variables for Italy

Variable	FTSE MIB	BS	BY	USBY	BDBY	MS	USMS	BDMS	GDP	USGDP	BDGDP	TS	USTS	BDTS	UR	USUR	BDUR	OIL	FX
FTSE MIB	1																		
BS	**-0.426**	1																	
BY	0.065	0.070	1																
USBY	**0.475**	**-0.418**	**0.328**	1															
BDBY	**0.335**	**-0.310**	**0.858**	**0.509**	1														
MS	0.201	0.146	-0.079	0.047	-0.087	1													
USMS	**-0.283**	**0.400**	0.037	**-0.346**	-0.211	0.221	1												
BDMS	**-0.396**	**0.311**	-0.019	**-0.280**	-0.172	-0.020	0.019	1											
GDP	**0.408**	-0.188	0.178	0.017	**0.342**	-0.059	**-0.439**	-0.138	1										
USGDP	-0.024	**0.311**	0.204	-0.189	0.013	0.124	**0.686**	-0.024	0.055	1									
BDGDP	**0.333**	-0.104	0.230	-0.033	**0.340**	-0.155	**-0.409**	0.047	**0.811**	0.028	1								
TS	**0.457**	-0.123	0.180	0.030	**0.303**	-0.055	**-0.375**	-0.170	**0.885**	0.082	**0.760**	1							
USTS	0.105	**0.276**	**0.275**	-0.215	0.118	0.063	**0.491**	-0.081	**0.318**	**0.923**	**0.278**	**0.353**	1						
BDTS	**0.239**	0.045	0.138	-0.062	0.191	0.016	**-0.361**	0.007	**0.785**	0.146	**0.715**	**0.772**	**0.411**	1					
UR	0.021	-0.118	**-0.253**	-0.019	-0.215	-0.217	0.047	0.009	**-0.328**	-0.193	**-0.361**	**-0.289**	**-0.278**	**-0.256**	1				
USUR	**-0.352**	0.211	**-0.245**	-0.113	**-0.340**	0.225	**0.350**	0.198	**-0.719**	-0.021	**-0.611**	**-0.746**	**-0.262**	**-0.671**	0.186	1			
BDUR	-0.132	-0.043	**-0.331**	-0.047	**-0.301**	0.053	**0.260**	-0.125	**-0.284**	-0.051	**-0.507**	**-0.244**	-0.210	**-0.404**	**0.312**	0.153	1		
OIL	0.228	0.059	**0.270**	-0.103	**0.386**	0.141	-0.129	0.021	**0.501**	0.230	**0.472**	**0.541**	**0.434**	**0.584**	**-0.295**	**-0.320**	**-0.401**	1	
FX	-0.088	**0.353**	0.177	-0.230	-0.033	0.120	**0.735**	0.009	-0.028	**0.992**	-0.041	0.000	**0.893**	0.076	-0.169	0.066	-0.037	0.196	1

Note: This table reports the coefficients of correlation between each pair of variables. Bold entries denote significance at the 10% level as measured by *t*-statistics. All variables are rates of change. Data frequency is on a quarterly basis. FTSE MIB = stock market index for Italy; BS = bond spread; BY = bond yield; USBY = U.S. bond yield; BDBY = German bond yield; MS = money supply; USMS = U.S. money supply; BDMS = German money supply; GDP = real GDP; USGDP = U.S. real GDP; BDGDP = German real GDP; TS = trade sector; USTS = U.S. trade sector; BDTS = German trade sector; UR = unemployment rate; USUR = U.S. unemployment rate; BDUR = German unemployment rate; OIL = oil price; FX = foreign exchange rate.

TABLE 6

Correlation matrix of the variables for Greece

Variable	ATHEX COMPOSITE	BS	BY	USBY	BDBY	MS	USMS	BDMS	GDP	USGDP	BDGDP	TS	USTS	BDTS	UR	USUR	BDUR	OIL	FX
ATHEX COMPOSITE	1																		
BS	**-0.467**	1																	
BY	**-0.278**	**0.589**	1																
USBY	**0.469**	**-0.344**	0.032	1															
BDBY	**0.337**	**-0.431**	0.069	**0.573**	1														
MS	0.276	-0.223	**-0.325**	0.140	0.041	1													
USMS	**-0.430**	**0.456**	0.182	**-0.383**	**-0.380**	0.015	1												
BDMS	-0.207	**0.300**	0.076	**-0.327**	-0.196	-0.144	0.012	1											
GDP	0.069	**-0.280**	**-0.410**	-0.026	0.077	0.154	-0.253	0.166	1										
USGDP	-0.207	0.237	**0.321**	-0.244	-0.152	0.047	**0.683**	-0.074	**-0.266**	1									
BDGDP	0.159	-0.181	0.063	-0.066	0.248	-0.005	**-0.489**	0.071	0.113	-0.026	1								
TS	0.113	-0.152	-0.167	-0.150	**0.288**	-0.087	-0.240	0.196	0.241	-0.071	**0.539**	1							
USTS	-0.116	0.199	**0.369**	**-0.278**	-0.041	0.012	**0.470**	-0.139	-0.221	**0.912**	0.251	0.102	1						
BDTS	0.084	-0.071	0.086	-0.091	0.150	0.046	**-0.420**	-0.030	0.041	0.074	**0.756**	**0.481**	**0.362**	1					
UR	-0.100	**0.317**	0.096	0.017	**-0.406**	-0.217	0.174	-0.180	-0.236	-0.140	-0.254	-0.190	-0.238	-0.169	1				
USUR	-0.193	0.139	-0.090	-0.078	**-0.267**	0.078	**0.422**	0.207	-0.068	0.017	**-0.571**	**-0.396**	-0.254	**-0.714**	0.144	1			
BDUR	-0.002	0.017	**-0.262**	-0.025	**-0.295**	0.023	**0.288**	-0.115	0.074	-0.018	**-0.501**	-0.032	-0.188	**-0.395**	**0.313**	0.120	1		
OIL	0.149	-0.153	-0.103	-0.142	**0.317**	0.159	-0.203	-0.007	0.005	0.174	**0.528**	**0.453**	**0.407**	**0.587**	**-0.428**	**-0.353**	**-0.411**	1	
FX	-0.250	**0.280**	**0.316**	**-0.282**	-0.193	0.021	**0.736**	-0.034	**-0.269**	**0.992**	-0.094	-0.110	**0.879**	0.000	-0.114	0.104	-0.009	0.144	1

Note: This table reports the coefficients of correlation between each pair of variables. Bold entries denote significance at the 10% level as measured by *t*-statistics. All variables are rates of change. Data frequency is on a quarterly basis. ATHEX COMPOSITE = stock market index for Greece; BS = bond spread; BY = bond yield; USBY = U.S. bond yield; BDBY = German bond yield; MS = money supply; USMS = U.S. money supply; BDMS = German money supply; GDP = real GDP; USGDP = U.S. real GDP; BDGDP = German real GDP; TS = trade sector; USTS = U.S. trade sector; BDTS = German trade sector; UR = unemployment rate; USUR = U.S. unemployment rate; BDUR = German unemployment rate; OIL = oil price; FX = foreign exchange rate.

TABLE 7

Correlation matrix of the variables for Spain

Variable	IBEX 35	BS	BY	USBY	BDBY	MS	USMS	BDMS	GDP	USGDP	BDGDP	TS	USTS	BDTS	UR	USUR	BDUR	OIL	FX
IBEX 35	1																		
BS	**-0.303**	1																	
BY	-0.053	**0.274**	1																
USBY	**0.357**	-0.148	**0.384**	1															
BDBY	0.203	0.009	**0.813**	**0.509**	1														
MS	0.141	0.139	-0.105	0.020	-0.039	1													
USMS	-0.226	0.118	-0.073	**-0.346**	-0.211	0.019	1												
BDMS	-0.190	0.061	-0.042	**-0.280**	-0.172	0.011	0.019	1											
GDP	0.127	-0.130	0.133	-0.010	**0.291**	0.141	**-0.405**	0.126	1										
USGDP	-0.101	0.035	0.156	-0.189	0.013	0.151	**0.686**	-0.024	0.041	1									
BDGDP	**0.253**	-0.020	**0.273**	-0.033	**0.340**	0.043	**-0.409**	0.047	**0.550**	0.028	1								
TS	**0.285**	-0.102	0.133	0.218	**0.295**	0.178	**-0.509**	-0.080	**0.474**	-0.155	**0.616**	1							
USTS	0.002	0.054	**0.243**	-0.215	0.118	0.155	**0.491**	-0.081	0.199	**0.923**	**0.278**	0.045	1						
BDTS	0.086	-0.022	0.183	-0.062	0.191	0.151	**-0.361**	0.007	**0.592**	0.146	**0.715**	**0.562**	**0.411**	1					
UR	**-0.338**	0.169	-0.077	-0.187	-0.233	**-0.443**	**0.366**	-0.052	**-0.651**	-0.168	**-0.553**	**-0.441**	**-0.304**	**-0.526**	1				
USUR	-0.184	0.121	**-0.271**	-0.113	**-0.340**	-0.134	**0.350**	0.198	**-0.588**	-0.021	**-0.611**	**-0.570**	**-0.262**	**-0.671**	**0.486**	1			
BDUR	-0.104	-0.141	**-0.395**	-0.047	**-0.301**	-0.030	**0.260**	-0.125	-0.048	-0.051	**-0.507**	-0.128	-0.210	**-0.404**	**0.285**	0.153	1		
OIL	0.224	0.015	**0.242**	-0.103	**0.386**	**0.254**	-0.129	0.021	**0.310**	0.230	**0.472**	**0.287**	**0.434**	**0.584**	**-0.454**	**-0.320**	**-0.401**	1	
FX	-0.135	0.063	0.124	-0.230	-0.033	0.141	**0.735**	0.009	-0.033	**0.992**	-0.041	-0.228	**0.893**	0.076	-0.096	0.066	-0.037	0.196	1

Note: This table reports the coefficients of correlation between each pair of variables. Bold entries denote significance at the 10% level as measured by *t*-statistics. All variables are rates of change. Data frequency is on a quarterly basis. IBEX 35 = stock market index for Spain; BS = bond spread; BY = bond yield; USBY = U.S. bond yield; BDBY = German bond yield; MS = money supply; USMS = U.S. money supply; BDMS = German money supply; GDP = real GDP; USGDP = U.S. real GDP; BDGDP = German real GDP; TS = trade sector; USTS = U.S. trade sector; BDTS = German trade sector; UR = unemployment rate; USUR = U.S. unemployment rate; BDUR = German unemployment rate; OIL = oil price; FX = foreign exchange rate.

6. EMPIRICAL RESULTS

A. THEORETICAL EXPECTATIONS

Nothing has yet been said about the theoretical foundations for the predicted nature of the relationship between the macro variables considered and aggregate stock indexes, reflected in the signs of the coefficients in the regression model. Early studies in this area threw some empirical evidence or theoretical grounds which support making predictions about the direction of the linear relationship between the stock indexes and the independent variables.

Chen et al. (1986) employing the risk premia variable argue that this default spread measure, expressed as, spreads of lower- over higher-grade bond yields, can represent economic conditions and the degree of risk aversion: the spreads are likely to be high under poor conditions and low under strong economic conditions. Moreover, Chen (1991) reported that the default spread is negatively correlated with the relative health of the current economy, represented by the U.S. GNP recent growth rate, in turn low levels of GNP are associated with low stock prices. A slope coefficient of negative sign is thus predicted for the variable BS.

Merton (1973) developed an intertemporal model for the capital market regarding the portfolio selection of risk-averse investors, who have the option to revise their portfolio allocation continually in time. An investment opportunity set, comprised of several risky assets and one risk-less asset, that is changing over time was considered and the assumption of the interest rate variable being sufficient to describe the shifts in the opportunity set was made. It was assumed the existence of an asset whose return is negatively correlated with changes in the investment opportunity set. It was further said that asset might be riskless long-term bonds. Intuitively, changes in government bond rates are likely to affect the opportunity cost of holding stocks, since they are both alternative assets in investors' portfolios. Moreover, Geske and Roll (1983) stated that an increase in the real rate of interest induces a reduction in all asset values through a discount factors effect (Eq. (1)). Thus, changes in the Treasury Bill rate attributable to its real interest rate component should lead to a contemporaneous stock return of the opposite sign. Within this framework, a negative regression coefficient for the variable BY is expected.

Homa and Jaffee (1971) showed that stock prices are positively related to the money supply through three channels influencing both the firms' expected cash flows and the discount factors of Eq. (1). First, a reduction in the supply of money gives rise to increased interest rates and less expenditures concerned with capital investment. Followed by a decrease in the firm's sales and in its earnings, the level and growth rate of dividends should also decrease. Second, an increased monetary tightness results in rising market interest rates and credit rationing in the loan markets, thus leading to an increase in the riskless interest rate. Third, increases in the degree of monetary tightness should increase the risk premium demanded by a risk-averter investor in order to account for the increased uncertainty associated with the expected growth rate of dividends. Therefore, reflecting the positive effect of the money supply on the price of common stocks, the estimated coefficient on the variable MS is expected to display a positive sign.

That stock levels are positively related to Real Activity levels, as measured by real GDP or industrial production, is a widely accepted fact that has to do with the information those variables carry about business conditions which are an important determinant of the cash flows to firms. Fama (1990) in an attempt to explain real returns on the value-weighted portfolio of NYSE stocks demonstrated empirically that real activity is positively related to stock prices. Using quarterly growth rates of industrial production to proxy for shocks to expected cash flows, it was shown that real activity explains more return variation for longer stock return horizons, given that from a regression R^2 of 6% for monthly returns, a 43% R^2 was achieved for annual returns. On this basis, the slope for the macro variable GDP should be positive.

In a study that had tried to find out if macroeconomic variables could be explanatory factors of real stock market returns in an emerging markets context of 20 countries, Bilson et al. (2001) considered a wide information set to be regressed on the equity returns of each country, in which the local Trade Sector macro variable was included to represent the size of the trade sector (i.e., exports plus imports). Some evidence is presented that the local variables and the global risk factor are significant associated with stock returns, although none of the factors clearly dominate across the different countries, suggesting that each market should be treated differently. The explanatory power of the model substantially improved when a wider set of variables was considered and it can be seen that the sign of the estimated coefficients on the trade sector was quite variable between countries. From the evidence of mixed results, a strong presumption of the direction of the relationship between stock returns and the TS variable is not made.

Investigating the short-run response of U.S. stock prices to announcements of the unemployment rate, Boyd et al. (2005) gave evidence that the stock market's response depends on the state of the economy. A consistent and statistically significant pattern was reported, with the slope coefficients on the unemployment news variable being negative in contractions and positive in expansions, which determined the effect on the average S&P 500 stock index portfolio returns. Bearing in mind Eq. (1) for valuing stocks, it was further identified that during expansions the interest rate effect (part of the variable discount factors) dominates, while during contractions the dominant effect arises from future corporate earnings and dividends (firms' expected cash flows). Overall, the major conclusion was that bad labor market news lead stock prices to rise during economic expansions, and to fall during economic contractions. Expectations for the coefficient estimates sign on the variable UR are in line with the work of Boyd et al. (2005).

As stated by Chen et al. (1986), oil prices should be included in any list of the systematic risk factors that influence stock market returns, perhaps reflecting the dependence of the world economy on oil. In a research conducted on the effects of oil shocks on international stock markets, Jones and Kaul (1996) showed that on average, in the postwar period, oil price hikes had a significant and detrimental effect on real stock returns. Evidence was found that oil shocks impact on the U.S. and Canadian stock markets were explained by their detrimental effects on output, and therefore on real cash flows. Hence, the prediction about the estimated coefficients sign of the OIL variable is negative.

According to Adler and Dumas (1983) there's empirical evidence for Purchasing Power Parity deviations across different nations which are closely correlated with exchange rate changes. Under these conditions and within the context of international capital markets, purchasing power parity deviations should be priced representing exchange risk borne by investors. Ferson and Harvey (1994) used an exchange risk factor defined as the trade-weighted U.S. dollar price of the currencies of 10 industrialized countries, where a depreciation of the dollar was indicated by a positive change of the exchange risk factor. The latter authors found positive beta coefficients on the exchange risk variable (except for the U.S. and Canada countries), illustrating that the dollar depreciation was followed by an increase in the excess return of stocks. Based on this, the regression slope coefficients on the FX variable should be negative, in which a positive change of FX reflects a U.S. dollar appreciation against the Euro.

B. ESTIMATION RESULTS

The estimated results from fitting the model expressed in Eq. (2), for each country, are presented in Tables 8 – 22, adopting the methods described in Section 4. All the results refer to contemporaneous relations between stock market returns and macro variables changes, once the macro variables were included contemporaneously with the stock returns. All the macro state variables were used and cover a quarterly sample period from January 1, 1999 through March 31, 2011, apart from Greece due to data availability, only in relation to three local variables. The empirical results for each country are now examined in some detail.

B.1. PORTUGAL

Table 8 presents the multifactor model regression results for Portugal using all the macro risk factors at once. Based on the *t*-statistics for each macro variable, the null hypothesis that their coefficient estimates are equal to zero can be rejected for three variables: USBY, UR and FX. The most influential macro variable on the PSI 20 returns in terms of statistical significance is the USBY, exhibiting a positive relation statistically significant at the 5% level. The Portuguese stock market is also positively-related to the UR factor and negatively-related to the FX factor, both significant at the 10% level. All these three state variables display coefficient signs in accordance with the theoretical expectations, except for the global factor USBY. However, the performance of this multifactor model with respect to the diagnostic tests is weak.

TABLE 8

Regression of the PSI 20 on the macro risk factors: 1999:01 – 2011:03 (49 observations)

Variable	βeta coefficient	*t*-statistic	*p*-value
BS	-0.053	-0.704	0.487
BY	-0.047	-0.116	0.909
USBY	**0.345** **	2.079	0.047
BDBY	-0.149	-0.375	0.710
MS	-0.193	-0.374	0.711
USMS	0.378	1.065	0.296
BDMS	0.359	0.259	0.797
GDP	2.746	0.898	0.377
USGDP	7.942	1.561	0.130
BDGDP	0.000	0.000	1.000
TS	1.060	0.978	0.336
USTS	0.555	0.400	0.692
BDTS	-0.732	-0.520	0.607
UR	**0.640** *	1.897	0.068
USUR	0.390	0.686	0.498
BDUR	-0.386	-0.754	0.457
OIL	0.006	0.047	0.963
FX	**-8.607** *	-1.786	0.085
(Constant)	**-8.381** *	-1.727	0.095
	0.457		
$\overline{R^2}$	0.108		
F-statistic	1.308		
p-value	0.255		

Note: This table reports the β coefficients, *t*-statistics and respective *p*-values, *F*-statistic and respective *p*- value, and *R*-squared from the OLS regression between the PSI 20 natural log returns (dependent variable) and each macro variable rates of change (independent variables). Estimated coefficients significance levels at 10%, 5%, and 1% are denoted by one, two, and three stars, respectively. Data frequency is on a quarterly basis. BS = bond spread; BY = bond yield; USBY = U.S. bond yield; BDBY = German bond yield; MS = money supply; USMS = U.S. money supply; BDMS = German money supply; GDP = real GDP; USGDP = U.S. real GDP; BDGDP = German real GDP; TS = trade sector; USTS = U.S. trade sector; BDTS = German trade sector; UR = unemployment rate; USUR = U.S. unemployment rate; BDUR = German unemployment rate; OIL = oil price; FX = foreign exchange rate.

As the high significance level associated with the *t*-tests can be due to multicollinearity problems among the explanatory variables it was decided to run the stepwise estimation method. Table 9 presents the results from the fitted multifactor model performed via stepwise method, where only the explanatory variables with estimated coefficients statistically significant were retained in the final models for the Portuguese stock market returns.

The "best" explanatory model of the PSI 20 returns (Model 2 in Table 9) includes one global factor and one local factor. Both the USBY and TS macro variables are statistically positively-related to stock returns, at the 1% and 5% levels, respectively.

The *F*-statistic concerned to the test of the null hypothesis that the two slope coefficients on the USBY and TS variables are jointly equal to zero leads to the clear rejection of the null. The adjusted *R*-squared reveals an explanatory power of 26%. Moreover, as one can see in Table 10, the null is never rejected in any of the specification tests conducted, and it can be concluded that the specification errors do not occur.

Albuquerque and Vega (2009) analyzed the daily and intraday co-movement between the U.S. and Portuguese stock market returns and its links with U.S. and Portuguese real-time macroeconomic announcements. Using high frequency data from January 4, 2002 to October 15, 2002, which was a period of economic recession for the U.S., they found U.S. macroeconomic public news to affect Portuguese stock market returns and that the Portuguese market only reacted to announcements that also affected the U.S. stock market. It is referred that a positive shock to the DJ 30 Industrial index return also increased the PSI 20 returns, although with a lag, which was interpreted as the Portuguese investors waiting for the better informed U.S. investors to first assess the significance of the news and then following their investment decisions.

Their evidence is consistent with the "best" return variation model for the PSI 20, here presented. First, U.S. macro news are shown to affect Portuguese stock market returns. Second, unexpected increases in the Federal funds target rate are found to depress the DJ 30 Industrial Index returns and consequently the PSI 20 returns through cross-country correlation. This finding, related to interest rates, is in line with the USBY being significantly related to the PSI 20 returns, although the coefficient sign is contradictory. One possible explanation for this contradiction could be that the authors had only captured the immediate market response to short-lived public information, once in this thesis it is reported a relative long-run trend between stock returns and macro variables, consistent with Fama (1990) explanation for why short-horizon returns can lead to different results than long-horizon returns. Third, Portuguese public announcements on the trade balance indicator had a significant positive effect on the PSI 20 returns. Here, the TS variable, which is a similar measure of the trade balance, is also significant and positively-related to the PSI 20 returns.

The already cited study of Bilson et al. (2001) reports a statistically significant and positive influence of a principal component, which has high positive loadings for the trade sector variable they use, in regard to the Portuguese market monthly returns through a sample period from January 1985 to December 1997. This empirical result supports the finding of the TS variable being positively-associated with the PSI 20 returns. Relating changes in the TS variable (size of the trade sector) to the competitive shocks mentioned in Karolyi and Stulz (1996), which are defined as shocks that shifts the market shares between countries, benefiting firms in one country at the expense of another country firms, it seems likely that the TS variable is influencing the PSI 20 through an exports positive effect on Portuguese exporters.

TABLE 9

Stepwise regressions of the PSI 20 on the macro risk factors: 1999:01 – 2011:03 (49 observations)

Panel A - Variables entered

Variable	βeta coefficient	*t*-statistic	*p*-value
Model 1			
(Constant)	-0.489	-0.333	0.741
USBY	**0.323** ***	3.240	0.002
	0.183		
$\overline{R^2}$	0.165		
F-statistic	10.499		
p-value	0.002		
Model 2			
(Constant)	-1.263	-0.890	0.378
USBY	**0.320** ***	3.401	0.001
TS	**1.186** **	2.599	0.013
	0.287		
$\overline{R^2}$	0.256		
F-statistic	9.269		
p-value	0.000		

Panel B - Excluded variables

Variable	βeta coefficient	*t*-statistic	*p*-value
Model 1			
BS	**-0.243** *	-1.885	0.066
BY	-0.100	-0.718	0.476
BDBY	0.066	0.427	0.671
MS	-0.016	-0.118	0.906
USMS	-0.125	-0.890	0.378
BDMS	-0.139	-1.011	0.317
GDP	**0.253** *	1.971	0.055
USGDP	-0.031	-0.227	0.822
BDGDP	0.194	1.493	0.142
TS	**0.324** **	2.599	0.013
USTS	0.072	0.530	0.598
BDTS	0.130	0.982	0.331
UR	0.101	0.759	0.452
USUR	-0.153	-1.160	0.252
BDUR	-0.086	-0.647	0.521
OIL	0.136	1.024	0.311
FX	-0.058	-0.428	0.671
Model 2			
BS	-0.174	-1.361	0.180
BY	-0.133	-1.013	0.316
BDBY	-0.053	-0.347	0.730
MS	-0.058	-0.455	0.651
USMS	0.068	0.435	0.666
BDMS	-0.134	-1.036	0.306
GDP	0.088	0.552	0.583
USGDP	-0.011	-0.084	0.933
BDGDP	-0.025	-0.153	0.879
USTS	0.005	0.041	0.968
BDTS	-0.139	-0.848	0.401
UR	0.181	1.424	0.161
USUR	-0.018	-0.126	0.900
BDUR	0.080	0.567	0.573
OIL	-0.096	-0.608	0.546
FX	-0.022	-0.169	0.866

Note: This table reports the β coefficients, *t*-statistics and respective *p*-values, *F*-statistic and respective *p*- value, and *R*-squared from OLS regressions between the PSI 20 natural log returns (dependent variable) and each macro variable rates of change (independent variables). Two model estimates are performed via the Stepwise method. Panel A reports the statistics for the entered variables. Panel B reports the statistics for the excluded variables. Estimated coefficients significance levels at 10%, 5%, and 1% are denoted by one, two, and three stars, respectively. Data frequency is on a quarterly basis. BS = bond spread; BY = bond yield; USBY = U.S. bond yield; BDBY = German bond yield; MS = money supply; USMS = U.S. money supply; BDMS = German money supply; GDP = real GDP; USGDP = U.S. real GDP; BDGDP = German real GDP; TS = trade sector; USTS = U.S. trade sector; BDTS = German trade sector; UR = unemployment rate; USUR = U.S. unemployment rate; BDUR = German unemployment rate; OIL = oil price; FX = foreign exchange rate.

TABLE 10

Specification tests for the "best" explanatory model of the PSI 20 returns

	White test		
Obs*R-squared	3.993	Prob. Chi-Square(5)	0.550
	Durbin-Watson test		
Durbin-Watson stat	2.102		
	Ramsey RESET Test		
F-statistic	0.479	*p*-value	0.623

Note: This table reports the statistics and *p*-values from three specification error tests applied to the"best" model of the PSI 20 return variation. White's test for heteroskedasticity; Durbin-Watson test for serial correlation; Ramsey RESET test for omission of relevant explanatory variables, incorrect functional form and correlation between explanatory variables and the errors of the model.

B.2. IRELAND

The results of the multifactor model regression for Ireland in which all the macro risk factors were included at once are presented in Table 11. The *t*-statistics for each macro variable reveal that the null hypothesis that is, their coefficient estimates are equal to zero can be rejected for the USBY and BDGDP, at the 10% significance level. These two variables exhibit a positive relation with the ISEQ Overall returns which, as regards the USBY, goes against the theoretical expectations. This initial multifactor model performance is weak in respect to its diagnostic tests.

TABLE 11

Regression of the ISEQ Overall on the macro risk factors: 1999:01 – 2011:03 (49 observations)

Variable	βeta coefficient		*t*-statistic	*p*-value
BS	-0.040		-0.595	0.559
BY	-0.015		-0.036	0.972
USBY	**0.477**	*	1.952	0.065
BDBY	-0.087		-0.176	0.862
MS	0.115		0.447	0.659
USMS	-0.386		-0.875	0.392
BDMS	-2.531		-1.286	0.213
GDP	0.070		0.042	0.967
USGDP	-3.424		-0.645	0.526
BDGDP	**6.966**	*	1.771	0.092
TS	-1.170		-1.051	0.306
USTS	0.422		0.255	0.802
BDTS	-0.279		-0.181	0.858
UR	-0.181		-0.492	0.628
USUR	-0.052		-0.065	0.949
BDUR	0.934		1.573	0.132
OIL	0.011		0.062	0.951
FX	3.782		0.753	0.460
(Constant)	3.706		0.606	0.552
	0.618			
$\overline{R^2}$	0.273			
F-statistic	1.794			
p-value	0.104			

Note: This table reports the β coefficients, *t*-statistics and respective *p*-values, *F*-statistic and respective *p*-value, and *R*-squared from the OLS regression between the ISEQ OVERALL natural log returns (dependent variable) and each macro variable rates of change (independent variables). Estimated coefficients significance levels at 10%, 5%, and 1% are denoted by one, two, and three stars, respectively. Data frequency is on a quarterly basis. BS = bond spread; BY = bond yield; USBY = U.S. bond yield; BDBY = German bond yield; MS = money supply; USMS = U.S. money supply; BDMS = German money supply; GDP = real GDP; USGDP = U.S. real GDP; BDGDP = German real GDP; TS = trade sector; USTS = U.S. trade sector; BDTS = German trade sector; UR = unemployment rate; USUR = U.S. unemployment rate; BDUR = German unemployment rate; OIL = oil price; FX = foreign exchange rate.

In order to avoid multicollinearity problems among the explanatory variables the stepwise estimation method was performed. Table 12 presents the fitted multifactor model results performed via stepwise method, in which only the statistically significant explanatory variables for the Irish stock market returns were retained in the final models.

Model 3 in Table 12 consists in the "best" return variation model for the ISEQ Overall and includes two global factors and one local factor. The global factors report to U.S.

macro indicators, the USBY and USUR, which are statistically significant at the 1% level. The USBY has a positive effect on the Irish stock market returns to the contrary of the USUR, which displays a negative slope coefficient. By accepting the findings of Boyd et al. (2005), this negative relation between the USUR and the ISEQ Overall returns brings out the fact that the Irish stock market has been responding to U.S. unemployment rates as if the Irish economy, on average, has been contracting over the last decade. The local factor is the BY which is statistically negatively-related to Irish stock returns at the 5% level, consistent with its coefficient sign expectation. The *F*-statistic, with regard to the test of the null hypothesis in which the three slope coefficients on the USBY, USUR and BY variables are jointly equal to zero leads to the clear rejection of the null. The adjusted *R*-squared reveals an explanatory power of 38%. Additionally, as one can see in Table 13, the null is never rejected in any of the tests conducted, except for the RESET test where the null hypotheses can be rejected at the 5% significance level. In the light of the Ramsey RESET test results it cannot be ignored that, nonlinear functions of the explanatory variables might have been omitted from the model and the OLS estimators might be biased and inconsistent, which could undermine all traditional statistical inference.

Bredin et al. (2003) investigated the impact of changes in domestic, U.S., U.K. and German/euro area policy rates, which are controlled by each country monetary authority, on the Irish stock market between 1988 to 2002, on a daily basis. By running a regression, the authors found that unanticipated changes in U.S. Federal funds target rate, proxied by the 1-month ahead Federal funds futures contract, was statistically significant with a negative effect on the ISEQ Index returns. Conversely, expected changes, computed as the difference between the actual change in Federal funds target rate and the change in the Federal funds futures rate on the day of the change, had a positive significant influence. In respect to the European influence, neither unanticipated nor expected changes in U.K., German/euro area and domestic policy rate changes had a significant effect on the Irish market.

In another study, Bredin and Hyde (2004) examined the influence of U.S., U.K. and domestic macroeconomic and financial variables on the Irish stock market monthly returns, from 1980 to 2001, in a nonlinear time-varying framework. As a preliminary result from a linear model, both the S&P 500 and the FT All Share Indexes returns were shown to be statistically positively-related to the ISEQ returns. Changes in the domestic long-term interest rate were also shown to be significant with a negative sign, along with a positive significant effect of U.S. industrial production growth and changes in oil prices displaying a marginally negatively significance. Evidence was found of nonlinearity in relation to some of the variables they employed, including domestic long-term interest rates, which supports the result above reported in regard to the Ramsey RESET test. From applying the nonlinear framework, the authors refer the broad findings to be not dissimilar to those presented for the linear model and emphasize a robust evidence of an important U.S. macro and financial influence on the Irish stock market. A puzzling finding was mentioned that U.S. short-term interest rate changes was the only variable with an opposite predicted sign, entering the model with a positive coefficient.

This ambiguous effect of international interest rates on stock prices was confirmed by Guidolin and Hyde (2008). Investigating about the time-varying nature of the relationship between monthly stock returns and short-term interest rates, in the context of the Irish economy over the period 1978-2004, the authors reported Irish excess returns to react positively to U.S. FED funds rate increases. It was also presented evidence on the primacy effect exerted by U.S. monetary policy shocks on the stock market of Ireland.

Overall, the findings of other authors here mentioned are entirely consistent with the "best" explanatory model of the ISEQ Overall returns here presented. Bredin and Hyde (2004) attribute their results of a significant influence of the U.S. market on the Irish stock exchange to the recent economic growth of Ireland. This is referred to be linked to a large influx of U.S. multinationals to Ireland which increased the Irish workforce employed in U.S. owned firms to 23.2% by 1994, and in 1999 pushed the U.S. foreign direct investment to account for 88% of the capital formation in Ireland. Another referred fact was the expansion of the major Irish firms in the U.S. market. The "best" model for Ireland also captures a strong U.S. macro influence with both the USBY and USUR displaying a statistically significant effect on the ISEQ Overall returns. The USBY also reveals an ambiguous positive coefficient sign opposed to the theoretical predictions but in line with the findings of the authors, with respect to U.S. short-term interest rates. Finally, in accordance with Bredin and Hyde (2004), which had shown a significant negative impact of changes in the domestic long-term interest rate on the

TABLE 12

Stepwise regressions of the ISEQ Overall on the macro risk factors: 1999:01 - 2011:03 (49 observations)

Variable	βeta coefficient	*t*-statistic	*p*-value
	Panel A - Variables entered		
Model 1			
(Constant)	-0.850	-0.492	0.625
USBY	**0.443** ***	3.797	0.000
	0.239		
$\overline{R^2}$	0.222		
F-statistic	14.415		
p-value	0.000		
Model 2			
(Constant)	0.389	0.234	0.816
USBY	**0.413** ***	3.786	0.000
USUR	**-0.821** ***	-2.864	0.006
	0.356		
$\overline{R^2}$	0.327		
F-statistic	12.436		
p-value	0.000		
Model 3			
(Constant)	1.277	0.775	0.442
USBY	**0.512** ***	4.493	0.000
USUR	**-0.861** ***	-3.122	0.003
BY	**-0.432** **	-2.199	0.033
	0.420		
$\overline{R^2}$	0.380		
F-statistic	10.609		
p-value	0.000		
	Panel B - Excluded variables		
Model 1			
BS	**-0.295** **	-2.400	0.021
BY	**-0.250** *	-1.826	0.074
BDBY	0.025	0.163	0.871
MS	0.052	0.397	0.693
USMS	**-0.242** *	-1.803	0.078
BDMS	**-0.222** *	-1.682	0.099
GDP	**0.225** *	1.788	0.081
USGDP	0.010	0.075	0.941
BDGDP	**0.325** ***	2.692	0.010
TS	0.074	0.570	0.571
USTS	0.112	0.845	0.403
BDTS	**0.314** **	2.585	0.013
UR	**-0.284** **	-2.302	0.026
USUR	**-0.344** ***	-2.864	0.006
BDUR	0.078	0.603	0.550
OIL	0.207	1.631	0.110
FX	-0.020	-0.150	0.882
Model 2			
BS	**-0.218** *	-1.784	0.081
BY	**-0.276** **	-2.199	0.033
BDBY	-0.136	-0.904	0.371
MS	0.027	0.220	0.827
USMS	-0.131	-0.967	0.339
BDMS	-0.158	-1.248	0.219
GDP	0.074	0.534	0.596
USGDP	-0.002	-0.017	0.987
BDGDP	0.185	1.225	0.227
TS	-0.101	-0.751	0.456
USTS	0.011	0.083	0.934
BDTS	0.148	0.896	0.375
UR	-0.130	-0.891	0.378
BDUR	0.130	1.078	0.287
OIL	0.088	0.673	0.504
FX	-0.002	-0.017	0.987

TABLE 12

Continued

Panel B - Excluded variables			
Variable	βeta coefficient	*t*-statistic	*p*-value
Model 3			
BS	-0.111	-0.790	0.434
BDBY	0.005	0.033	0.973
MS	-0.043	-0.350	0.728
USMS	-0.054	-0.395	0.695
BDMS	-0.131	-1.068	0.291
GDP	0.057	0.427	0.671
USGDP	0.058	0.476	0.636
BDGDP	0.173	1.194	0.239
TS	-0.085	-0.653	0.517
USTS	0.063	0.495	0.623
BDTS	0.081	0.495	0.623
UR	-0.057	-0.389	0.699
BDUR	0.089	0.755	0.454
OIL	0.057	0.451	0.654
FX	0.064	0.525	0.603

Note: This table reports the β coefficients, *t*-statistics and respective *p*-values, *F*-statistic and respective *p*-value, and *R*-squared from OLS regressions between the ISEQ OVERALL natural log returns (dependent variable) and each macro variable rates of change (independent variables). Two model estimates are performed via the Stepwise method. Panel A reports the statistics for the entered variables. Panel B reports the statistics for the excluded variables. Estimated coefficients significance levels at 10%, 5%, and 1% are denoted by one, two, and three stars, respectively. Data frequency is on a quarterly basis. BS = bond spread; BY = bond yield; USBY = U.S. bond yield; BDBY = German bond yield; MS = money supply; USMS = U.S. money supply; BDMS = German money supply; GDP = real GDP; USGDP = U.S. real GDP; BDGDP = German real GDP; TS = trade sector; USTS = U.S. trade sector; BDTS = German trade sector; UR = unemployment rate; USUR = U.S. unemployment rate; BDUR = German unemployment rate; OIL = oil price; FX = foreign exchange rate.

TABLE 13

Specification tests for the "best" explanatory model of the ISEQ Overall returns

	White test		
Obs*R-squared	9.841	Prob. Chi-Square(9)	0.364
	Durbin-Watson test		
Durbin-Watson stat	2.316		
	Ramsey RESET Test		
F-statistic	5.013	*p*-value	0.011

Note: This table reports the statistics and *p*-values from three specification error tests applied to the"best" model of the ISEQ OVERALL return variation. White's test for heteroskedasticity; Durbin-Watson test for serial correlation; Ramsey RESET test for omission of relevant explanatory variables, incorrect functional form and correlation between explanatory variables and the errors of the model.

ISEQ Index, the results here reported also display a negative stock returns-local BY relation.

B.3. ITALY

The results of the multifactor model regression for Italy in which all the macro risk factors were included at once are presented in Table 14. Based on the *t*-statistics, the null is rejected for six macro variables: MS, at the 1% significance level; USBY, BDTS and UR, at the 5% level; BY and USTS, at the 10% level. Even though the substantial number of statistically significant explanatory variables and a statistically well-specified multifactor model, as suggested by its *F*-statistic and quite high adjusted *R*-squared, not too much importance is attached to it given the large number of independent variables employed. All the macro variables have the predicted theoretical sign with the exception of the USBY positive coefficient.

TABLE 14

Regression of the FTSE MIB on the macro risk factors: 1999:01 – 2011:03 (49 observations)

Variable	βeta coefficient	*t*-statistic	*p*-value
BS	0.007	0.076	0.940
BY	**-1.210** *	-1.823	0.078
USBY	**0.283** **	2.215	0.035
BDBY	0.795	1.334	0.192
MS	**1.216** ***	2.834	0.008
USMS	-0.107	-0.394	0.696
BDMS	-0.753	-0.758	0.454
GDP	-1.282	-0.291	0.773
USGDP	-1.007	-0.323	0.749
BDGDP	3.029	1.078	0.290
TS	1.613	1.460	0.155
USTS	**1.757** *	1.829	0.077
BDTS	**-2.045** **	-2.089	0.045
UR	**0.443** **	2.451	0.020
USUR	-0.208	-0.535	0.597
BDUR	-0.299	-0.820	0.419
OIL	-0.051	-0.524	0.604
FX	-0.138	-0.046	0.964
(Constant)	-0.218	-0.079	0.938

	0.704
$\overline{R^2}$	0.527
F-statistic	3.966
p-value	0.000

Note: This table reports the β coefficients, *t*-statistics and respective *p*-values, *F*-statistic and respective *p*- value, and *R*-squared from the OLS regression between the FTSE MIB natural log returns (dependent variable) and each macro variable rates of change (independent variables). Estimated coefficients significance levels at 10%, 5%, and 1% are denoted by one, two, and three stars, respectively. Data frequency is on a quarterly basis. BS = bond spread; BY = bond yield; USBY = U.S. bond yield; BDBY = German bond yield; MS = money supply; USMS = U.S. money supply; BDMS = German money supply; GDP = real GDP; USGDP = U.S. real GDP; BDGDP = German real GDP; TS = trade sector; USTS = U.S. trade sector; BDTS = German trade sector; UR = unemployment rate; USUR = U.S. unemployment rate; BDUR = German unemployment rate; OIL = oil price; FX = foreign exchange rate.

As the high significance level associated with the *t*-tests can be due to multicollinearity problems among the explanatory variables it was decided to run the stepwise estimation method. Table 15 presents the fitted multifactor model results performed via stepwise method, retaining only the explanatory variables with estimated coefficients statistically significant for the Italian stock market returns, in the final models.

The "best" model of the FTSE MIB return variation (Model 2 in Table 15) comprises one global factor and one local factor, both highly significant at the 1% level. It is shown that both variables move Italian stock returns in the same direction. Similar to what is seen in the Portuguese market, the local TS variable (size of the trade sector) for Italy is also statistically positively-related to the FTSE MIB returns and it should make sense to suppose this positive effect to be exerted by the exports component of the variable. The *F*-statistic concerned to the test of the null hypothesis, in which the two slope coefficients on the USBY and TS variables are jointly equal to zero leads to the clear rejection of the null. The adjusted *R*-squared reveals an explanatory power of 40%. With regard to the specification tests, in Table 16, it can be seen that the null is never rejected in any of the specification tests conducted, except for the RESET test where the null hypotheses can be rejected at the 5% significance level. In the light of the Ramsey RESET test results it cannot be ignored that, nonlinear functions of the explanatory variables might have been omitted from the model and the OLS estimators might be biased and inconsistent, which could undermine all traditional statistical inference.

Bonini et al. (2007) modeled Italian stock market monthly returns, from October 1994 to December 2004, with domestic macroeconomic factors and an equity analysts' consensus variable, which was measured on the basis of research analysts' estimates of share prices. The empirical results pointed out to a good in-sample fitting capability of the model and the stepwise procedure retained the following statistically significant variables, a surprisingly negative sign consensus variable, a negative sign Euro/U.S. Dollar exchange rate and also a negative sign inflation rate.

By comparison to the results here presented, the findings of Bonini et al. (2007) are not quite consistent. Despite their results showing a non-significant Italian GDP which is also seen here with the absence of the local GDP from the "best" explanatory model of the FTSE MIB returns, the authors reported a statistically significant exchange rate factor. Even though the same negative sign for the slope coefficient of the FX variable being here presented in Table 14, this variable is never statistically significant. A possible explanation for this contradictory result might be the different sample periods covered in each study, which implied two procedure differences. First, Bonini et al. (2007) used the MIB30 stock market index, which had stopped being the Italian stock exchange reference index on September 20, 2004. Second, their exchange rate indicator was firstly measured as the Italian Lire price of U.S. dollars and with the advent of the single currency in 1999, the Euro price of U.S. dollars was then used for the remaining sample period. This thesis didn't take that issue into account once the empirical analysis coincides with the introduction of the euro.

Panetta (2001) studied the linkages between monthly Italian equity returns and macroeconomic factors, covering the period from January 1979 to December 1994. He found the growth rate of industrial production, the unanticipated change in the term structure and unexpected inflation to be strongly significant. In another estimated model, both the change in the Italian Lire/U.S. Dollar exchange rate and the surprise in oil prices displayed strong significance, which Panetta (2001) argues to be expected, as Italy is a highly dependent country on international trade and oil imports. However the author refers the relation between these macro factors and Italian stock returns to be highly unstable, with the returns sensitivities to the factors changing signs on an analysis over successive sub-periods.

This last finding might help explaining the disparity of results when compared to the reports here presented. The author argues that one possible cause for the instability mentioned could be associated with the globalization process and its effects on various economies, which are likely to modify financial markets exposure to economic shocks. Only the marginally significance of the BY macro variable reported for the overall model, in Table 14 reveal some consistency with the results of the author, regarding the term structure factor he had used.

TABLE 15

Stepwise regressions of the FTSE MIB on the macro risk factors: 1999:01 – 2011:03 (49 observations)

Variable	βeta coefficient	*t*-statistic	*p*-value
Panel A - Variables entered			
Model 1			
(Constant)	-0.755	-0.520	0.605
USBY	**0.364** ***	3.696	0.001
	0.225		
$\overline{R^2}$	0.209		
F-statistic	13.663		
p-value	0.001		
Model 2			
(Constant)	-1.599	-1.245	0.220
USBY	**0.354** ***	4.113	0.000
TS	**1.908** ***	3.952	0.000
	0.422		
$\overline{R^2}$	0.396		
F-statistic	16.765		
p-value	0.000		
Panel B - Excluded variables			
Model 1			
BS	**-0.276** **	-2.019	0.049
BY	-0.101	-0.741	0.462
BDBY	0.126	0.845	0.403
MS	0.179	1.406	0.166
USMS	-0.135	-0.984	0.330
BDMS	**-0.286** **	-2.226	0.031
GDP	**0.400** ***	3.464	0.001
USGDP	0.068	0.515	0.609
BDGDP	**0.349** ***	2.930	0.005
TS	**0.443** ***	3.952	0.000
USTS	**0.217** *	1.681	0.100
BDTS	**0.269** **	2.176	0.035
UR	0.031	0.236	0.815
USUR	**-0.302** **	-2.457	0.018
BDUR	-0.109	-0.849	0.401
OIL	**0.280** **	2.264	0.028
FX	0.022	0.167	0.868
Model 2			
BS	**-0.220** *	-1.814	0.076
BY	-0.192	-1.620	0.112
BDBY	-0.052	-0.369	0.714
MS	**0.204** *	1.867	0.068
USMS	0.057	0.439	0.663
BDMS	**-0.214** *	-1.855	0.070
GDP	0.038	0.156	0.877
USGDP	0.028	0.239	0.812
BDGDP	0.028	0.157	0.876
USTS	0.058	0.464	0.645
BDTS	-0.188	-1.060	0.295
UR	0.173	1.496	0.142
USUR	0.072	0.419	0.677
BDUR	-0.002	-0.015	0.988
OIL	0.052	0.383	0.703
FX	0.019	0.166	0.869

Note: This table reports the β coefficients, *t*-statistics and respective *p*-values, *F*-statistic and respective *p*- value, and *R*-squared from OLS regressions between the FTSE MIB natural log returns (dependent variable) and each macro variable rates of change (independent variables). Two model estimates are performed via the Stepwise method. Panel A reports the statistics for the entered variables. Panel B reports the statistics for the excluded variables. Estimated coefficients significance levels at 10%, 5%, and 1% are denoted by one, two, and three stars, respectively. Data frequency is on a quarterly basis. BS = bond spread; BY = bond yield; USBY = U.S. bond yield; BDBY = German bond yield; MS = money supply; USMS = U.S. money supply; BDMS = German money supply; GDP = real GDP; USGDP = U.S. real GDP; BDGDP = German real GDP; TS = trade sector; USTS = U.S. trade sector; BDTS = German trade sector; UR = unemployment rate; USUR = U.S. unemployment rate; BDUR = German unemployment rate; OIL = oil price; FX = foreign exchange rate.

TABLE 16

Specification tests for the "best" explanatory model of the FTSE MIB returns

	White test		
Obs*R-squared	3.859	Prob. Chi-Square(5)	0.570
	Durbin-Watson test		
Durbin-Watson stat	2.073		
	Ramsey RESET Test		
F-statistic	4.428	*p*-value	0.018

Note: This table reports the statistics and *p*-values from three specification error tests applied to the"best" model of the FTSE MIB return variation. White's test for heteroskedasticity; Durbin-Watson test for serial correlation; Ramsey RESET test for omission of relevant explanatory variables, incorrect functional form and correlation between explanatory variables and the errors of the model.

B.4. GREECE

Table 17 presents the multifactor model regression results for Greece using all the macro risk factors at once. The *t*-statistics for each macro variable reveal that the null hypothesis can only be rejected for the USTS, at the 5% significance level. The U.S. trade sector size is shown to be statistically positively-associated with the Athex Composite returns. All the other macro variables are never statistically significant. However, the performance of this multifactor model with respect to the diagnostic tests is weak.

TABLE 17

Regression of the Athex Composite on the macro risk factors: 1999:01 – 2011:03 (49 observations)

Variable	βeta coefficient	*t*-statistic	*p*-value
BS	-0.069	-0.461	0.649
BY	-0.576	-1.210	0.238
USBY	0.376	1.524	0.141
BDBY	0.146	0.235	0.816
MS	1.158	1.615	0.119
USMS	-0.876	-1.612	0.120
BDMS	2.356	1.053	0.303
GDP **a**	-2.284	-1.058	0.301
USGDP	-4.734	-0.702	0.490
BDGDP	-0.630	-0.132	0.896
TS **a**	0.312	0.366	0.717
USTS	**4.145** **	2.095	0.047
BDTS	-2.671	-1.491	0.149
UR **b**	0.485	1.098	0.283
USUR	-0.138	-0.192	0.849
BDUR	0.324	0.465	0.646
OIL	-0.075	-0.383	0.705
FX	2.124	0.334	0.742
(Constant)	1.835	0.329	0.745
	0.543		
$\overline{R^2}$	0.201		
F-statistic	1.586		
p-value	0.144		

Note: This table reports the β coefficients, *t*-statistics and respective *p*-values, *F*-statistic and respective *p*- value, and *R*-squared from the OLS regression between the ATHEX COMPOSITE natural log returns (dependent variable) and each macro variable rates of change (independent variables). Estimated coefficients significance levels at 10%, 5%, and 1% are denoted by one, two, and three stars, respectively. Data frequency is on a quarterly basis. BS = bond spread; BY = bond yield; USBY = U.S. bond yield; BDBY = German bond yield; MS = money supply; USMS = U.S. money supply; BDMS = German money supply; GDP = real GDP; USGDP = U.S. real GDP; BDGDP = German real GDP; TS = trade sector; USTS = U.S. trade sector; BDTS = German trade sector; UR = unemployment rate; USUR = U.S. unemployment rate; BDUR = German unemployment rate; OIL = oil price; FX = foreign exchange rate. **a** Sample period 2000:01 - 2011:03 (44 observations). **b** Sample period 1999:01 - 2010:12 (48 observations).

In order to avoid multicollinearity problems among the explanatory variables the stepwise estimation method was performed. Table 18 presents the fitted multifactor model results performed via stepwise method, in which only the explanatory variables with estimated coefficients statistically significant were retained in the final models for the Greek stock market returns.

Model 2 in Table 18 consists in the "best" return variation model for the Athex Composite and includes one global factor and one local factor, both significant at the

5% level. The global factor USBY exerts a positive effect on the stock returns, as opposed to theoretical anticipations. On the other hand, the local factor BS is negatively-related to the Athex Composite, as expected. This bond spread variable, that is, spreads of Greek sovereign bond yields over the German Bund (the euro area benchmark) should have a business-cycle pattern, being high around business troughs, which in turn is associated with a risk aversion increase. High risk aversion should lead investors to rebalance their portfolios towards less risky assets ("flight to safety"), and thus depressing stock market returns. The *F*-statistic concerned to the test of the null hypothesis, in which the two slope coefficients on the USBY and BS variables are jointly equal to zero leads to the clear rejection of the null. The adjusted *R*-squared reveals an explanatory power of 29%. With regard to the specification tests, in Table 19, it can be seen that the null is never rejected in any of the tests conducted, and it can be concluded that the specification errors do not occur.

The already cited study of Bilson et al. (2001) provides some evidence that support the findings in regard to the "best" model for the Greek market. From fitting an augmented model that includes several explanatory variables, the authors report some statistically significant relations. First, the authors found the interest rate variable to significantly depress Greek stock market returns, an effect that may be being captured here by the negative Athex Composite returns-BS relation, with respect to the Greek sovereign bond yield component of the BS variable. Finally, the authors also report the significance of a global risk factor, namely the return on a world market index which is positively related to the Greek stock market. In line with this last finding, the results here reported also document the presence of a significant global factor as an explanatory variable of the Athex Composite returns, which is the USBY.

TABLE 18

Stepwise regressions of the Athex Composite on the macro risk factors: 1999:01 – 2011:03 (49 observations)

Variable	βeta coefficient	*t*-statistic	*p*-value
Panel A - Variables entered			
Model 1			
(Constant)	-2.198	-1.020	0.314
USBY	**0.473** ***	3.396	0.002
	0.220		
$\overline{R^2}$	0.201		
F-statistic	11.534		
p-value	0.002		
Model 2			
(Constant)	-1.398	-0.681	0.500
USBY	**0.352** **	2.525	0.016
BS	**-0.194** **	-2.508	0.016
	0.326		
$\overline{R^2}$	0.292		
F-statistic	9.656		
p-value	0.000		
Panel B - Excluded variables			
Model 1			
BS	**-0.347** **	-2.508	0.016
BY	**-0.293** **	-2.223	0.032
BDBY	0.102	0.603	0.550
MS	0.215	1.569	0.125
USMS	**-0.293** **	-2.036	0.048
BDMS	-0.061	-0.411	0.683
GDP **a**	0.081	0.580	0.565
USGDP	-0.099	-0.690	0.494
BDGDP	0.190	1.392	0.172
TS **a**	0.187	1.354	0.183
USTS	0.016	0.110	0.913
BDTS	0.128	0.919	0.363
UR **b**	-0.108	-0.781	0.439
USUR	-0.157	-1.140	0.261
BDUR	0.009	0.066	0.947
OIL	0.220	1.609	0.116
FX	-0.128	-0.888	0.380
Model 2			
BY	-0.143	-0.846	0.403
BDBY	-0.020	-0.121	0.904
MS	0.159	1.194	0.240
USMS	-0.188	-1.246	0.220
BDMS	0.013	0.091	0.928
GDP **a**	-0.022	-0.157	0.876
USGDP	-0.044	-0.317	0.753
BDGDP	0.125	0.938	0.354
TS **a**	0.121	0.894	0.377
USTS	0.055	0.403	0.689
BDTS	0.093	0.704	0.486
UR **b**	0.004	0.030	0.976
USUR	-0.120	-0.909	0.369
BDUR	0.012	0.092	0.927
OIL	0.156	1.165	0.251
FX	-0.062	-0.441	0.662

Note: This table reports the β coefficients, *t*-statistics and respective *p*-values, *F*-statistic and respective *p*- value, and *R*-squared from OLS regressions between the ATHEX COMPOSITE natural log returns (dependent variable) and each macro variable rates of change (independent variables). Two model estimates are performed via the Stepwise method. Panel A reports the statistics for the entered variables. Panel B reports the statistics for the excluded variables. Estimated coefficients significance levels at 10%, 5%, and 1% are denoted by one, two, and three stars, respectively. Data frequency is on a quarterly basis. BS = bond spread; BY = bond yield; USBY = U.S. bond yield; BDBY = German bond yield; MS = money supply; USMS = U.S. money supply; BDMS = German money supply; GDP = real GDP; USGDP = U.S. real GDP; BDGDP = German real GDP; TS = trade sector; USTS = U.S. trade sector; BDTS = German trade sector; UR = unemployment rate; USUR = U.S. unemployment rate; BDUR = German unemployment rate; OIL = oil price; FX = foreign exchange rate. **a** Sample period 2000:01 - 2011:03 (44 observations). **b** Sample period 1999:01 - 2010:12 (48 observations).

TABLE 19

Specification tests for the "best" explanatory model of the Athex Composite returns

	White test		
Obs*R-squared	2.257	Prob. Chi-Square(5)	0.813
	Durbin-Watson test		
Durbin-Watson stat	1.917		
	Ramsey RESET Test		
F-statistic	0.962	*p*-value	0.390

Note: This table reports the statistics and *p*-values from three specification error tests applied to the"best" model of the ATHEX COMPOSITE return variation. White's test for heteroskedasticity; Durbin-Watson test for serial correlation; Ramsey RESET test for omission of relevant explanatory variables, incorrect functional form and correlation between explanatory variables and the errors of the model.

B.5. SPAIN

The results of the multifactor model regression for Spain in which all the macro risk factors were included at once are presented in Table 20. The *t*-statistics reveal that the null can be rejected for the USBY, at the 5% level, and for the USTS and BDTS, at the 10% level. With the exception of the BDTS, the other two variables exhibit a positive relation with the IBEX 35 returns. However, this initial multifactor model performance is weak in respect to its diagnostic tests.

TABLE 20

Regression of the IBEX 35 on the macro risk factors: 1999:01 – 2011:03 (49 observations)

Variable	βeta coefficient	*t*-statistic	*p*-value
BS	-0.035	-1.054	0.300
BY	-0.653	-1.144	0.262
USBY	**0.461** **	2.564	0.016
BDBY	-0.038	-0.071	0.944
MS	0.097	0.427	0.672
USMS	0.326	0.897	0.377
BDMS	-0.216	-0.159	0.875
GDP	2.254	0.476	0.637
USGDP	-3.022	-0.735	0.468
BDGDP	4.293	1.316	0.198
TS	0.149	0.214	0.832
USTS	**2.263** *	1.842	0.075
BDTS	**-2.122** *	-1.719	0.096
UR	-0.054	-0.118	0.907
USUR	0.095	0.200	0.843
BDUR	-0.182	-0.359	0.722
OIL	0.123	0.996	0.327
FX	0.458	0.119	0.906
(Constant)	-1.475	-0.329	0.745

	0.487
$\overline{R^2}$	0.180
F-statistic	1.585
p-value	0.129

Note: This table reports the β coefficients, *t*-statistics and respective *p*-values, *F*-statistic and respective *p*- value, and *R*-squared from the OLS regression between the IBEX 35 natural log returns (dependent variable) and each macro variable rates of change (independent variables). Estimated coefficients significance levels at 10%, 5%, and 1% are denoted by one, two, and three stars, respectively. Data frequency is on a quarterly basis. BS = bond spread; BY = bond yield; USBY = U.S. bond yield; BDBY = German bond yield; MS = money supply; USMS = U.S. money supply; BDMS = German money supply; GDP = real GDP; USGDP = U.S. real GDP; BDGDP = German real GDP; TS = trade sector; USTS = U.S. trade sector; BDTS = German trade sector; UR = unemployment rate; USUR = U.S. unemployment rate; BDUR = German unemployment rate; OIL = oil price; FX = foreign exchange rate.

As the high significance level associated with the *t*-tests can be due to multicollinearity problems among the explanatory variables it was decided to run the stepwise estimation method. Table 21 presents the results from the fitted multifactor model performed via stepwise method, where only the statistically significant explanatory variables were retained in the final models for the Spanish stock market returns.

The "best" explanatory model of the IBEX 35 returns (Model 2 in Table 21) includes one global factor and one local factor, both significant at the 5% level. The USBY has a positive effect on the Spanish stock market to the contrary of the UR which is shown to be negatively associated with the IBEX 35 returns. Based on the findings of Boyd et al. (2005), this negative IBEX 35 returns-UR relation leads to the conclusion that the Spanish stock market has been reacting to country-specific unemployment rates as if the Spanish economy has been contracting over the last decade, on average. The significance of the unemployment rate is not surprising as Spain is the euro area country with the highest level of unemployed per total labor force, reaching a peak of 20.1%, in 2010 (European Commission, 2011a). The F-statistic concerned to the test of the null hypothesis that the two slope coefficients on the USBY and UR variables are jointly equal to zero leads to the clear rejection of the null. The adjusted R-squared reveals an explanatory power of 17%. Moreover, as one can see in Table 22, the null is never rejected in any of the specification tests conducted, and it can be concluded that the specification errors do not occur.

Martínez (1998) analyzed the impact that fluctuations in the foreign exchange rate have on non financing companies listed on the Spanish stock exchange, from a perspective of monthly stock returns during January 1992 to December 1997. Employing a trade-weighted index measured as the exchange rate of the Spanish Peseta against other foreign currencies, it was found that only a minority of 20% of the individual firms significantly reacted to exchange rate movements. It was argued that the exchange rate risk exposure of each company should be dependent on their exports, imports and foreign denominated debt levels, which also should determine the direction of the stock returns response to exchange rate fluctuations. Even though this analysis not being entirely comparable to the findings of the present thesis, once the financial sector accounts for the biggest share of the IBEX 35 Index, and Martínez (1998) had focused only on non-financial companies, the findings are not dissimilar. The author report that exchange rate changes explain only a minimal fraction of the stock returns which is consistent with the lack of statistically significance here presented for the FX variable.

TABLE 21

Stepwise regressions of the IBEX 35 on the macro risk factors: 1999:01 – 2011:03 (49 observations)

Panel A - Variables entered

Variable	βeta coefficient	*t*-statistic	*p*-value
Model 1			
(Constant)	0.341	0.225	0.823
USBY	**0.269** **	2.619	0.012
	0.127		
$\overline{R^2}$	0.109		
F-statistic	6.859		
p-value	0.012		
Model 2			
(Constant)	0.701	0.475	0.637
USBY	**0.230** **	2.272	0.028
UR	**-0.473** **	-2.097	0.041
	0.204		
$\overline{R^2}$	0.169		
F-statistic	5.877		
p-value	0.005		

Panel B - Excluded variables

Variable	βeta coefficient	*t*-statistic	*p*-value
Model 1			
BS	**-0.255** *	-1.905	0.063
BY	-0.223	-1.535	0.132
BDBY	0.029	0.179	0.859
MS	0.134	0.983	0.331
USMS	-0.116	-0.796	0.430
BDMS	-0.097	-0.682	0.499
GDP	0.130	0.956	0.344
USGDP	-0.035	-0.247	0.806
BDGDP	**0.265** *	2.003	0.051
TS	0.217	1.579	0.121
USTS	0.083	0.591	0.558
BDTS	0.109	0.793	0.432
UR	**-0.281** **	-2.097	0.041
USUR	-0.145	-1.062	0.294
BDUR	-0.087	-0.634	0.530
OIL	**0.264** *	1.986	0.053
FX	-0.056	-0.398	0.692
Model 2			
BS	-0.219	-1.663	0.103
BY	-0.225	-1.605	0.115
BDBY	-0.024	-0.154	0.878
MS	0.013	0.089	0.929
USMS	-0.022	-0.148	0.883
BDMS	-0.131	-0.946	0.349
GDP	-0.095	-0.535	0.595
USGDP	-0.098	-0.712	0.480
BDGDP	0.159	0.992	0.326
TS	0.120	0.805	0.425
USTS	-0.021	-0.145	0.885
BDTS	-0.061	-0.385	0.702
USUR	-0.017	-0.111	0.912
BDUR	-0.010	-0.072	0.943
OIL	0.169	1.123	0.267
FX	-0.099	-0.724	0.473

Note: This table reports the β coefficients, *t*-statistics and respective *p*-values, *F*-statistic and respective *p*-value, and *R*-squared from OLS regressions between the IBEX 35 natural log returns (dependent variable) and each macro variable rates of change (independent variables). Two model estimates are performed via the Stepwise method. Panel A reports the statistics for the entered variables. Panel B reports the statistics for the excluded variables. Estimated coefficients significance levels at 10%, 5%, and 1% are denoted by one, two, and three stars, respectively. Data frequency is on a quarterly basis. BS = bond spread; BY = bond yield; USBY = U.S. bond yield; BDBY = German bond yield; MS = money supply; USMS = U.S. money supply; BDMS = German money supply; GDP = real GDP; USGDP = U.S. real GDP; BDGDP = German real GDP; TS = trade sector; USTS = U.S. trade sector; BDTS = German trade sector; UR = unemployment rate; USUR = U.S. unemployment rate; BDUR = German unemployment rate; OIL = oil price; FX = foreign exchange rate.

TABLE 22

Specification tests for the "best" explanatory model of the IBEX 35 returns

	White test		
Obs*R-squared	8.898	Prob. Chi-Square(5)	0.113
	Durbin-Watson test		
Durbin-Watson stat	2.265		
	Ramsey RESET Test		
F-statistic	1.494	*p*-value	0.236

Note: This table reports the statistics and *p*-values from three specification error tests applied to the"best" model of the IBEX 35 return variation. White's test for heteroskedasticity; Durbin-Watson test for serial correlation; Ramsey RESET test for omission of relevant explanatory variables, incorrect functional form and correlation between explanatory variables and the errors of the model.

7. CONCLUSION

This thesis aims to empirically find which macroeconomic indicators (if any) are more closely related to the stock returns in five peripheral euro area countries, the so-called PIIGS. Portugal, Ireland, Italy, Greece and Spain caught the financial markets' attention due to the recent European sovereign-debt crisis. The *a priori* selection of a set of macro variables was mainly influenced by the extant empirical literature and the inclusion of U.S. and German macro variables, together with the oil price and the exchange rate, was a way to assess the integration level of the stock markets considered.

The analysis of the dynamics between the stock market returns and the macro variables was carried out on the basis of standard OLS regressions, firstly by including all the macro variables at once and secondly by identifying the "best" explanatory model of stock returns for each country via the stepwise estimation method, whereby only the significant macro variables were retained. The time span considered for all the analysis was from January 1, 1999 to March 31, 2011, on a quarterly basis, and the main national stock market indexes were considered.

A first conclusion to be drawn consists in the relative ability of the macro variables to explain stock market returns, with their explanatory power ranging from a low of 17% in the Spanish market to a high of 40% in Italy, with regard to the "best" models. Then, the set of macro variables which is related to both local economic conditions and world business cycle, displays some success in explaining returns.

In all countries, it was found that at least one global factor and one local factor were included in the "best" model. In this context, a mild segmentation model is shown to be appropriate to explain these countries stock market returns, revealing these markets to be neither fully segmented nor fully integrated into world capital markets, in the same vein to Bekaert and Harvey (1995). However, a significant German influence was never found given the absence of German factors from the "best" models of all countries. In the light of this finding, it can be suggested that the higher degree of market integration into euro area markets by comparison with U.S. markets, reported in Baele et al. (2004), didn't occur in the stock markets of these five countries.

Perhaps the most interesting finding is that the U.S. Treasury 10-year bond yield is highly significant in all countries, even though the nature of its relationship with stock returns being surprising. It is shown that the USBY is statistically positively-related to stock returns that is, upward movements in the U.S. Treasury bond yields generate a positive increase in stock market returns. Other authors, such as Guidolin and Hyde (2008) also reported a surprising positive effect of U.S. interest rates on the specific stock market returns of Ireland. This somehow puzzling finding is interpreted as being the negative impact in the government bond spread measure of each country that a positive increase in the U.S. Treasury bond yield should generate. To support this argument, it was seen the U.S. Treasury bond yield to be strongly and positively correlated with the German Government 10-year bond yield (euro area benchmark bond). In this sense, an upward movement of U.S. Treasury bond yields should decrease the BS variable of these five countries and thus their level of risk aversion, leading to an increase in stock prices.

Another further interesting finding is the common cross-country pattern of return explanation in the Portuguese and Italian stock markets, whereby the U.S. Treasury 10-year bond yield and the country-specific size of the trade sector are strongly related to the stock returns of both countries, taking into account the "best" models.

It also should be noted that despite the use of a large set of macro variables as explanatory factors of stock market returns, only two or three were finally retained in the "best" explanatory model for each country. The absence of popular macro indicators such as the Real GDP, the Money Supply, the Oil Price and the Foreign Exchange Rate is remarkably.

Finally, some areas for future research are mentioned as follows. First, a sizeable proportion of returns is left unexplained by the macro variables set employed, that was of 60% in Italy, which was the country where the macro variables experienced the greatest success in explaining the stock returns. For this reason it should make sense to empirically test other factors potentially linked to stock market returns. Second, this thesis studied the contemporaneous relationships between stock returns and macro factors, therefore future investigations could analyze the lead and lag effects of these same variables and conclude if the models increased in explanatory power. Third, further research could investigate the time-varying stability of the relationships identified. Thus, it would be possible to assess if the effects of the macro variables on the stock market returns of the five so-called PIIGS vary across the stage of the business cycle.

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