國立政治大學國際經營與貿易學系

碩士論文

Department of International Business

National Chengchi University

Master Thesis

Trade Imbalance and Adjustment of Capital Requirement in Euro Area

國際收支失衡與資本適足率最適調整之探討–以歐元區為例

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中華民國 101 年 6 月

June, 2012

謝誌

研究所的時光過得好快，至今還記得當初剛揮別大學、迎接研究所來臨時，那感傷卻又參雜著興奮的心情。這段時光雖然短暫而緊湊，然而我卻吸收成長了許多，也接觸學習到更多更廣闊的領域。

很感謝指導教授胡聯國教授的教導，不論是在課堂中或是研究方面，都能感受到教授廣博且精深的學問，每次教授的談話也總是讓我有所感觸並且受益良多。更特別感謝教授在奔波忙碌之餘，儘管是最忙碌的時刻，仍特地撥出時間耐心指導，更不忘關心詢問近況。每每在我感到山窮水盡之際，教授從旁的啟發與教導，引領我度過了層層關卡。

此外，也十分感謝口試委員龔尚智教授與林柏生教授的指導，並且給予論文關鍵精闢的建議，使我瞭解更多研究上的不足與使論文更臻完善的努力方向。

還要謝謝一路陪伴我走來的老友們與研究所的好友們，謝謝你們所有無形與有形的鼓勵，也難忘你們增添在我生活中的許多歡笑與回憶。謝謝我認真又有毅力的研究夥伴—均亭，不論時間如何流逝，將不會忘記那些我們共同打拚作戰的日子，妳的打氣與笑語常是我繼續往前突破難關的動力，也是我在研究期間珍貴的歡樂來源。

最後，感謝我親愛的家人，這一路的成長，因為有您們在我身旁鼓勵，每當我面臨難題時，也總是不厭其煩地聆聽與開導，並且相信與全力支持我的每一個抉擇，使我能無後顧之憂、更加有勇氣地迎接所有前來的挑戰。

蕭筑方 謹誌

于政大

摘要

目前歐盟訂立的歐盟資本要求規範(Capital Requirements Directive)是為加強歐元區內的金融機構之間的風險管理並參考新巴塞爾資本協定(New Basel Capital Accord)所建構而成的風險管理規範。本文之理論基礎是以 Holmström and Tirole (2011)流動性衝擊之模型與 Hu (2012)資本適足率之模型為基底，從國際貿易的觀點繼續延伸，探討當考慮國際收支帳之後，資本適足率應當如何加以調整，並且探討目前歐元區全面遵循一致的資本要求規範之現象是否合適。由於歐元區各國的貿易失衡問題也是造成當前歐洲債務危機的主要因素之一，因此，本文也將觀察貿易失衡與調整資本適足率之間的關係。最後，本文以歐元區 17 國最近 6 年的經濟統計資料套用理論模型並經過實證之後發現，歐元區各國對於資本適足率調整之方向並非一致，此外，由於各國在每個時期的經濟表現也不盡相同，因此，歐盟應更多加思考歐元區各國不同的資本調整之特性與總體經濟表現來修訂資本要求規範。

關鍵字：資本適足率、貿易失衡、歐洲貨幣聯盟

ABSTRACT

The European Union constructs a comprehensive and risk-sensitive framework, Capital Requirements Directive (CRD), to enhance risk management among financial institutions. This paper analyzes whether the rules of capital requirement ratios should be uniform for all the countries in Euro area by establishing a model of liquidity shock and capital requirement from the sight of balance of payments. This paper will also observe the relationships between current account imbalances and the adjustment of capital requirement, because international trade imbalances also account for parts of the reasons that cause nowadays European debt crisis. The results of the model show that uniform policy for capital requirement is not appropriate for all the EU-17. The adjustment of capital requirement should be considered for the various macroeconomic environments in different countries and in different times.

Keywords: Capital regulation, trade imbalance, European monetary union

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1 Introduction

The European sovereign debt crisis represents a huge financial crisis in which some countries in the Euro area are unable to refinance their government debt independently or without the assistance of other countries. In the end of 2009, investors have started to worry about the Euro debt situations due to the rising government debt levels internationally and some downgrading of government debt in some European states. On 9 May 2010, the leading Europe's finance ministers approved a rescue package worthy of 750 billion euro dollars and created the European Financial Stability Facility to promote the financial stability across Europe.[1] In October and February 2012, the Eurozone leaders agreed on more measures, including requiring European banks to achieve 9% capitalization, and created a European Fiscal Compact to introduce balanced budget amendment from those participating countries.

In order to construct a comprehensive and risk-sensitive framework and to enhance risk management among financial institutions, European Commission has established EU rules, Capital Requirements Directive (CRD), on capital requirements for credit institutions and investment firms. The original framework of CRD was initially published in June 2004.[2] The directives have kept amended and expanding from legislation in force, CRD I, CRD II and CRD III packages, to the newest proposals, CRD IV packages.

The Capital Requirements Directive introduces a supervisory framework which is revised by Basel II rules on capital measurement and capital standards. The Basel

[1] "EU ministers offer 750bn-euro plan to support currency". *BBC News*. 10 May 2010. Retrieved 11 May 2010.

[2] The detailed rules of Capital Requirements Directive are on the European Commission website, available in http://ec.europa.eu/internal_market/bank/regcapital/index_en.htm.

Accord, established in 1988 by Basel Committee on Banking Supervision, requires higher capital ratios to ensure the soundness and stability of international banking system. Basel II is composed of the concept of three pillars. Pillar I sets out the minimum capital requirements on firms. Pillar II requires firms and supervisors to observe whether there are risks which are not covered in Pillar I and increase additional capital if so. Third pillar requires firms to disclosure certain details of their risks, capital and risk management in order to complement the supervisory review process.

After the financial crisis over 2008 and 2009, Basel III proposals improve deficiencies in Basel II to strengthen the regulatory regime. On 20 July 2011, the European Commission also adopted a new CRD IV package, which referred to the reform in Basel III, in order to enhance more complete regulation on the banking sector. This new legislative package is a key instrument to introduce the new European supervisory structure.[3]

To deliberate the causes of the European sovereign debt crisis, there are many complex factors involved. Among those factors, international trade imbalances account for one of the reasons that caused today's European debt crisis. If a country imports more than exports, it runs a current account deficit and is a net importer of capital. This means that it will decrease its savings or borrow money to buy those imports. Conversely, a country with trade surplus is a net exporter of capital and its savings will increase, and it can lend money to other countries.

In Eurozone, richer countries whose currencies are devalued keep surpluses in their current accounts, and poorer countries whose currencies are overvalued keep deficits in their current accounts. Countries with deficits in the current accounts will keep

[3] The explanations of CRD are from the website of UK Financial Services Authority, available in http://www.fsa.gov.uk/about/what/international/basel.

accumulating increasing debt or foreign ownership of domestic assets.

During 1999-2007, Germany had a better performance of public debt and fiscal deficit relative to GDP than other Eurozone members. Estonia, Portugal, Greece, Ireland, Italy and Spain had worse balance of payments deficits which are considered to be the most vulnerable countries by the perspective on current account deficits, whereas Germany had an increased trade surplus as a percentage of GDP after 1999.[4] Greece's trading position has improved during 2011 to 2012. The percentage of imports has dropped 20.9% and the percentage of exports has grown 16.9%. Hence, the percentage of trade deficits is reduced by 42.8%.[5]

Although trade imbalances between different countries can be reduced automatically by the appreciation or devaluation of currencies, this mechanism is not suitable in the countries within Euro area due to the fact that the countries within Euro area all hold the same currency. The only solution to increase a country's saving is to reduce budget deficits and change consumption and saving habits. For example, countries with large trade deficits, like Greece, are suggested to consume or import less and encourage their exporting industries. While countries with large trade surpluses, like Germany, Austria and the Netherlands, should consume more domestic goods and services and increase wages to support domestic consumption. In May 2012, Wolfgang, German finance minister, has expressed the government will help decreasing current account imbalances within Eurozone by increasing the wages in Germany.

This paper aims to analyze whether the rules of capital ratios should be identical for all the countries in Euro area. This study covers four steps. First, establish a model with

[4] Martin Wolf (6 December 2011). "Merkozy failed to save the eurozone". *The Financial Times*. Retrieved 9 December 2011.

[5] "Commercial Transactions of Greece: March 2012 (estimations)". *Hellenic Statistical Authority*. statistics.gr. 29 May 2012. p. 10. Retrieved 6 June 2012.

liquidity shock from the sight of balance of payments to consider the appropriate capital requirement ratios. Second, put the recent data in 17 countries in the European Monetary Union into the established model. Third, consider some variables and run a panel data between EU-17 from 2005Q2 to 2011Q3. Finally, estimate how to adjust the appropriate capital requirement in the realistic economy environments in the different countries.

2 Literature Review

2.1 Public Debt

Governments often issue government debt to make the fiscal policy. Although appropriate debt could help the economy to go well, the amount of debt is not always good for the economy. Debt will have a great positive or negative impact on the social economy depending on its amount in different countries. Checherita, Cristina, and Rother (2010) found that debt levels of around 70-80% of GDP start to have a negative effect on per-capita GDP growth, and beyond the turning point, about 90-100% of GDP, the debt will have a deleterious impact on growth in 12 Euro area countries over a period of about 40 years since 1970. Cecchetti, Mohanty, and Zampolli (2011) also support that debt is a burden on growth beyond a certain level, and governments should keep debt below the estimated thresholds of government debt, around 85% of GDP.

2.2 Capital Requirement

Morrison and White (2005) set up a model in which the regulators can screen banks to decide whether giving licenses and imposing capital requirement on them. In this model, it is suggested that countries with worse regulator reputation should have a tighter capital regulation, and countries with better reputation should have a looser capital regulation. From the banks' side, if a bank's investment is more transparent, then its capital requirements can be looser.

In Blundell- Wignall and Atkinson (2010)'s review for the history of Basel Accords, Basel I developed in 1988 and came into effect in 1992. The aim of Basel I was to require enough capital in banks in avoid of causing systemic problems and to avoid

competitiveness internationally. Because under Basel I banks accumulated capital more than regulatory minimum requirements which had no constraining impact on the risk taking of banks, a new accord, Basel II, was released in 2004. In the Basel system the capital regulations are pro-cyclicality. It's mainly because that it's easy to underestimate risks in good times but overestimate risks in bad times.

However, there is still room for revises for Basel II. Kashyap and Stein (2004) state that Basel II with only a single time-invariant risk curve is suboptimal. It's because from the social planner's view, not only bank defaults should be considered, but also the efficiency of bank lending should be. Hence, it's more complete to have a family of point-in-time risk curves in different macroeconomic conditions. That is, the policy for the capital requirement should tolerate higher probabilities of default when the bank capital is scarce relative to lending opportunities.

In response to the problems of capital regulation found by the late-2000s financial crisis, the Basel Committee revised Basel Accords and developed Basel III in 2010. Blundell- Wignall and Atkinson (2010) review that Basel III has reformed the quality, consistency and transparency of the capital base, enhanced risk coverage, proposed a "backstop" leverage ratio, and dealt with pro-cyclicality through dynamic provisioning based on expected losses.

Slovik and Cournede (2011) estimate medium-term impact of implementing Basel III on GDP growth in the 3 main OECD economies is in the range of -0.05 to -0.15 percentage point per annum. This estimation is under the assumption that there is no response from monetary policy. If considering the effect from monetary policy, a macroeconomic impact of Basel III on the annual GDP growth of -0.05 to -0.15 percentage points could be offset by an average reduction in the monetary policy rates of about 30 to 80 basis points.

2.3 Trade Imbalance

In Krugman's (1979) model of balance-of-payments crises, if a country keeps issuing money or making use of its reserves to finance the fiscal deficit, to some extent the reserves will be exhausted. At that time, it will lead to a sudden collapse of fixed exchange-rate regime, called the balance-of-payments crises. Currency crises will also accompany the balance-of-payments crises when the price level begins rising and the currency gradually depreciates due to the increasing nominal money supply.

Kaminsky and Reinhart (1999) organize that most of the former literature emphasized on the inconsistency between fiscal and monetary policies and the exchange-rate commitment, or on the self-fulfilling expectations and herding behavior in international capital markets. However, seldom literature studied the interaction between banking and currency problems. In their studies for a number of industrial and developing countries, they find that after the liberalization of financial markets across many countries, banking and currency crises become closely linked. Problems in the banking sector often come before a currency crisis. The currency crisis deepens the banking crisis and causes a vicious spiral. Although banking crises often precede balance-of-payments crises, they are not the immediate cause of currency crises. Both of them are preceded by recessions, a worsening of the terms of trade, an overvalued exchange rate, and the rising cost of credit. The crises typically come after a series of weak and deteriorating economic fundamentals. Besides, comparing the crises where banking and currency crises occurred jointly with the crises where banking or currency crises occurred alone, the economic fundamentals are worse in twin crises.

With more countries suffered financial crises, many observers suggested that countries should move to corner solutions, hard pegs-such as currency board, currency

unions, or dollarization, or freely floating exchange rate regimes. Calvo and Reinhart (2002) analyze the data of exchange rates, reserves, and interest rates from 39 countries, including Africa, Asia, Europe, and the Western Hemisphere, to gauge whether there is a tendency that country practice is moving toward corner solutions. They find exchange rates are not really that freely floating in most countries, across regions and levels of development, due to the fact that countries are fear of the possible effects brought by fluctuations, such as an output cost, the combination of lack of credibility. They also found in many emerging markets interest rate policy is replacing foreign exchange intervention as the instrument of smoothing exchange rate fluctuations.

Blanchard and Giavazzi (2002) investigate that the hypothesis that poorer countries should run larger current account deficits and richer countries should run larger current account surpluses is truly reflected in the economies. After they analyze the current account deficits in Portugal and Greece, they find most of the increase in the current account deficits is due to a decrease in saving and less than half of the increase in the current account deficits is due to an increase in investment. The current account deficits are severer in both Portugal and Greece due to the overvalued currency under the same exchange rate in Euro area after they joined the European Monetary Area.

Schmitz and Hagen (2011) examine the current account balances for the EU-15 countries. They find that while the current account of the all Euro area is almost balanced but several member countries have large deficits or surpluses. Besides, the elasticity with respect to per-capita incomes of net capital flows within the Euro area has increased only for the members of the Euro zone. But this increase is not observed neither for flows between the Euro members and the rest of the world nor for flows between the EU countries that stay outside the monetary union and the Euro zone. This is the evidence that the financial integration in the Euro area is increasing, but

meanwhile the European Monetary Union has caused some diversion of capital flows between the member countries and non-member countries.

3 The Model

3.1 Background

The fundamental framework is established from the model in Holmström and Tirole (2011) and Hu (2012). It is assumed that there are two periods in this economy, $t = 0, 1$. Only one representative individual acts neutrally as an entrepreneur (a banker and an inside financier of the bank) and investor (a depositor) on the same time. In time 0, the entrepreneur chooses a level of loan, L, and invests L in the high-tech or low-tech program. The amount of L could be financed by interior funds in the bank, K_0, and the deposits outside, D_0.

$$L = K_0 + D_0.$$

The depositors who deposit D_0 in time 0 will obtain D_1 in time 1, which include D_0 and an additional interest rate, R_f.

$$D_1 = (1 + R_f)D_0.$$

The investment opportunity is worth Z_1 for the entrepreneur, while only Z_0 for the investor. It is assumed that

$$Z_0 < L < Z_1.$$

There will be net present value due to $Z_1 - L > 0$. The investment is not self-financing, because there will be a shortage because the fund that investor can offer is less than the need of investment L, that is, $Z_0 - L < 0$. The entrepreneur can commit a maximum amount of the capital, A, either through the personal fund or the firm to fill up the shortage. The project can only go forward smoothly if and only if when

$$K_0 \geq L - Z_0 > 0$$

In time 1, the entrepreneur could choose to invest by high or low technology. The entrepreneur can obtain return R when the program is successful, but nothing when the program fails. If the entrepreneur chooses the high tech program, he will have the probability of success p_H and the probability of failure $1-p_H$. If the entrepreneur chooses the low tech program, he will have the of success p_L and the probability of failure $1-p_L$. But if investing by low technology, the entrepreneur could gain additional private benefit, B, as private consumption additionally.

$$\Delta p = p_H - p_L > 0.$$

It is assumed that there is no discounting between the periods. In order to guarantee there is no moral hazard problem, the expected return of the investment by low technology is negative and that by high technology is positive. The entrepreneur would rather not to invest than invest by low technology and get negative expected return.

$$p_H R - L > 0 > p_L R - L + B$$

The entrepreneur owns assets K_0 which are liquid. It is assumed that $K_0 < L$, so that the firm needs borrowing at least $L - K_0$ from the outside investor to make the project go forward smoothly. The outside investor demands an interest rate, R_f.

The total expected return per unit invested is $\rho_1 = \rho_H \cdot R$. The pledgeable income per unit invested is $\rho_0 = \rho_H(R - \frac{B}{\Delta p})$. The difference between the total expected return and the pledgeable income is entrepreneur's minimum rent per unit, $\rho_H \frac{B}{\Delta p}$. When investing L, the entrepreneur can gain $\rho_H \frac{B}{\Delta p} \cdot L$.

Besides, it is assumed that

$$0 < \rho_0 < 1 < \rho_1.$$

3.2 Liquidity Shock

In the model of Holmström and Tirole (2011) and Hu (2012), the liquidity shock will happen with probability $1-\rho$ between time 0 and time 1. The investment can be smoothly carried on with probability ρ. The entrepreneur will gain zero return with probability $1-\rho$. The investors are guaranteed by the government that they must can obtain the riskless return with R_f. The liquidity shock ρ unknown at time 0 is distributed as $f(\rho)$.

When the representative individual acts as the entrepreneur, the entrepreneur will want to maximize the minimum rent.

$$\max_{L,\rho^*} \int_0^{\rho^*} (\rho_1 - \rho_0) \cdot L \cdot f(\rho) d\rho$$

$$\text{s.t } \int_0^{\rho^*} (\rho_0 - \rho) \cdot L \cdot f(\rho) d\rho \geq (L - K_0) R_f \equiv D_1$$

The constraint

$$L \cdot \left[F(\rho^*)\rho_0 - \int_0^{\rho^*} \rho\, f(\rho) d\rho \right] = (L - K_0) R_f$$

$$L = \frac{K_0}{k}$$

$$k = \frac{K_0}{L} = 1 + \frac{\int_0^{\rho^*} \rho f(\rho) d\rho - F(\rho^*)\rho_0}{R_f}$$

k is the ratio that the amount of interior asset to total investment. The ratio k is between zero and one, so that

$$-R_f < \int_0^{\rho^*} \rho f(\rho) d\rho - F(\rho^*)\rho_0 = (\rho^* - \rho_0)F(\rho^*) - \int_0^{\rho^*} F(\rho) d\rho < 0$$

$$\frac{\partial k}{\partial \rho^*} = \frac{\rho^* f(\rho^*) - f(\rho^*)\rho_0}{R_f} > 0$$

$$\int_0^{\rho^*}(\rho_1-\rho_0)\cdot L\cdot f(\rho)d\rho=(\rho_1-\rho_0)\frac{K_0}{k}\,F(\rho^*)$$

$$=(\rho_1-\rho_0)\frac{K_0}{1+\frac{\int_0^{\rho^*}\rho f(\rho)d\rho-F(\rho^*)\rho_0}{R_f}}\,F(\rho^*)$$

$$=\frac{(\rho_1-\rho_0)R_f\cdot K_0}{\frac{R_f+\int_0^{\rho^*}\rho\, f(\rho)d\rho}{\mathrm{F}(\rho^*)}-\rho_0}=\frac{(\rho_1-\rho_0)R_f\cdot K_0}{c(\rho^*)-\rho_0}$$

Where

$$c(\rho^*)\equiv\frac{R_f+\int_0^{\rho^*}\rho\, f(\rho)d\rho}{\mathrm{F}(\rho^*)}$$

To choose the optimal ρ^* to minimize $c(\rho^*)$, the first order condition will be

$$\frac{\partial c(\rho^*)}{\partial\rho^*}=\frac{\rho^* f(\rho^*)F(\rho^*)-f(\rho^*)[R_f+\int_0^{\rho^*}\rho\, f(\rho)d\rho]}{[F(\rho^*)]^2}$$

And the F.O.C. can be simplified as

$$R_f=\int_0^{\rho^*}F(\rho)d\rho$$

When the representative individual acts as a representative consumer, he will allocate his savings into the bank deposit by the proportion of μ and the equity shareholding for the bank by the proportion of $1-\mu$ to maximize his utility.

$$\max_{C_0,\mu}U(C_0)+\delta U(E(\widetilde{C_1})-\frac{var(\widetilde{C_1})}{2t})$$

Where $C_0=Y-D_0-K_0$, $D_0=(Y-C_0)\cdot\mu$ and $K_0=(Y-C_0)\cdot(1-\mu)$

$$E(\widetilde{C_1})=D_1+\int_0^{\rho^*}(\rho_1-\rho_0)\,L\cdot f(\rho)d\rho$$

$$=(Y-C_0)\mu R_f+(\rho_1-\rho_0)F(\rho^*)\frac{(Y-C_0)(1-\mu)}{k}$$

$$var(\widetilde{C_1})=\left(\frac{B}{\Delta p}\right)^2\left(1-p_H F(\rho^*)\right)^2 p_H F(\rho^*)\cdot[\frac{(Y-C_0)(1-\mu)}{k}]^2$$

t stands for risk tolerance and equals to $t\equiv-\frac{U'}{C\cdot U''}$.

The first order conditions for C_0 and μ yield

$$U'(C_0) + \delta U'\left(E(\widetilde{C_1}) - \frac{var(\widetilde{C_1})}{2t}\right) \cdot (-R_f) = 0$$

$$R_f + \frac{1-\mu}{t} \cdot (Y - C_0) \cdot \left(\frac{B}{\Delta p}\right)^2 \cdot \frac{\left(1 - p_H F(\rho^*)\right)^2 p_H F(\rho^*)}{k^2} = \frac{\rho_1 - \rho_0}{k} \cdot F(\rho^*)$$

And the indirect value function of the representative individual is

$$V(C_0^*, \mu^*; \rho^*) = \max_{C_0^*, \mu^*} U(C_0^*) + \delta U[(Y - C_0^*)(\frac{R_f(1+\mu^*)}{2} - \frac{(\rho_1 - \rho_0)F(\rho^*)(1-\mu^*)}{2k})]$$

We assume the government will manage the level of bankruptcy threshold and maximize the social utility.

$$\max_{\rho^*} V(C_0^*, \mu^*; \rho^*)$$

After using the envelope theorem and integrating by parts to organize the first order condition of the optimal choice of ρ^*, we can derive the equation that

$$R_f = \int_0^{\rho^*} F(\rho) d\rho$$

Let $Y = h(R_f)$. And then

$$dY = h' \cdot dR_f,\ dR_f = \frac{dY}{h'}$$

Due to $dR_f = F(\rho^*)d\rho^*$, the impact of GDP on the bankruptcy threshold can be presented as

$$d\rho^* = \frac{1}{F(\rho^*)} \cdot dR_f = \frac{dY}{h' \cdot F(\rho^*)}$$

And the result of the total differential of equity-loan ratio k can be organized like:

$$dk = \frac{(\rho^* - \rho_0)f(\rho^*)R_f d\rho^* - [(\rho^* - \rho_0)F(\rho^*) - \int_0^{\rho^*} F(\rho)d\rho] \cdot dR_f}{{R_f}^2}$$

$$= \frac{(\rho^* - \rho_0)f(\rho^*)R_f \frac{dY}{h' \cdot F(\rho^*)} - [(\rho^* - \rho_0)F(\rho^*) - \int_0^{\rho^*} F(\rho)d\rho] \cdot \frac{dY}{h'}}{{R_f}^2}$$

$$= \left\{ \frac{(\rho^* - \rho_0)f(\rho^*)}{R_f \cdot h' \cdot F(\rho^*)} - \frac{[(\rho^* - \rho_0)F(\rho^*) - \int_0^{\rho^*} F(\rho)d\rho]}{h' \cdot {R_f}^2} \right\} \cdot dY$$

Or $\frac{dk}{dY} = \left\{ \frac{(\rho^* - \rho_0)f(\rho^*)}{R_f \cdot F(\rho^*)} - \frac{[(\rho^* - \rho_0)F(\rho^*) - \int_0^{\rho^*} F(\rho)d\rho]}{{R_f}^2} \right\} \cdot \frac{1}{h'}$

Due to $[(\rho^* - \rho_0)F(\rho^*) - \int_0^{\rho^*} F(\rho)d\rho] < 0$ and $(\rho^* - \rho_0) > 0$, so $\frac{dk}{dY} \cdot h' > 0$.

The relation between dk and dY depends on whether h' is positive or negative. If h' is positive, and then $\frac{dk}{dY}$ should be positive. If h' is negative, and then $\frac{dk}{dY}$ should also be negative.

3.3 Balance of Payment

Considering the national gross saving and international investment, we put the balance of payment into the model. It is assumed that the interest rate (r) here is the same with R_f. First, we start from the national account. The national output is composed of private consumption (C), investment (I), government consumption expenditure (G_c), the export (X) and the import (M).

$$Y = C(Y) + I(r) + G_c + \big(X - M(Y)\big)$$

If it turns to another side, the national output can be presented as the aggregate of private consumption (C), taxes (T) and saving (S).

$$Y = C(Y) + T + S(Y, r)$$

The saving (S) relations can be obtained by combining the two equations.

$$S(Y,r) = I(r) + (G_c - T) + \big(X - M(Y)\big) \quad (1)$$

The real money supply (m^S) is represented as the function of GDP (Y) and interest rate (r). In this country, the government issues government bonds (B^S) to finances its deficits, government expenditure (G_e) minus taxes (T).

$$m^S = \frac{\mathrm{M}^S}{P} = L(Y,r) \quad (2)$$

$$G_e - T = B^S \quad (3)$$

Government consumption expenditure (G_c) is only part of government expenditure (G_e), so government expenditure is divided as two parts, government consumption expenditure (G_c) and others (G_o).

$$G_e = G_c + G_o$$

Current account (CA) is also considered in this model and presented as the sum of net trade, factor income (F) (earnings on foreign investments minus payments made to foreign investors), and transfer (TR) by definition.

$$CA(Y) = \big(X - M(Y)\big) + F + TR \quad (4)$$

From the Capital and Financial account side,

Current account (CA) + Capital account (KA) + Financial account(FA) + errors = 0.

$CA = \Delta B^f = \big(B_t^f - B_{t-1}^f\big)$=Net Foreign Financial Assets Gain+ Net Reserves Gain (5)

$\Delta B^f = \big(B_t^f - B_{t-1}^f\big)$= Net outflow amount of capital and financial account

Assume that the net flow of international capital is affected by the factor $\hat{r}$, which equals $(r - r^* - \frac{F-S}{S})$. If the interest rate parity theory is hold, then there is no arbitrage opportunity and $\hat{r} = r - r^* - \frac{F-S}{S} = 0$.

By substituting $(B^S - G_o)$ and $(\Delta B^f(r - r^* - \frac{F-S}{S}) - (F + TR))$ for $(G_c - T)$ and $\big(X - M(Y)\big)$ respectively, the saving equation will become

$$S(Y,r) = I(r) + (B^S - G_o) + (\Delta B^f(r - r^* - \frac{F-S}{S}) - (F + TR))$$

After taking a total differential in the equation (5) and (2), the equations will become

$$\begin{cases} S_y dy + (S_r - I_r - B^f_{\hat{r}})dr = d(B^S - G_o) - B^f_{\hat{r}}(dr^* + d\frac{F-S}{S}) - (dF + dTR) & (6) \\ L_y dy + L_r dr = d\mathrm{m}^{\mathrm{S}} & (7) \end{cases}$$

Combining equation (6) and (7), dY can be organized by equation (7) like

$$dY = \frac{dm^S - L_r dr}{L_y}. \quad (8)$$

Put equation (8) into equation (6), dr can be presented as

$$S_y\left(\frac{dm^S - L_r dr}{L_y}\right) + (S_r - I_r - B^f_{\hat{r}})dr = d(B^S - G_o) - B^f_{\hat{r}}(dr^* + d\frac{F-S}{S}) - (dF + dTR)$$

$$dr = \frac{d(B^S - G_o) - B^f_{\hat{r}}(dr^* + d\frac{F-S}{S}) - (dF + dTR) - \frac{S_y}{L_y}dm^S}{S_r - I_r - B^f_{\hat{r}} - \frac{S_y L_r}{L_y}} \quad (9)$$

After substituting equation (8) and (9) for $h' = \frac{dY}{dR_f}$, we can derive $h'(ka)$, which we call the interest rate sensitivity of output here.

$$h'(ka) = \frac{dY}{dR_f} = \frac{dY}{dr} = \frac{dm^S - L_r dr}{L_y dr}$$

$$= \frac{\left(S_r - I_r - B^f_{\hat{r}} - \frac{S_y L_r}{L_y}\right)dm^S - L_r\left(d(B^S - G_o) - B^f_{\hat{r}}\left(dr^* + d\frac{F-S}{S}\right) - (dF + dTR) - \frac{S_y}{L_y}dm^S\right)}{L_y\left(d(B^S - G_o) - B^f_{\hat{r}}\left(dr^* + d\frac{F-S}{S}\right) - (dF + dTR)\right) - S_y dm^S}$$

$$= \frac{\left(S_r - I_r - B^f_{\hat{r}}\right)dm^S - L_r(d(B^S - G_o) - B^f_{\hat{r}}(dr^* + d\frac{F-S}{S}) - (dF + dTR))}{L_y(d(B^S - G_o) - B^f_{\hat{r}}(dr^* + d\frac{F-S}{S}) - (dF + dTR)) - S_y dm^S} \quad (10)$$

Thus, $\frac{dk}{dY}$ can be shown by $h'(ka)$.

$$\frac{dk}{dY} = \underbrace{\left(\frac{(\rho^* - \rho_0)f(\rho^*)}{R_f \cdot F(\rho^*)} - \frac{[(\rho^* - \rho_0)F(\rho^*) - \int_0^{\rho^*} F(\rho)d\rho]}{{R_f}^2}\right)}_{\text{constant}} \cdot \frac{1}{h'(ka)} =$$

$$\left(\frac{(\rho^*-\rho_0)f(\rho^*)}{R_f\cdot F(\rho^*)}-\frac{[(\rho^*-\rho_0)F(\rho^*)-\int_0^{\rho^*}F(\rho)d\rho]}{{R_f}^2}\right)\cdot\left(\frac{L_y\left[dB^S-dG_o-B_{\hat{r}}^f\left(dr^*+d\frac{F-S}{S}\right)-(dF+dTR)\right]-S_y dm^S}{\left(S_r-I_r-B_{\hat{r}}^f\right)dm^S-L_r\left[dB^S-dG_o-B_{\hat{r}}^f\left(dr^*+d\frac{F-S}{S}\right)-(dF+dTR)\right]}\right) \quad (11)$$

Thus, $\frac{dk}{dY}$ can be measured by the interest rate sensitivity of output $(h'(ka))$, which will be estimated later.

4 The Empirical Model

In this part, we put the collected data into the previous model first and obtain the values of the interest rate sensitivity of output, $h'(ka)$. After comparing the values of $h'(ka)$ in different countries, section 4.4 sets up a panel data regression model to consider what variables might affect the interest rate sensitivity of output. In the end of this section, the result of regression will be used to estimates the out of sample values of $h'(ka)$ in 2011 Q4 and try inferring the appropriate capital requirement policies for the countries in EU-17 individually according to their different macroeconomic environments.

4.1 Data

All the data is collected mainly from the Datastream, Eurostat Statistics Database and European Central Bank (ECB) Database. OECD iLibrary and the database of central banks in the respective countries are also the sources of a part of data. The range of data is within the 17 countries in the European Monetary Union, and the period of data is from 2005 Q1 to 2011 Q4. The part of calculation and regression in section 4.3 and section 4.5 is composed of data from 2005 Q2 to 2011 Q3, and the part of estimation in section 4.6 also includes the data in 2011 Q4. The detailed description of data is listed in Table 6 and Table 7 in Appendix A.

4.2 Statistics of Economics Environment in EU-17

4.2.1 Current Account

Observing the current account deficits in individual EU-17 from 2005 Q1 to 2011 Q4 in

Figure 1, these countries can be classified into four kinds in general. Current account to GDP ratio in Germany, Luxembourg, Netherlands, Austria, and Finland is the first kind of classification. Current accounts in these 5 countries are positive most of the time. Current accounts in Ireland, France, Slovenia and Slovakia are close to zero in recent several quarters. The values in Belgium, Ireland, Cyprus and Malta are volatile. Sometimes they are positive and sometimes negative largely. The last kind of classification is for Greece, Spain, Italy, and Portugal, which keep negative values all the time. They happen to be the nations with or possibly with debt crises.

From the graphs, it can be seen that economy in Ireland is not that pessimistic. Although its values are often negative, its deficit is becoming smaller and has a tendency towards zero.

4.2.2 Growth Rate of Output

In Figure 2, the GDP growth rates in EU-17 have similar trends, with declining growth rates from 2005 Q1, experiencing the seriously decline during the financial crisis around 2008 and 2009, and recovering gradually. However, most of the countries have a downward direction again in the recent years. Although having similar trends, the growth ratios of these countries can be organized into four groups by their degrees of growth. Greece, Spain, Italy, and Portugal are in the first group, and their growth levels are relatively lowest compared to other countries in most periods. Cyprus, Malta, Netherlands, and Slovenia are in the second relatively lowest group. Ireland, Belgium, Germany, Estonia, and Austria are in the second relatively highest group. The nations with highest levels of growth are France, Luxembourg, Slovakia, and Finland, that have positive or zero growth rates in 2011 Q4.

4.2.3 Debt to GDP Ratio

It is observed that in Figure 3, most of the accumulative public debt ratios in EU-17 have positive trends of curves from 2005 Q1 to 2011 Q4. These countries can be categorized into three groups by the debt ratios, which are more than 90%, between 70%-90%, and smaller than 70% in 2011 Q4. Greece, Italy, Ireland, Portugal, and Belgium are in the relatively higher level of debt to GDP ratios, while Spain is in the relatively lower level of debt to GDP ratios. The levels of debt ratios in these countries reflected the countries with higher debt ratios are more vulnerable and prone to involved in the European debt crisis.

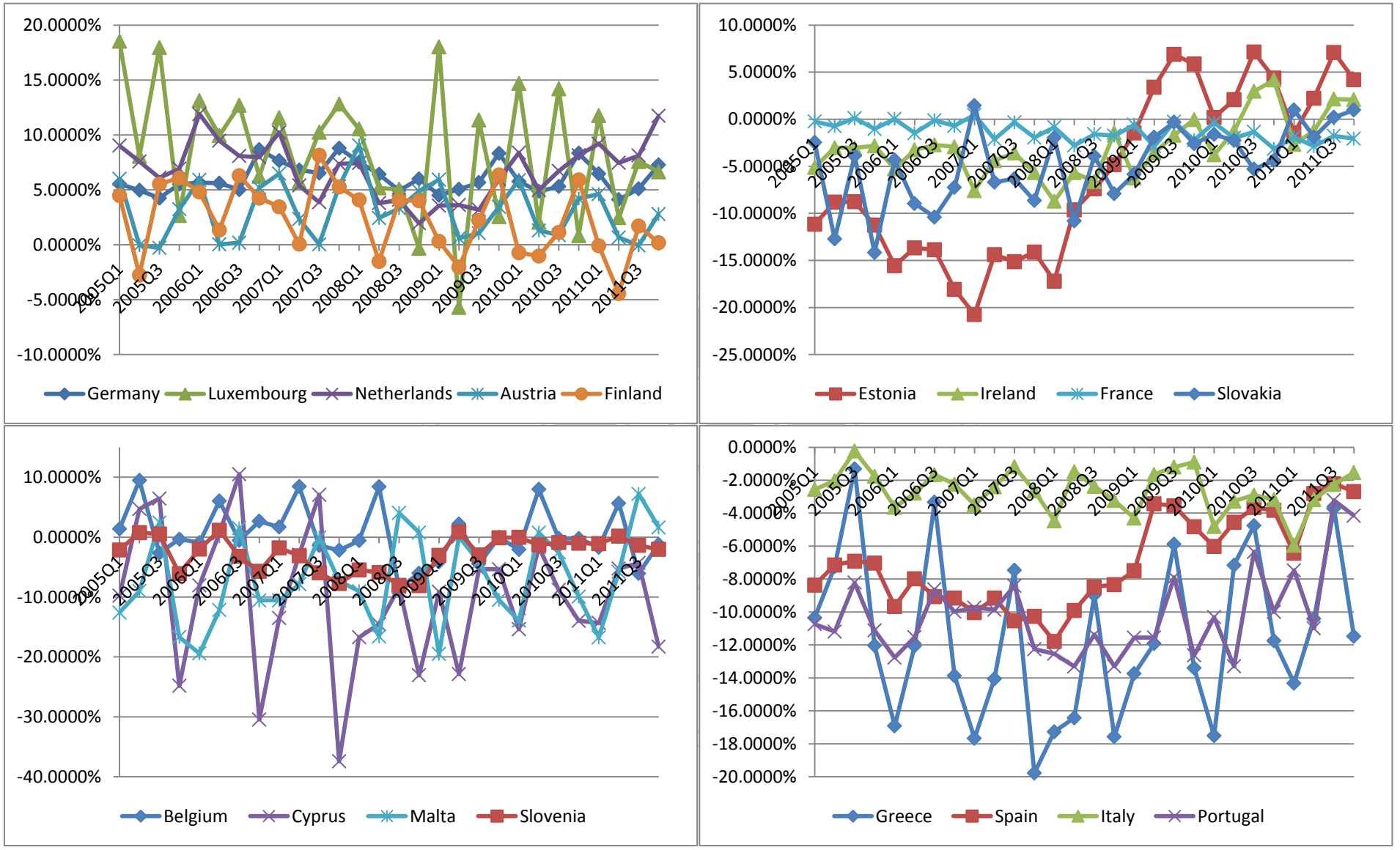


Fig 1. Current Account to GDP Ratios in EU-17 from 2005 Q1 to 2011 Q4 (Units: %)

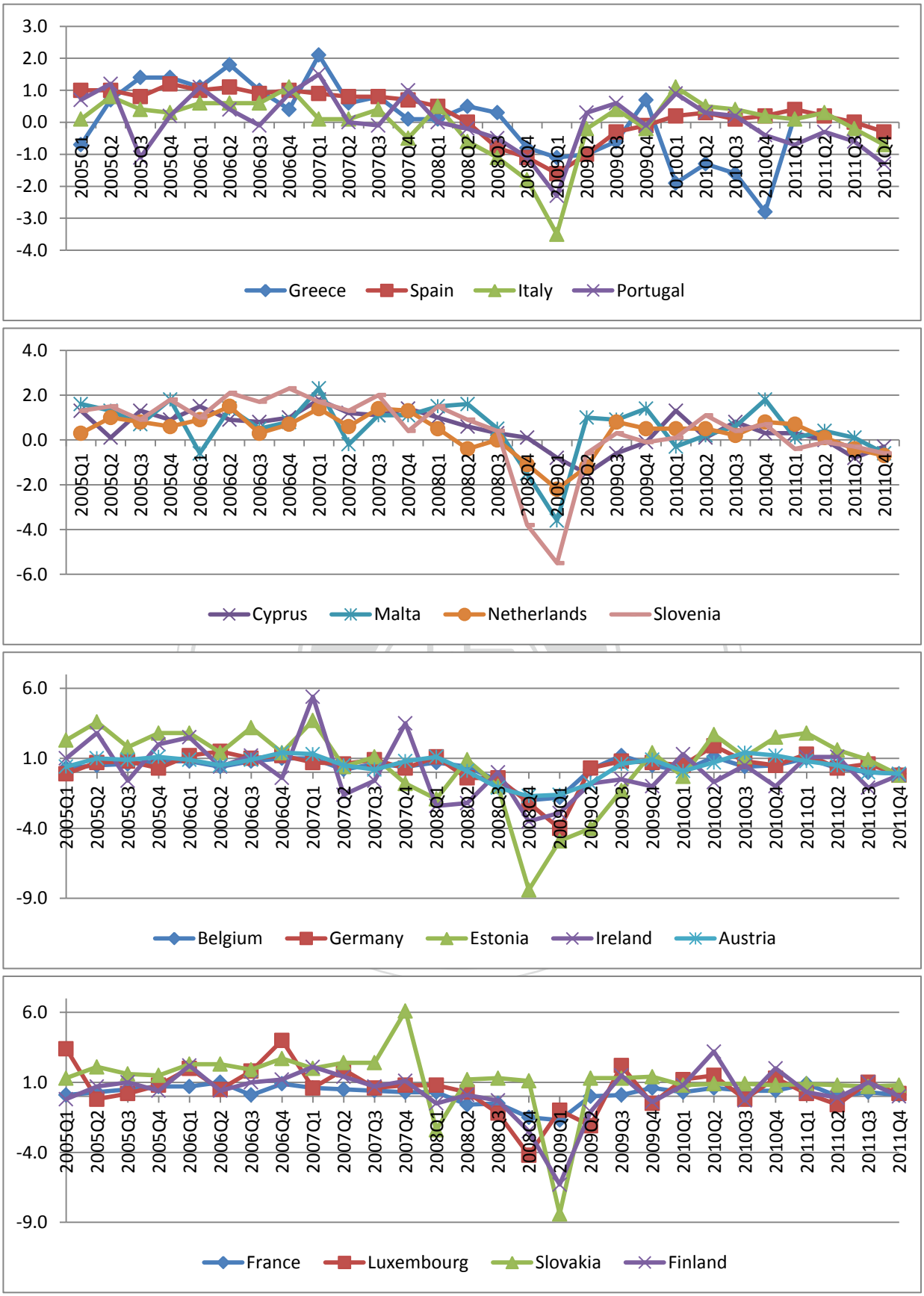


Fig 2. GDP Growth Rates in EU-17 from 2005 Q1 to 2011 Q4 (Units: %)

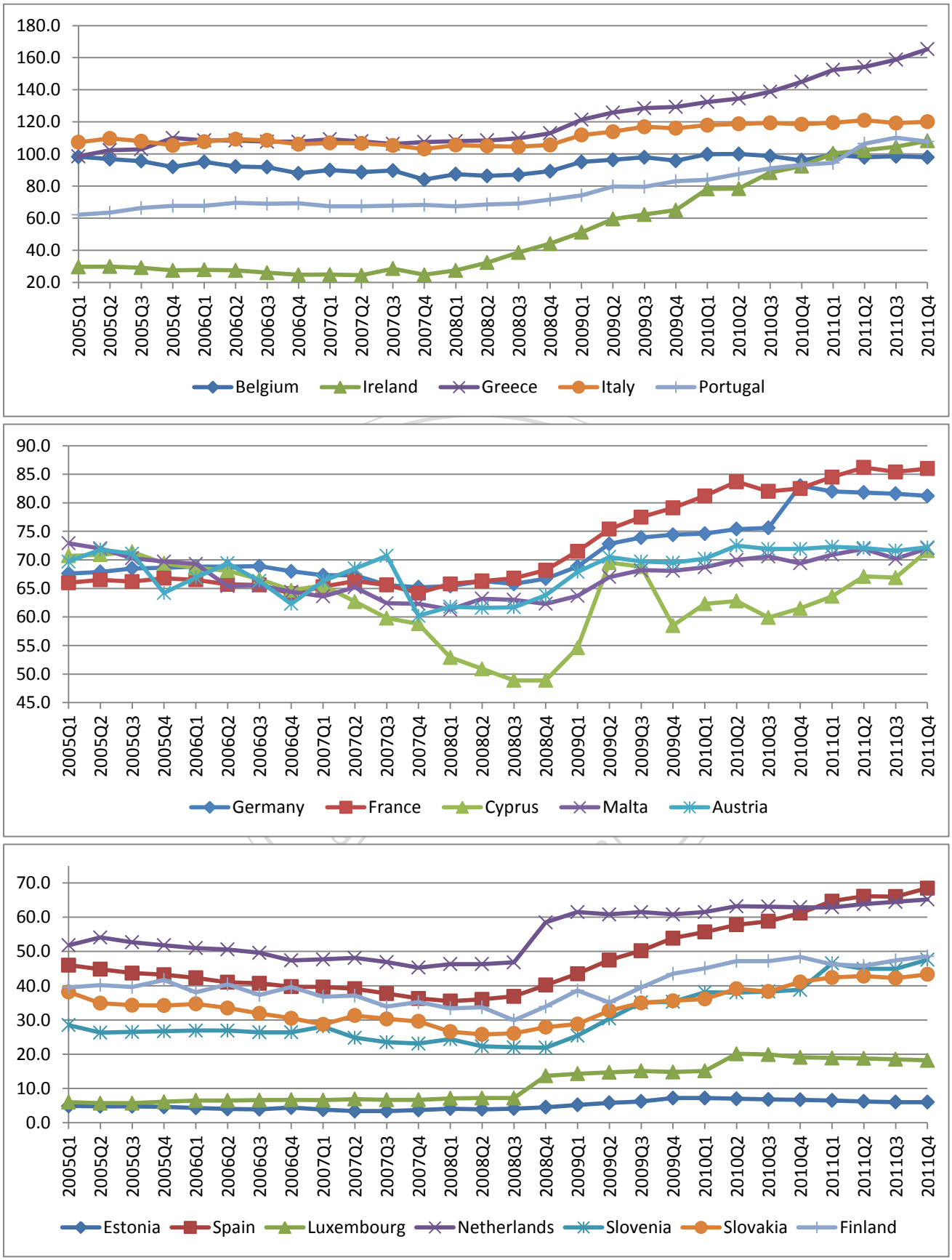


Fig 3: Debt to GDP Ratios in EU-17 from 2005 Q1 to 2011 Q4 (Units: %)

4.3 Comparison of the Interest Rate Sensitivity of Output between EU-17

Because the adjustment of capital requirement to the per unit change of GDP, $\frac{dk}{dY}$, is affected by $h'(ka)$, the interest rate sensitivity of output, this paper will evaluate the change of capital to per unit change of GDP through the interest rate sensitivity of output.

The interest rate sensitivity of output of EU-17 can be calculated by putting the organized data into equation (10). After calculated, $h'(ka)$ in different countries can be sorted into five kinds of classification according to their values in Table 1 and are graphed in Figure 4 and 5. The detailed values are in Table 8. Large parts of $h'(ka)$ in EU-17 are positive. Especially, $h'(ka)$ are all positive in Italy, France, Slovakia, and Slovenia. However, $h'(ka)$ in Cyprus, Malta, and Luxembourg are negative in general and all negative in Belgium. Italy and Slovenia are relatively least fluctuated within the positive classification, and Cyprus and Malta are relatively least fluctuated within the negative classification.

Based on the former equation in section 3.3, we know that the adjustment of capital requirement to per unit change of GDP $(\frac{dk}{dY})$ will have the same direction with the interest rate sensitivity of output. Thus, the adjustments of capital requirement to the change of GDP in most of countries are positive, and the ratios in Belgium, Cyprus, Malta, and Luxembourg are negative most of the time.

When the interest rate sensitivity of output is positive, this means that the capital requirement should be higher when one economy is growing and lower when one economy is declining. This counter-cyclical capital policy is appropriate for countries

like Italy, France, Slovakia, and Slovenia. The capital requirement should be in the same direction of $h'(ka)$ in most countries most of the time.

On the other side, the capital requirement should be pro-cyclical in Belgium, Cyprus, Malta, and Luxembourg most of the time. When there is a positive growth ratio in one country, the capital requirement should be decreased. Conversely, the capital requirement should be stricter during the period of negative growth ratio.

The interest rate sensitivity of output is negative in more countries during the period of 2008 Q3 and 2008 Q4, the financial crisis period. This can be considered that the pro-cyclical capital requirement is appropriate for more countries during the period of recession.

Table 1. The Classification of the Interest Rate Sensitivity of Output in EU-17

Classification	Nations
All Positive	Italy, France, Slovakia, Slovenia
positive usually (1-4 negative)	Greece, Austria, Spain, Ireland, Finland, Germany
Often positive (5-10 negative)	Portugal, Netherlands, Estonia
Negative usually	Cyprus, Malta, Luxembourg
All negative	Belgium

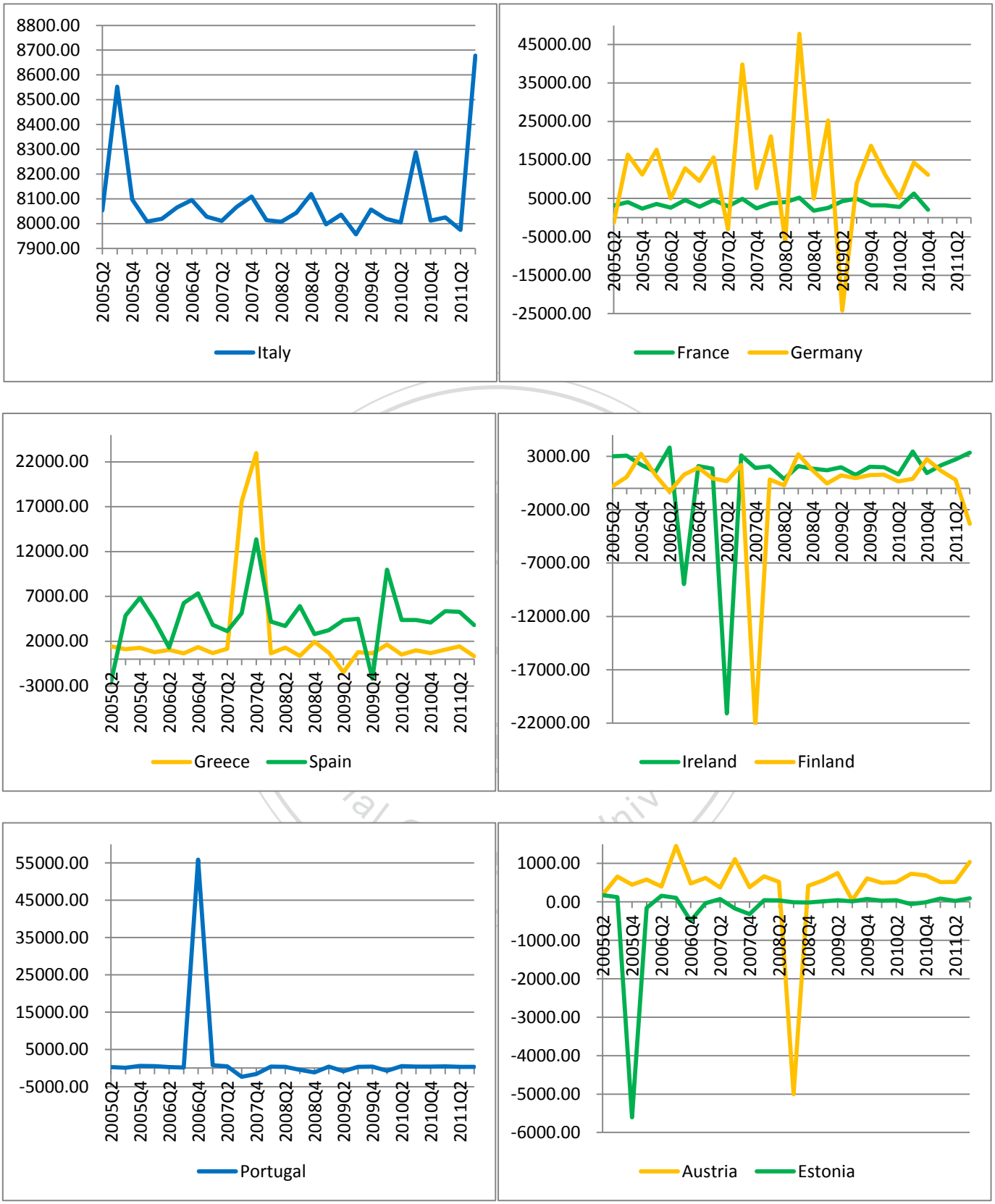


Fig 4. The Interest Rate Sensitivity of Output in EU-17 from 2005 Q2 to 2011 Q3

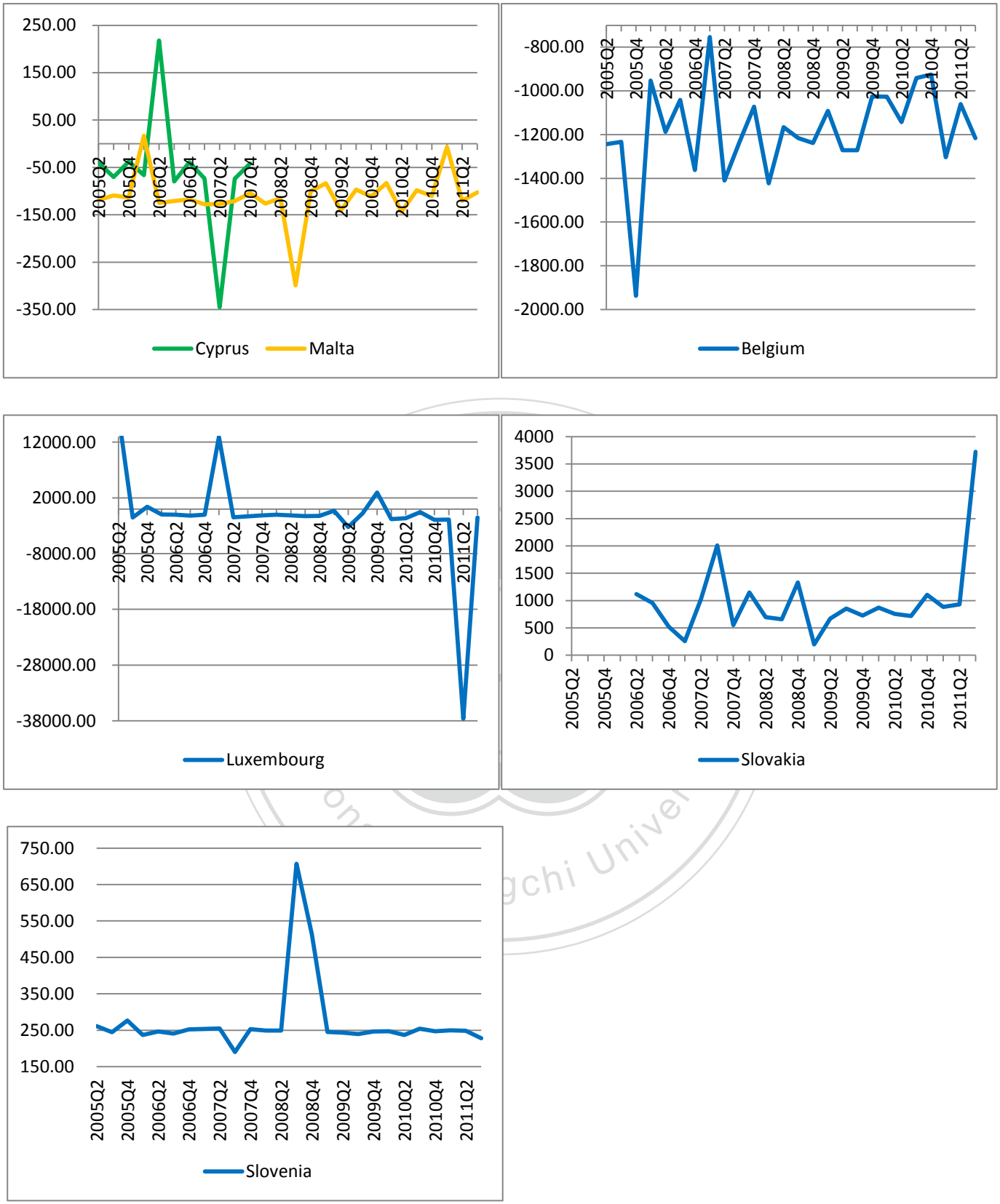


Fig 5. The Interest Rate Sensitivity of Output in EU-17 from 2005 Q2 to 2011 Q3 (continued)

4.4 The Method of Regression

In this model, $h'(ka)$ of EU-17 are calculated from 2005 Q2 to 2011 Q3. The model uses the regression of panel least squares to analyze how $h'(ka)$ change across different countries and different periods on the same time.

Before carrying out the regression of panel data, there is a unit root test for the considered variables in the regression in section 4.4.1.

4.4.1 Unit Root Test

There are six variables which need a unit rood test before we formally run the regression. The result of the tests in Table 2 reveals that the debt to GDP ratio is un-stationary and is in the situation of unit root. The problem can be avoided by using the first difference of these three variables as the new variables in the latter regression model, because the first difference of debt to GDP ratio is stationary after they changed their original levels into first difference. The result of the test with first difference is in Table 3.

Table 2. Panel Unit Root Tests on the Original Data

Period: from 2005 Q2 to 2011 Q3										
Null Hypothesis : Unit root (assumes individual unit root process)										
	DEBT/GDP		Public Ratio		Money supply elasticity of output		Government expenditure elasticity of output		Trade Openness	
	Statistics	P-value	Statistics	P-value	Statistics	P-value	Statistics	P-value	Statistics	P-value
Im, Pesaran and Shin W-stat	5.9643	1.0000	-13.7797	0.0000	-16.3643	0.0000	-9.05235	0.0000	-3.11017	0.0009
ADF - Fisher Chi-square	13.6923	0.9992	231.007	0.0000	218.574	0.0000	143.632	0.0000	65.3137	0.0010
PP - Fisher Chi-square	9.9291	1.0000	278.715	0.0000	239.358	0.0000	308.523	0.0000	47.274	0.0647

Table 3. Panel Unit Root Tests on the Variables with First Difference

Period: from 2005 Q2 to 2011 Q3			
Null: Unit root (assumes individual unit root process)			
D(DEBT/GDP)	Im, Pesaran and Shin W-stat	ADF - Fisher Chi-square	PP - Fisher Chi-square
Statistics	-5.7948	91.6443	89.4419
P-value	0.0000	0.0000	0.0000

4.5 Variables, Explanations, and Results of Regression

To find the variables that possibly affect the value of $h'(ka)$, this model considers six variables, including debt to GDP ratio, fiscal policy ratio, the elasticity of *IS* curve, the elasticity of *LM* curve, trade openness, money supply elasticity of output.

$$h'(ka) = C(1) + C(2) * d\left(\frac{Debt}{GDP}\right) + C(3) * Fiscal\ policy\ ratio + C(4) * Money\ supply\ elasticity\ of\ output + C(5) * Government\ expenditure\ elasticity\ of\ output + C(6) * Trade\ Openness$$

4.5.1 Variables

a. Debt to GDP ratio[6]:

The accumulated public debt relative to GDP ratio.

b. Fiscal policy ratio[7]:

The ratio that calculates how much weight the fiscal policy stands for in total effects of fiscal and monetary policy.

c. Money supply elasticity of output:

The elasticity to calculate how much percent of GDP will vary when money supply change one percent.

d. Government expenditure elasticity of output:

---

[6] $\frac{\text{Debt}}{\text{GDP}}$ with first difference.

[7] $\frac{|G_e|}{|G_e|+|\frac{dm}{Ly}|}$. The effect of monetary policy is estimated from *LM* curve.

$m^S = L(Y, r)$, $L_y dy + L_r dr = dm^S$, $dy = \frac{dm^S - L_r dr}{L_y}$. Considering dr is zero, so the move in $dy = \frac{dm^S}{L_y}$.

The elasticity of how much percent of GDP will be affected when the government expenditure changes 1%.

e. Trade openness[8]**:**

Trade openness is the sum of export and import to GDP ratio. This ratio represents the level of openness to accept the international trades in a country.

4.5.2 Results and Explanation

The outcome of the panel data is listed in Table 4.

Table 4. The Result of Panel Data Regression

Dependent Variable: $h'(ka)$				
Method: Panel Least Squares				
Sample: 2005 Q2 – 2011 Q3				
Cross-sections included: 17				
Total panel (unbalanced) observations: 390				
Variables	Coefficient	Std. Error	t-Statistic	Prob.
Intercept	8159.225	1867.161	4.369856	0.0000***
Debt to GDP ratio	-77.9641	163.283	-0.47748	0.6333
Fiscal policy ratio	-2674.61	1797.277	-1.48815	0.1375
Money supply elasticity of output	6.672881	16.6188	0.401526	0.6883
Government expenditure elasticity of output	-282.46	341.288	-0.82763	0.4084
Trade openness	-37.664	7.470726	-5.04155	0.0000***

R-squared	0.071263	Adjusted R-squared	0.05917
F-statistic	5.892967	Prob(F-statistic)	0.000029
Mean dependent var	1740.273	S.D. dependent var	8081.261

***indicate coefficient estimates significantly different from zero at the 1% level.

a. Debt to GDP ratio

When one country is with higher ratio, its interest rate sensitivity of output is smaller. Hence, the adjustment of capital requirement to per unit change of GDP $(\frac{dk}{dY})$ should be larger.

[8] Trade openness is calculated by $\frac{(X+M)}{GDP}$.

b. Fiscal policy ratio

When the fiscal policy ratio is higher or the monetary policy ratio is lower, its interest rate sensitivity of output is smaller. Hence, the adjustment of capital requirement to per unit change of GDP $(\frac{dk}{dY})$ should be larger.

c. Money supply elasticity of output

If the money supply elasticity of output is larger, its interest rate sensitivity of output will be larger and the adjustment of capital requirement to per unit change of GDP $(\frac{dk}{dY})$ should be smaller.

d. Government expenditure elasticity of output

If the government expenditure elasticity of output is larger, its interest rate sensitivity of output is smaller. If the interest rate sensitivity of output is smaller, the adjustment of capital requirement to per unit change of GDP $(\frac{dk}{dY})$ should be larger.

f. Trade openness

When one country is more open-minded to accept the international trade, its interest rate sensitivity of output will be smaller. That is, the adjustment of capital requirement to per unit change of GDP $(\frac{dk}{dY})$ should be larger.

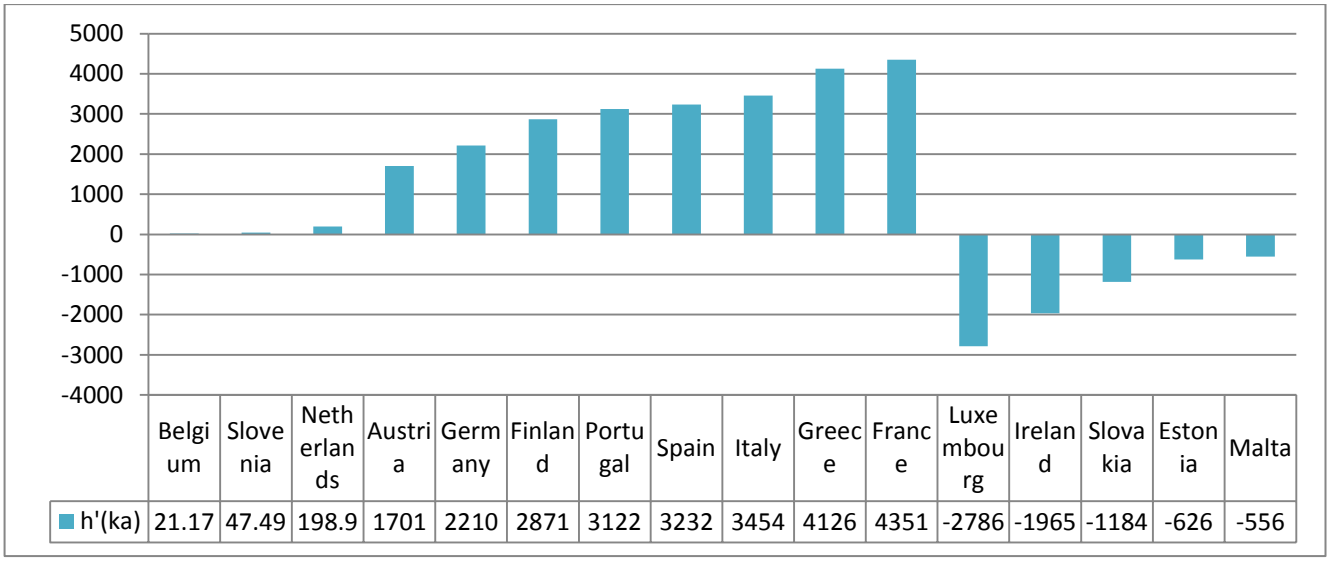
4.6 Estimation and Policy Suggestion

To estimate the adjustment of capital requirement to per unit change of GDP, $h'(ka)$, in 2012 Q4, the regression in section 4.5 is used to calculate the values of $\widehat{h'(ka)}$. Most of the $\widehat{h'(ka)}$, which are graphed in Figure 6, are positive in 2012 Q4. Only $\widehat{h'(ka)}$ in Luxembourg, Ireland, Slovakia, Estonia, and Malta are negative. Therefore, it can be suggested that policy in those nations with debt crises should be

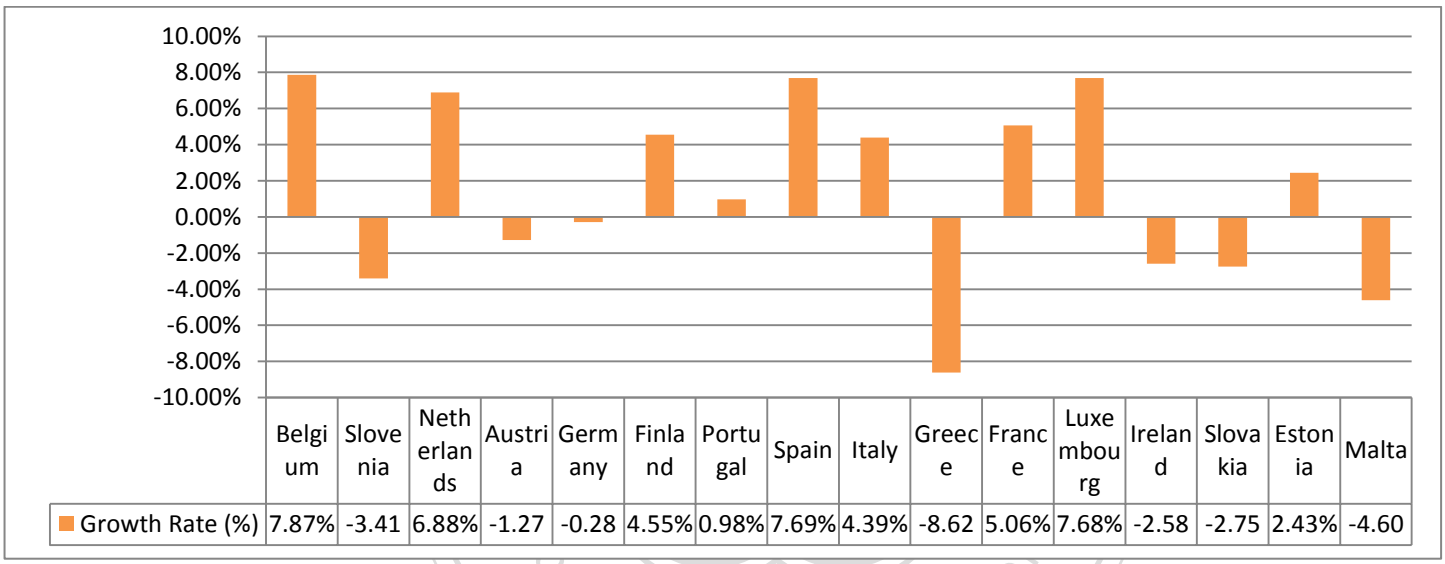
different. Adjust of capital requirement should be counter-cyclical in Italy, Greece, Spain, and Portugal, but pro-cyclical in Ireland during 2011 Q4.[9]

During 2011 Q4, the change of capital requirement to the change of GDP is both positive and largest in Belgium. It is becoming smaller in Slovenia, Netherlands, Austria, Germany, Finland, Portugal, Spain, Italy, and Greece. The positive and smallest one is the value of France. In the pro-cyclical countries, the change of capital requirement to the change of GDP is smallest in Luxembourg, then becoming larger in Ireland, Slovakia, Estonia, and Malta.

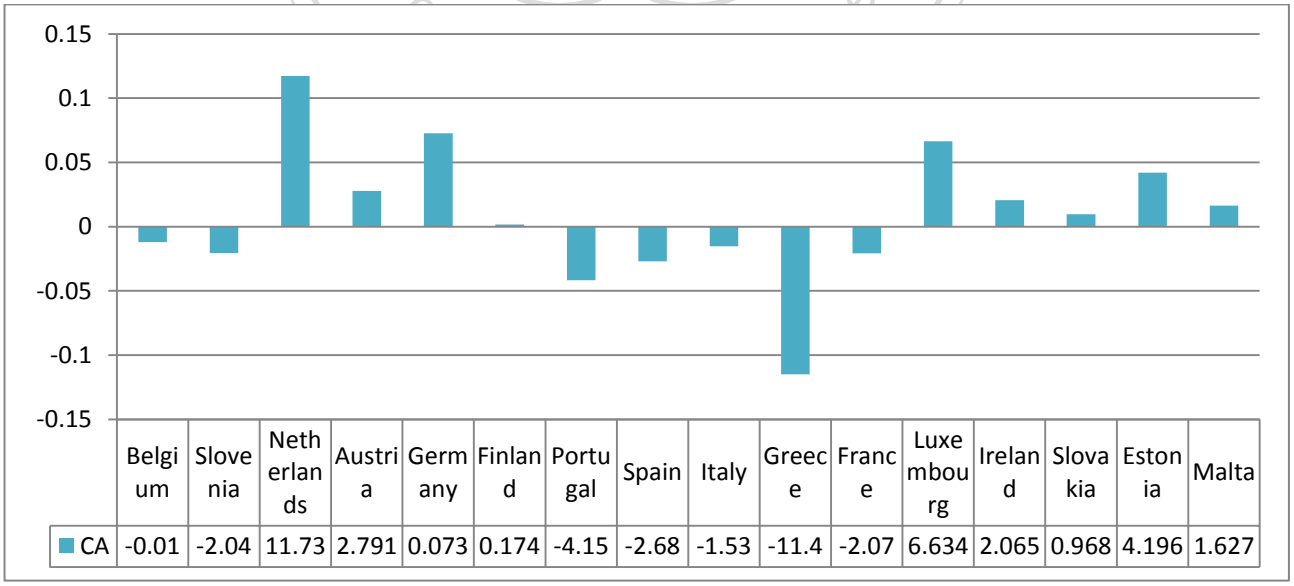
[9] Cyprus is not included in this estimation because some data is still not available in 2011 Q4.



	Belgium	Slovenia	Netherlands	Austria	Germany	Finland	Portugal	Spain	Italy	Greece	France	Luxembourg	Ireland	Slovakia	Estonia	Malta
h'(ka)	21.17	47.49	198.9	1701	2210	2871	3122	3232	3454	4126	4351	-2786	-1965	-1184	-626	-556



	Belgium	Slovenia	Netherlands	Austria	Germany	Finland	Portugal	Spain	Italy	Greece	France	Luxembourg	Ireland	Slovakia	Estonia	Malta
Growth Rate (%)	7.87%	-3.41	6.88%	-1.27	-0.28	4.55%	0.98%	7.69%	4.39%	-8.62	5.06%	7.68%	-2.58	-2.75	2.43%	-4.60



	Belgium	Slovenia	Netherlands	Austria	Germany	Finland	Portugal	Spain	Italy	Greece	France	Luxembourg	Ireland	Slovakia	Estonia	Malta
CA	-0.01	-2.04	11.73	2.791	0.073	0.174	-4.15	-2.68	-1.53	-11.4	-2.07	6.634	2.065	0.968	4.196	1.627

Fig 6. Estimation of the Interest Rate Sensitivity of Output, Growth Rate (%), and Current Account to GDP Ratio (%) in EU-17 in 2011 Q4

Observing the relationship between $h'(ka)$ and current account, all the five pro-cyclicality countries have positive values of current account. However, there are positive or negative values of current account in counter-cyclicality countries.

Combining the estimation of $h'(ka)$ and Growth rate, the suggestion of policies for capital requirement in EU-17 are listed in the Table 5.

Table 5. Suggestion of Policies for Capital Requirement in 2011 Q4

	Positive GDP growth rate in 2011 Q4	Negative GDP growth rate in 2011 Q4
Counter-cyclicality policy for capital	Raise the adjustment of capital requirement in Italy, Spain, Portugal, Belgium, Netherlands, Finland, and France.	Lower the adjustment of capital requirement in Greece, Germany, Slovenia, and Austria.
Pro-cyclicality policy for capital	Lower the adjustment of capital requirement in Luxembourg and Estonia.	Raise the adjustment of capital requirement in Ireland, Slovakia, and Malta.

5 Conclusion

The results of the model show that the standard of capital requirement should not be comprehensive across EU-17. The adjustment of capital requirement should be considered thoroughly for the various macroeconomic environments in different countries and during different periods.

For pro-cyclicality countries, when the economy is in prosperity, the capital requirement should be decreased. However, the capital requirement should be stricter during the period of economic recession. For the counter-cyclicality countries, the situations will be converse. Furthermore, if we have collected the updated data, then we could obtain the estimation in every period by the established model. For example, the regression model suggests that in 2011 Q4 the capital requirement should be pro-cyclical in Luxembourg, Ireland, Slovakia, Estonia, and Malta; counter-cyclical in other EU-17 (except for the Cyprus). For those countries involved in the debt crisis, Italy, Spain, Portugal, and Ireland should raise the adjustment of capital requirement, and Greece should lower the adjustment of capital requirement.

Appendix A.

Table 6. The Descriptions of Data

Variable	Description	Unit	Source
Y	Gross domestic product	Millions of Euro	Datastream
C	Final consumption expenditure of households		Datastream
I	Gross fixed capital formation		Datastream
X	Exports of goods and services		Datastream
M	Imports of goods and services		Datastream
G(consumption)	Final consumption expenditure of general government		Eurostat
G(expenditure)	Total general government expenditure		Eurostat
M^S	Money supply 2		Datastream
CPI	Harmonized European Union Basis (2005=100)	Index	Datastream
R	Interbank interest rate- 3 month (if not available, treasury or deposit rate are substituted for interbank)	Percentage	Datastream/ Eurostat/ OECD iLibrary
T	Total tax revenue of the general government	Millions of Euro	ECB
S	Gross saving (substitute: Net saving in Luxembourg and Malta)		Eurostat
CA	Current account (net)		Eurostat
F	Current account, Income (net)		Eurostat
TR	Current account, Current transfers (net)		Eurostat

Table 7. The Descriptions of Interest Rates (unit: percentage)

Nation	Description	Source
Austria	OE INTERBANK OFFERED RATE: THREE MONTH	Datastream
Belgium	BG THREE MONTH INTERBANK OFFERED RATE (EP)	Datastream
France	FR PIBOR / EURIBOR - 3-MONTH (MTH.AVG.)	Datastream
Germany	BD FIBOR - 3 MONTH (MTH.AVG.)	Datastream
Finland	FN HELIBOR - 3 MONTH (MTH.AVG.)	Datastream
Netherlands	NL INTERBANK THREE MONTH: OFFERED RATE (EP)	Datastream
Greece	GR THREE MONTH INTERBANK RATE (EP)	Datastream
Ireland	IR INTERBANK OFFERED RATE - 3 MONTH (EP)	Datastream
Italy	IT INTERBANK DEPOSIT RATE-AVERAGE ON 3-MONTHS DEPOSITS	Datastream
Spain	ES INTERBANK RATE - 3 MONTH (WEIGHTED AVERAGE, EP)	Datastream
Portugal	PT LISBON INTERBANK OFFER RATE - 3 MONTH (EP)	Datastream
Cyprus	INTERBANK 1-6 MONTH INTEREST RATE	Central Bank of Cyprus
Estonia	TALIBOR Interbank- 3 month	Central Bank of Estonia
Luxembourg	MFI interest rates - Deposits	Eurostat
Malta	MA TREASURY BILL RATE - 3 MONTH	Datastream
Slovakia	Interbank rate-3 month	OECD iLibrary
Slovenia	SJ TREASURY BILL RATE - 3 MONTH (EP)	Datastream

Table 8. The Results of Simple Regressions

Nation	Results	C_{yd}	L_r	I_r	M_y	L_y	S_y	S_r	$\Delta B_{\hat{r}}^{f}$
Austria	Coefficient	-0.0544	-43.2671	295.3604	0.6876	0.0786	0.4623	632.7606	-387.1018
	(P-value)	(0.4826)	(0.0319)	(0.0033)	(0.0000)	(0.0000)	(0.0036)	(0.0041)	(0.5653)
Belgium	Coefficient	0.1114	20.6836	192.6522	1.1487	0.0176	0.1815	861.7395	-387.4431
	(P-value)	(0.0203)	(0.0630)	(0.2391)	(0.0000)	(0.0000)	(0.2204)	(0.0851)	(0.5348)
Cyprus	Coefficient	0.7357	2377.1132	49.6110	0.4340	52.2010	-0.6040	176.5300	66.6248
	(P-value)	(0.0000)	(0.0229)	(0.4022)	(0.0000)	(0.0000)	(0.3739)	(0.5903)	(0.8854)
Estonia	Coefficient	0.7569	-0.3683	81.4458	0.7517	0.0137	0.1829	-23.9509	28.7394
	(P-value)	(0.0000)	(0.5841)	(0.0110)	(0.0000)	(0.0000)	(0.0305)	(0.2539)	(0.0199)
Finland	Coefficient	0.5143	-33.8418	330.1788	0.5745	0.0333	0.0906	697.6792	-106.8312
	(P-value)	(0.0021)	(0.0000)	(0.0002)	(0.0000)	(0.0000)	(0.3635)	(0.0007)	(0.8772)
France	Coefficient	0.2455	-210.5349	2007.7071	0.4123	0.0513	0.1111	4088.7260	-2022.6728
	(P-value)	(0.0003)	(0.0000)	(0.0137)	(0.0000)	(0.0000)	(0.0415)	(0.0000)	(0.6436)
Germany	Coefficient	0.3262	-366.7757	1931.2062	0.9380	0.0383	0.3657	5795.3632	-2742.0517
	(P-value)	(0.0054)	(0.0000)	(0.0389)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.5426)
Greece	Coefficient	0.7606	-45.6756	910.7447	0.3754	0.0605	-0.1643	767.4850	297.5160
	(P-value)	(0.0001)	(0.0003)	(0.0000)	(0.0002)	(0.0000)	(0.4116)	(0.1237)	(0.5273)
Ireland	Coefficient	0.2294	-65.4263	1714.0339	0.2871	0.0334	0.5223	195.1559	556.2931
	(P-value)	(0.0208)	(0.2336)	(0.0000)	(0.0173)	(0.1951)	(0.0841)	(0.7552)	(0.5073)
Italy	Coefficient	0.0451	-357.0801	2310.3225	0.6773	0.0446	-0.3800	5508.1058	344.8150
	(P-value)	(0.5640)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0005)	(0.0000)	(0.9058)
Luxembourg	Coefficient	0.3370	139.9829	71.3167	1.5734	0.0054	4.0476	4945.2658	-11.7347
	(P-value)	(0.0000)	(0.0000)	(0.3365)	(0.0000)	(0.5529)	(0.4485)	(0.4709)	(0.9132)
Malta	Coefficient	0.4997	0.5104	9.4137	1.0870	0.0266	15.0612	1786.3795	-4.8768
	(P-value)	(0.0001)	(0.3327)	(0.0302)	(0.0000)	(0.0000)	(0.0004)	(0.0001)	(0.9162)
Netherlands	Coefficient	0.2071	-64.5517	654.9895	1.2933	0.0636	0.0699	1708.7932	-38.8938
	(P-value)	(0.0007)	(0.0246)	(0.0116)	(0.0000)	(0.0000)	(0.5834)	(0.0095)	(0.9628)
Portugal	Coefficient	0.1914	-12.6566	292.6725	0.6038	0.0374	-0.1033	206.1557	112.6440
	(P-value)	(0.1281)	(0.1222)	(0.0000)	(0.0000)	(0.0000)	(0.3283)	(0.0826)	(0.6656)
Slovakia	Coefficient	0.7730	-8.9003	145.6630	0.8802	0.0124	0.1496	213.0344	18.4851
	(P-value)	(0.0000)	(0.0001)	(0.0278)	(0.0000)	(0.0000)	(0.0405)	(0.0154)	(0.9116)
Slovenia	Coefficient	0.9820	-2.3984	135.1240	0.8671	0.0097	0.0581	146.9495	35.6243
	(P-value)	(0.0000)	(0.0000)	(0.0002)	(0.0000)	(0.0000)	(0.1721)	(0.0000)	(0.5112)
Spain	Coefficient	0.3332	-333.2026	5590.0363	0.2928	0.0712	-0.0028	1454.9750	-754.1274
	(P-value)	(0.0002)	(0.0000)	(0.0000)	(0.0045)	(0.0000)	0.9694)	(0.0592)	(0.2690)

Table 9. Values of the Interest Rate Sensitivity of Output (Unit: Index)

	Italy	France	Slovakia	Slovenia	Greece	Austria	Spain	Ireland	Finland	Germany	Portugal	Nether-lands	Estonia	Cyprus	Malta	Luxem-bourg	Belgium
2005Q2	8053.16	3104.95	NA	261.12	1425.23	188.56	-2590.64	2995.83	195.30	-1402.90	253.19	9764.94	177.80	-40.52	-118.87	16951.81	-1243.90
2005Q3	8552.26	4034.73	NA	244.64	1111.12	658.72	4847.39	3061.09	1070.93	16394.83	99.47	11903.92	120.55	-70.47	-109.20	-1500.23	-1232.67
2005Q4	8096.53	2332.69	NA	276.46	1261.21	447.44	6848.90	2215.25	3227.58	11200.71	560.92	596.99	-5603.67	-37.80	-113.71	418.28	-1937.58
2006Q1	8007.67	3552.81	NA	237.22	781.99	581.41	4316.51	1544.83	1224.61	17643.51	546.84	-2977.45	-155.10	-66.16	16.52	-989.05	-952.69
2006Q2	8018.98	2583.86	1117.52	246.44	1040.82	397.97	1282.73	3823.17	-327.42	4998.42	245.11	-97501.17	156.68	217.67	-124.67	-1020.33	-1187.08
2006Q3	8064.88	4587.59	955.23	240.98	632.14	1452.48	6241.33	-8963.29	1266.92	12852.57	178.40	1730.81	105.10	-79.56	-120.75	-1168.63	-1041.62
2006Q4	8094.71	2812.11	519.43	252.34	1338.96	480.66	7341.53	2073.49	1930.56	9487.00	55842.68	-386.75	-495.10	-39.14	-117.57	-1036.75	-1361.78
2007Q1	8027.89	4541.20	254.88	253.98	669.61	620.47	3821.26	1840.50	931.80	15637.03	769.03	6947.17	-36.06	-73.05	-127.61	12956.43	-753.35
2007Q2	8010.70	2938.65	1023.94	254.84	1172.19	372.94	3135.74	-21074.86	673.43	-3040.65	480.76	994.22	75.47	-344.94	-127.08	-1480.48	-1409.89
2007Q3	8066.72	4880.27	2008.53	190.55	17570.19	1108.31	5108.41	3085.66	2188.71	39819.44	-2304.94	1639.35	-172.40	-73.69	-121.13	-1317.03	-1235.61
2007Q4	8109.49	2381.56	548.65	252.91	22959.89	383.44	13364.26	1907.53	-22242.99	7655.16	-1559.34	1172.18	-320.68	-41.90	-104.40	-1128.10	-1072.07
2008Q1	8013.59	3732.64	1146.29	249.11	644.89	665.33	4181.29	2050.74	827.59	21160.91	382.16	245.45	42.65	NA	-126.24	-1005.61	-1422.28
2008Q2	8006.79	4050.06	696.12	249.25	1279.59	521.77	3691.84	865.82	278.03	-6120.84	338.20	2465.93	35.47	NA	-115.07	-1137.01	-1166.03
2008Q3	8043.23	5150.57	658.92	706.95	368.24	-5001.19	5924.60	2073.04	3195.23	47815.69	-459.63	-136.32	-12.35	NA	-298.85	-1281.48	-1215.77
2008Q4	8119.49	1804.14	1329.28	513.10	1927.90	416.89	2780.76	1844.72	1692.07	4939.53	-1142.46	-154.35	-16.03	NA	-100.17	-1209.22	-1238.07
2009Q1	7997.23	2505.16	197.68	245.04	686.70	559.23	3222.65	1691.60	453.13	25247.51	378.14	479.33	14.79	NA	-83.57	-323.39	-1091.31
2009Q2	8036.56	4241.60	671.24	243.53	-1451.70	749.49	4328.14	1962.12	1217.38	-24163.89	-871.80	3588.17	42.46	NA	-140.43	-3234.63	-1271.43
2009Q3	7957.07	4907.77	851.70	239.29	769.98	46.85	4483.08	1256.59	957.21	8909.18	315.82	1001.79	11.24	NA	-96.95	-775.91	-1271.83
2009Q4	8057.16	3191.21	723.75	246.88	637.52	611.20	-2162.84	2010.04	1234.96	18655.47	401.68	1092.64	72.98	NA	-111.69	2932.57	-1025.40
2010Q1	8019.50	3181.93	871.66	247.11	1621.63	498.43	9962.97	1975.11	1279.96	11158.60	-738.85	1137.09	32.43	NA	-83.17	-1821.15	-1025.96
2010Q2	8004.01	2741.63	756.36	236.91	504.40	516.47	4377.42	1298.95	648.90	5111.44	548.96	1612.02	43.76	NA	-143.39	-1631.60	-1142.75
2010Q3	8287.81	6264.07	718.77	254.61	989.39	729.04	4368.91	3458.02	889.92	14317.72	396.07	941.88	-57.68	NA	-98.24	-539.05	-940.77
2010Q4	8011.55	2047.23	1106.15	247.08	660.96	688.45	4091.35	1422.22	2737.23	11157.72	397.19	1056.21	-10.63	NA	-110.08	-1952.65	-925.58
2011Q1	8024.77	NA	881.37	249.94	1051.79	513.39	5343.55	2169.79	1633.13	NA	443.76	2995.80	85.96	NA	-7.07	-1895.04	-1303.28
2011Q2	7974.21	NA	929.74	248.52	1410.49	521.82	5273.74	2714.66	791.96	NA	321.31	1344.96	27.60	NA	-120.29	-37638.54	-1060.25
2011Q3	8678.11	NA	3719.94	228.31	340.38	1041.45	3788.47	3335.24	-3319.59	NA	329.29	945.75	95.09	NA	-102.58	-1499.92	-1215.87
Average	8089.77	3546.45	985.78	273.73	2361.75	375.81	4514.36	870.69	179.10	11714.53	2159.69	-1826.90	-220.76	-59.05	-111.78	-1243.34	-1182.49
Std	164.77	1119.18	700.35	101.71	5256.52	1109.85	3052.88	4936.67	4645.89	14225.20	10761.38	19376.33	1085.91	120.91	51.04	8514.43	216.99

Table 10. Government Consolidated Gross Debt

TIME/GEO	Belgium	Germany	Estonia	Ireland	Greece	Spain	France	Italy	Cyprus	Luxem-bourg	Malta	Nether-lands	Austria	Portugal	Slovenia	Slovakia	Finland
2005Q2	96.8	67.9	4.8	29.9	102.4	44.8	66.5	109.7	70.9	5.7	72.0	54.1	71.8	63.5	26.3	34.9	40.2
2005Q3	95.6	68.5	4.8	29.2	103.0	43.7	66.2	108.0	71.4	5.7	70.3	52.7	71.1	66.4	26.5	34.3	39.6
2005Q4	92.0	68.6	4.6	27.5	110.0	43.2	66.8	105.4	69.4	6.1	69.7	51.8	64.2	67.7	26.7	34.2	41.7
2006Q1	95.1	68.8	4.3	27.9	108.5	42.3	66.5	107.7	68.6	6.5	69.3	51.0	66.9	67.7	26.9	34.7	38.1
2006Q2	92.2	68.8	4.0	27.5	108.4	41.0	65.7	109.3	68.1	6.5	65.4	50.6	69.4	69.6	26.9	33.5	40.4
2006Q3	91.8	68.9	3.9	26.1	107.7	40.7	65.6	108.5	66.6	6.6	65.5	49.6	66.3	69.0	26.4	31.9	37.3
2006Q4	88.0	68.0	4.4	24.8	107.7	39.7	64.1	106.1	64.7	6.7	64.4	47.4	62.3	69.3	26.4	30.5	39.6
2007Q1	90.0	67.3	3.8	24.9	109.2	39.6	65.3	106.9	65.5	6.6	63.6	47.7	66.3	67.5	28.1	28.7	36.8
2007Q2	88.7	67.3	3.4	24.5	107.9	39.1	66.3	106.7	62.7	6.9	65.2	48.1	68.5	67.5	24.8	31.3	37.1
2007Q3	89.7	65.6	3.4	28.6	106.3	37.7	65.6	105.4	59.8	6.7	62.4	46.9	70.7	67.8	23.5	30.3	33.9
2007Q4	84.1	65.2	3.7	24.8	107.5	36.3	64.2	103.1	58.8	6.7	62.3	45.3	60.2	68.3	23.1	29.6	35.2
2008Q1	87.5	65.4	4.1	27.5	108.0	35.5	65.8	105.6	52.9	7.1	61.3	46.3	61.8	67.4	24.4	26.6	33.4
2008Q2	86.4	66.3	3.9	32.4	108.5	36.0	66.3	105.0	50.9	7.2	63.2	46.3	61.6	68.6	22.3	25.8	33.7
2008Q3	87.1	65.8	4.1	38.7	109.8	36.9	66.8	104.5	48.9	7.2	63.0	46.8	61.7	69.2	22.0	26.1	29.9
2008Q4	89.3	66.7	4.5	44.2	113.0	40.2	68.2	105.7	48.9	13.7	62.3	58.5	63.8	71.6	21.9	27.9	33.9
2009Q1	95.1	68.8	5.2	51.2	121.4	43.5	71.5	111.8	54.6	14.3	63.7	61.5	67.9	74.3	25.4	28.8	38.6
2009Q2	96.4	72.8	5.8	59.5	125.8	47.5	75.4	113.9	69.5	14.7	67.0	60.8	70.5	79.8	30.4	32.7	35.1
2009Q3	98.0	73.9	6.2	62.3	128.6	50.2	77.5	117.0	68.8	15.1	68.2	61.5	69.7	79.6	35.1	35.0	39.5
2009Q4	95.8	74.4	7.2	65.1	129.4	53.9	79.1	116.0	58.5	14.8	68.1	60.8	69.5	83.1	35.3	35.6	43.5
2010Q1	99.9	74.6	7.2	78.3	132.4	55.7	81.2	118.0	62.3	15.1	68.7	61.5	70.2	84.0	38.1	36.1	45.1
2010Q2	100.0	75.4	7.0	78.4	134.6	57.8	83.7	118.8	62.8	20.1	70.0	63.2	72.5	87.6	38.0	39.1	47.2
2010Q3	98.7	75.6	6.8	88.4	138.8	58.8	82.0	119.4	59.9	19.9	70.6	63.1	71.9	91.1	38.3	38.3	47.2
2010Q4	96.0	83.0	6.7	92.5	145.0	61.2	82.5	118.6	61.5	19.1	69.4	62.9	71.9	93.3	38.8	41.1	48.4
2011Q1	99.5	82.0	6.5	100.4	152.4	64.7	84.5	119.5	63.6	18.9	70.9	62.9	72.3	94.5	46.5	42.4	46.2
2011Q2	98.0	81.8	6.2	102.3	154.3	66.1	86.2	121.0	67.1	18.8	71.9	63.8	72.1	106.5	44.9	42.8	45.8
2011Q3	98.6	81.6	6.0	104.5	158.8	66.0	85.4	119.3	66.9	18.5	70.2	64.5	71.6	110.2	44.9	42.2	47.4
2011Q4	98.0	81.2	6.0	108.2	165.3	68.5	86.0	120.1	71.6	18.2	72.0	65.2	72.2	107.8	47.6	43.3	48.6

Table 11. Trade Openness

Time/GEO	Belgium	Germany	Estonia	Ireland	Greece	Spain	France	Italy	Cyprus	Luxem-bourg	Malta	Nether-lands	Austria	Portugal	Slovenia	Slovakia	Finland
2005Q2	152.7	77.3	158.4	148.3	54.8	57.4	53.4	52.5	98.1	280.0	157.7	127.0	102.4	64.6	119.9	158.2	77.9
2005Q3	152.0	77.1	163.7	153.2	59.5	58.4	52.8	53.0	109.8	287.7	155.6	135.9	102.8	65.5	124.7	150.7	79.0
2005Q4	153.3	81.3	169.5	154.6	53.3	56.0	54.6	50.4	99.9	298.1	163.8	133.0	104.5	64.9	131.0	168.9	81.2
2006Q1	165.2	83.8	152.0	145.7	54.3	59.0	56.3	56.8	94.9	309.0	179.2	137.0	108.7	71.9	136.5	170.8	86.5
2006Q2	158.1	85.0	161.1	150.6	58.1	58.8	55.8	56.3	101.2	311.9	189.4	135.2	106.7	70.1	128.6	170.0	87.6
2006Q3	156.4	84.0	155.8	144.7	61.1	59.6	53.5	56.2	112.4	311.1	187.7	141.8	105.5	71.6	130.4	171.2	85.5
2006Q4	151.8	88.9	153.6	151.8	52.3	58.2	54.8	54.9	90.9	304.2	193.7	137.9	109.6	68.6	139.2	179.3	85.7
2007Q1	162.7	87.3	144.5	146.1	57.1	60.6	55.4	59.5	91.8	316.9	176.5	139.1	114.7	72.6	144.6	178.2	87.8
2007Q2	159.5	87.5	148.9	150.0	58.8	59.8	55.6	58.5	98.7	317.0	198.3	137.0	109.6	71.7	138.4	175.3	88.2
2007Q3	160.9	86.0	141.0	154.1	65.0	63.1	54.5	58.1	117.0	329.0	189.3	144.3	110.2	73.3	138.7	164.6	85.7
2007Q4	161.9	88.6	139.6	155.8	60.8	58.9	55.5	56.0	102.0	315.9	201.6	140.4	113.7	72.0	142.1	181.4	84.6
2008Q1	175.2	90.3	147.5	153.4	61.9	60.6	57.3	60.5	96.7	321.4	187.4	147.0	119.2	78.3	144.5	180.5	92.2
2008Q2	173.3	91.4	143.8	157.6	64.6	60.2	57.5	59.3	99.2	324.8	191.2	143.9	113.6	76.3	139.0	177.0	93.5
2008Q3	173.6	90.3	149.9	154.6	69.0	62.2	56.4	58.8	118.5	334.5	189.8	152.2	110.6	77.6	136.3	160.2	89.9
2008Q4	151.4	87.6	142.6	165.9	54.9	52.7	52.9	52.6	96.0	289.2	189.5	134.6	108.0	67.9	130.7	160.7	84.3
2009Q1	147.7	81.0	121.2	165.1	50.1	47.8	49.0	48.5	86.3	286.4	158.7	130.5	101.3	62.9	116.7	141.8	75.0
2009Q2	138.3	77.4	118.7	168.4	48.7	47.7	47.9	47.2	84.4	284.5	167.0	125.1	93.6	61.8	111.0	138.6	72.2
2009Q3	139.3	77.6	128.2	159.1	53.8	53.1	48.0	48.9	94.1	294.2	181.0	135.4	94.9	65.8	114.1	134.9	69.2
2009Q4	142.3	79.7	126.6	172.4	46.4	50.0	49.1	47.5	84.7	297.6	167.2	132.4	94.8	63.4	119.7	154.8	75.5
2010Q1	155.5	83.0	137.0	171.8	50.0	52.4	51.4	52.2	84.2	296.5	177.8	144.9	103.0	66.9	126.6	154.5	74.0
2010Q2	156.8	89.3	148.1	182.4	49.9	55.5	53.6	55.5	87.7	307.2	189.0	145.5	103.8	69.6	127.4	162.0	78.7
2010Q3	158.1	88.6	154.2	181.3	55.0	59.4	53.6	56.6	92.6	298.6	196.1	154.1	103.8	70.0	129.9	157.6	80.7
2010Q4	158.2	91.4	165.9	197.3	52.4	57.3	54.3	56.3	97.1	293.3	192.7	150.0	103.8	70.2	137.1	180.3	83.4
2011Q1	175.1	93.3	176.3	188.3	53.3	60.4	57.2	59.7	84.1	304.1	191.7	159.0	114.2	74.3	145.9	180.8	81.6
2011Q2	169.5	95.9	181.9	189.4	54.3	59.2	56.8	60.0	89.4	308.4	195.9	153.9	108.8	75.9	141.0	179.4	77.9
2011Q3	168.1	94.9	185.8	184.0	60.7	64.2	55.8	59.7	93.5	304.7	180.7	162.3	109.6	76.7	141.7	160.9	76.6
2011Q4	161.4	96.5	177.5	197.8	53.1	59.6	55.9	56.6	92.0	283.8	196.4	154.1	108.8	72.4	146.0	182.1	78.9

Table 12. Explainable Variables in EU-17

Nation	Austria			Belgium			Cyprus			Estonia			Finland
year	Fiscal Ratio	Monetary Elasticity	Gov. Exp. Elasticity	Fiscal Ratio	Monetary Elasticity	Gov. Exp. Elasticity	Fiscal Ratio	Monetary Elasticity	Gov. Exp. Elasticity	Fiscal Ratio	Monetary Elasticity	Gov. Exp. Elasticity	Fiscal Ratio
2005Q2	0.726058	0.244598	0.134644	0.827247	-1.86169	-0.05096	0.782037	1.657702	0.229832	0.220456	1.011787	0.999683	0.726183
2005Q3	0.966122	2.180454	-0.10173	0.604544	0.471007	-0.25598	0.812357	1.145029	0.146069	0.472749	1.600838	-0.47246	0.874543
2005Q4	0.854163	0.351788	0.08719	0.164562	0.795888	0.501235	0.944757	2.05461	0.092689	0.362275	0.305654	0.164037	0.621219
2006Q1	0.90039	0.849077	-0.12526	0.358918	7.076744	0.303741	0.885157	0.36482	-0.02257	0.698814	-0.11048	0.011413	0.865418
2006Q2	0.573525	0.164212	0.162874	0.254754	1.753689	4.426031	0.839218	2.486042	0.248315	0.279295	1.667901	1.070023	0.627842
2006Q3	0.636429	0.725443	-0.53869	0.460274	1.215503	-0.4208	0.597673	0.317931	0.119076	0.210056	1.163042	1.089922	0.783832
2006Q4	0.913154	0.906721	0.124705	0.200405	0.734009	0.994786	0.883076	1.274561	0.116468	0.541089	0.632653	0.168579	0.747221
2007Q1	0.894771	0.73425	-0.10822	0.307906	0.294939	0.3492	0.761995	0.456661	-0.06999	0.73327	0.264434	-0.02315	0.951855
2007Q2	0.688745	0.159062	0.092326	0.00807	-1.65778	7.486287	0.180481	0.698997	-1.46622	0.667247	4.043819	0.566564	0.598085
2007Q3	0.388811	-0.00822	-0.01627	0.557299	-0.98901	-0.26447	0.648996	0.840723	0.227242	0.201883	-0.68756	-0.76627	0.163378
2007Q4	0.738531	0.212657	0.099756	0.603749	-0.74671	0.137151	0.884507	1.357876	0.108193	0.719055	1.831748	0.242588	0.575871
2008Q1	0.832999	0.567259	-0.13382	0.227249	-11.6535	0.556381	NA	NA	-0.0807	0.789241	8.92768	0.69649	0.884527
2008Q2	0.893535	0.149933	0.021452	0.862874	-0.84995	0.418475	NA	NA	0.405236	0.895299	21.49976	0.841635	0.820663
2008Q3	0.51118	-0.60692	0.67226	0.58523	-5.44133	-0.13252	NA	NA	0.074097	0.559736	3.554052	0.908817	0.40262
2008Q4	0.85461	-0.55773	-0.12375	0.832331	-3.23444	-0.25756	NA	NA	-0.00259	0.923138	-6.394	-0.21456	0.672064
2009Q1	0.97793	-6.50215	0.172356	0.521295	0.298881	-0.71262	NA	NA	0.066148	0.920084	-26.3186	0.728955	0.846967
2009Q2	0.617059	0.455356	-0.34641	0.107812	-2.42096	-0.58616	NA	NA	-0.01564	0.874691	14.04768	0.684191	0.791907
2009Q3	0.4967	-0.58235	-0.72521	0.608408	-0.49484	-0.35578	NA	NA	-0.9917	0.827909	4.933962	0.310813	0.875574
2009Q4	0.902905	-0.67296	0.098023	0.645376	0.590332	0.066503	NA	NA	0.079397	0.635931	2.054074	0.398156	0.846137
2010Q1	0.774257	0.021758	0.008389	0	-5.96022	NA	NA	NA	-0.02546	0.876388	19.08423	0.790613	0
2010Q2	0.838984	1.439295	-0.35441	0.364958	0.608709	2.546026	NA	NA	0.115811	0.554136	21.96674	5.277623	0.728392
2010Q3	0.151912	1.718314	12.21698	0.298837	-0.75246	-0.33176	NA	NA	1.156708	0.36351	-1.17691	-0.59759	0.763735
2010Q4	0.833232	-0.35227	0.103034	0.459505	-1.73215	0.218965	NA	NA	0.072501	0.805027	4.505128	0.355874	0.765744
2011Q1	0.931863	-0.76564	-0.07378	0.2227	-0.5968	1.521931	NA	NA	0.017408	0.611253	2.549962	0.473648	0.718089
2011Q2	0.922999	1.147457	0.130905	0.271926	-0.73972	0.413908	NA	NA	0.53462	0.987916	362.7763	1.39625	0.638643
2011Q3	0.628967	0.302651	0.244812	0.576203	-0.6509	-0.13834	NA	NA	0.151566	0.153543	1.258537	-2.11942	0.435259

Table 13. Explainable Variables in EU-17 (continued)

Nation	Finland		France			Germany			Greece			Ireland	
year	Monetary Elasticity	Gov. Exp. Elasticity	Fiscal Ratio	Monetary Elasticity	Gov. Exp. Elasticity	Fiscal Ratio	Monetary Elasticity	Gov. Exp. Elasticity	Fiscal Ratio	Monetary Elasticity	Gov. Exp. Elasticity	Fiscal Ratio	Monetary Elasticity
2005Q2	-0.24886	0.085379	0.434185	0.376871	0.605929	0.650358	0.477056	-0.17143	0.7920	0.404774	0.103685	0.324155	1.543243
2005Q3	4.964518	-0.63845	0.978946	-13.6033	-0.35239	0.34265	1.234831	1.580752	0.9155	1.301136	-0.09266	0.349913	-0.29698
2005Q4	-0.21057	0.120222	0.282444	0.313803	0.931013	0.855821	-0.30074	0.036749	0.5208	0.379483	0.275683	0.547115	0.800857
2006Q1	1.092152	-0.14512	0.66738	-0.70906	0.428341	0.588424	0.571789	-0.27189	0.8418	-6.44517	0.981074	0.611129	1.191036
2006Q2	-0.4191	0.216878	0.395341	0.680574	1.248221	0.711203	1.674068	-0.44067	0.8519	0.727029	0.12191	0.297687	0.020274
2006Q3	-7.18988	-1.71362	0.672098	1.051186	-0.60145	0.644049	2.287269	0.825786	0.9791	3.131852	-0.05177	0.298359	0.722848
2006Q4	-0.72765	0.228467	0.365966	0.353895	0.703368	0.990636	25.73654	0.171739	0.6424	0.402809	0.182117	0.648164	-0.62134
2007Q1	-6.50713	-0.27531	0.423632	0.971869	1.509797	0.693732	1.245263	-0.36407	0.7645	2.212166	0.572397	0.649962	3.342074
2007Q2	-0.6664	0.382425	0.555609	0.421391	0.385789	0.583888	0.46907	-0.20952	0.8428	0.49089	0.090582	0.152888	-0.20594
2007Q3	-0.56175	-2.37297	0.549895	0.762796	-0.69501	0.280096	0.41692	0.665204	0.9068	0.748282	-0.06098	0.555969	-1.43464
2007Q4	-0.27578	0.174568	0.352671	0.157583	0.314332	0.823287	0.26684	0.038252	0.5900	0.411033	0.232677	0.829574	-5.55299
2008Q1	-0.58902	-0.05947	0.512586	-1.71525	1.7974	0.549305	0.695143	-0.35948	0.8133	0.959394	0.186579	0.628173	2.649688
2008Q2	-0.4579	0.082214	0.941479	-1.625	-0.11279	0.607854	-0.13264	0.052193	0.8720	0.519006	0.076668	0.195218	-1.45829
2008Q3	-0.09814	-0.11518	0.420027	0.086132	-0.12861	0.121138	-0.16968	-0.73817	0.8329	0.232553	-0.0373	0.853857	-0.45323
2008Q4	0.454673	-0.18844	0.401043	-0.16678	-0.26408	0.728072	-1.0373	-0.24811	0.4248	-0.18101	-0.19518	0.744581	2.370745
2009Q1	-3.215	0.45219	0.228873	0.341978	-1.29925	0.628293	-2.20497	0.783253	0.8277	-0.62074	0.093866	0.588051	-1.65021
2009Q2	-1.75458	-0.38585	0.90705	1.67268	-0.19582	0.196939	-0.78015	1.933691	0.8316	-0.3152	-0.05308	0.998948	-238.088
2009Q3	1.762867	-0.20395	0.723706	0.157125	-0.06625	0.912167	-10.486	0.627782	0.9857	1.037124	0.011641	0.8467	-2.96476
2009Q4	-0.1685	0.027633	0.568395	0.281263	0.237043	0.720641	-0.4141	0.110219	0.9459	-0.86028	0.048498	0.5398	-5.1015
2010Q1	0.591812	NA	0	-0.21654	NA	0	0.796266	NA	0.0000	0.10042	NA	0	-8.23439
2010Q2	-0.96866	-0.29995	0.436416	0.359433	0.523031	0.764355	1.064309	-0.20138	0.8408	0.05806	0.009025	0.157684	-0.38217
2010Q3	1.715161	-0.436	0.585553	0.424937	-0.3242	0.901613	1.248327	0.092965	0.4647	0.400224	0.377974	0.852845	0.201389
2010Q4	-0.74854	0.207433	0.437462	0.145991	0.200481	0.719721	-0.59933	-0.15517	0.8905	1.541865	-0.19355	0.488934	1.125049
2011Q1	0.581755	-0.19355	0.404573	-0.65249	1.063963	0.779086	1.688487	-0.30137	0.8441	0.09112	0.013303	0.873463	-1.29615
2011Q2	-0.65398	0.318669	0.527572	0.378647	0.375697	0.3463	0.49352	-0.57061	0.6820	NA	NA	0.23742	0.387215
2011Q3	-0.37351	-0.39149	0.636008	0.511188	-0.3126	0.14413	0.364683	1.304545	0.3115	NA	NA	0.835824	0.71808

Table 14. Explainable Variables in EU-17 (continued)

Nation	Ireland	Italy			Luxembourg			Malta			Netherlands		
year	Gov. Exp. Elasticity	Fiscal Ratio	Monetary Elasticity	Gov. Exp. Elasticity	Fiscal Ratio	Monetary Elasticity	Gov. Exp. Elasticity	Fiscal Ratio	Monetary Elasticity	Gov. Exp. Elasticity	Fiscal Ratio	Monetary Elasticity	Gov. Exp. Elasticity
2005Q2	1.029023	0.456472	0.454603	0.469571	0.135369	146.6605	8.934143	0.460711	-4.10312	1.054172	0.69768	0.445878	0.150172
2005Q3	-0.18022	0.877795	-2.00328	-0.23647	0.013161	1.219331	0.88045	0.824626	11.90539	-0.50092	0.627786	0.286556	-0.11417
2005Q4	0.239493	0.865265	0.373265	0.062564	0.207174	1.24167	0.056157	0.36725	-1.198	-0.43184	0.738768	0.454436	0.11689
2006Q1	-0.22566	0.987674	-0.69984	-0.00723	0.03634	0.844143	-0.20943	0.930664	-80.4576	1.192206	0.517314	0.538345	-0.34384
2006Q2	0.014493	0.835804	1.983051	0.3382	0.00793	-0.33132	-0.39077	0.086881	-2.96914	6.502923	0.766827	0.73349	0.16513
2006Q3	0.526398	0.825501	-0.4736	-0.08455	0.012763	0.684379	0.506608	0.351761	3.022153	1.183091	0.810556	0.454661	-0.0702
2006Q4	-0.1168	0.870177	0.329068	0.054984	0.056818	1.467165	0.274914	0.28336	-0.64792	-0.36607	0.505823	0.284482	0.189159
2007Q1	-0.54836	0.927478	-0.22813	-0.01484	0.646676	10.44524	-0.05659	0.515221	-0.42471	0.077926	0.369117	0.44103	-0.47874
2007Q2	-0.3422	0.830217	1.842473	0.322163	0.054764	-3.96273	-0.64374	0.303188	-8.31002	3.820447	0.977901	-10.8698	0.170931
2007Q3	-0.36679	0.537522	-1.1659	-0.85449	0.000709	0.010289	-0.12889	0.232198	1.705704	-1.04311	0.811177	0.978293	-0.14312
2007Q4	0.405004	0.841019	0.08258	0.017359	0.134929	-1.14668	0.081161	0.600509	-1.42293	-0.21183	0.765311	-0.8782	0.185796
2008Q1	0.525416	0.955637	-0.17086	-0.00662	0.004906	1.011077	-2.13646	0.074026	-0.19581	0.511671	0.241714	-0.57909	-1.26881
2008Q2	-2.00398	0.96434	5.919113	0.194653	0.023155	0.132947	0.054511	0.200564	-1.71475	-1.41579	0.568216	0.079014	0.043395
2008Q3	0.026961	0.888211	2.891884	0.310175	0.004607	-0.04818	-0.09836	0.373254	-13.6726	-4.72846	0.687528	-0.14779	-0.04538
2008Q4	-0.31701	0.806675	-0.21734	-0.0545	0.01357	0.174155	-0.1542	0.576585	-5.20971	-0.82981	0.656171	-0.04009	-0.0152
2009Q1	0.370975	0.963523	-2.64136	0.081215	0.005161	2.267984	-5.45294	0.624666	6.269464	0.752676	0.43822	2.329775	2.158364
2009Q2	-0.09321	0.652673	-0.03467	-0.01538	0.057212	1.387313	0.272963	0.389987	-2.0693	0.72015	0.514851	-0.44821	-0.30963
2009Q3	0.182786	0.765261	0.237246	-0.05796	0.007197	-0.73262	1.291495	0.677056	-7.27258	-0.72067	0.980719	-8.32729	-0.11609
2009Q4	-1.50245	0.860039	-0.0272	-0.00442	0.193151	-1.59367	-0.09406	0.403721	-0.82916	-0.2731	0.907823	-1.07444	0.083707
2010Q1	NA	0.931746	-0.68195	-0.03853	0.00266	1.044908	5.432315	0.763392	5.388143	0.344811	0	-2.33075	NA
2010Q2	-0.71082	0.996098	84.41246	0.264877	0.030128	-0.94104	-0.4009	0.63247	-3.39003	0.446827	0.433773	0.731562	0.735154
2010Q3	-0.0169	0.523988	-0.07375	-0.05335	0.035035	-1.86748	0.708027	0.622657	-5.89584	-0.75624	0.97144	-2.42914	-0.04971
2010Q4	-0.66342	0.976462	0.65952	0.016138	0.039647	-0.80245	0.306512	0.514602	-0.56201	-0.12916	0.948104	-3.04935	0.126888
2011Q1	-0.06231	0.917061	-0.45938	-0.03364	0.002528	0.162521	0.978926	0.982468	-67.4689	0.266844	0.608536	-0.3315	-0.15743
2011Q2	0.412152	0.67583	-0.51959	0.210985	0.939363	-37.4385	0.033525	0.127592	-1.74245	2.739307	0.723756	0.118349	0.03514
2011Q3	-0.06606	0.757211	0.017069	0.004488	0.007198	0.359719	0.672333	0.41047	3.395109	-1.05538	0.987706	1.325478	-0.01169

Table 15. Explainable Variables in EU-17 (continued)

Nation	Portugal			Slovakia			Slovenia			Spain		
year	Fiscal Ratio	Monetary Elasticity	Gov. Exp. Elasticity	Fiscal Ratio	Monetary Elasticity	Gov. Exp. Elasticity	Fiscal Ratio	Monetary Elasticity	Gov. Exp. Elasticity	Fiscal Ratio	Monetary Elasticity	Gov. Exp. Elasticity
2005Q2	0.706408	-0.94308	0.179329	NA	NA	1.206645	0.436102	0.680653	0.203716	0.737415	0.58405	0.149306
2005Q3	0.115479	-0.01004	-0.03453	NA	NA	0.241022	0.840182	-5.01832	-0.21095	0.906126	2.623417	-2.71174
2005Q4	0.778377	0.344343	0.0525	NA	NA	0.129384	0.361626	0.666835	0.273214	0.830227	0.610188	0.09627
2006Q1	0.837657	-0.52363	-0.04151	NA	NA	-0.07641	0.445857	0.722754	-0.18797	0.947863	1.893192	-0.04734
2006Q2	0.870124	-1.32939	0.093138	0.620258	3.370082	0.391877	0.969404	-33.4986	0.248988	0.680337	0.4329	0.155256
2006Q3	0.88253	-2.47812	-0.14696	0.208723	0.639274	-0.41952	0.538942	2.552658	-0.48311	0.552324	0.434947	0.614596
2006Q4	0.668105	0.237507	0.062633	0.473892	0.585735	0.139572	0.496619	1.856205	0.440938	0.791868	0.322953	0.064068
2007Q1	0.757593	-0.62952	-0.08629	0.688679	1.207563	-0.09566	0.545551	-1.68851	-0.30789	0.881425	0.78345	-0.04355
2007Q2	0.631056	0.217425	0.058572	0.351949	0.654968	0.227725	0.729519	2.521029	0.228387	0.752527	0.510599	0.108501
2007Q3	0.300294	0.108688	-0.11008	0.212246	2.20371	-1.49025	0.287999	0.864055	-0.47827	0.739764	0.718319	-4.89709
2007Q4	0.743966	0.451199	0.079635	0.610154	1.286092	0.17814	0.502989	0.825281	0.194758	0.917434	1.087667	0.060903
2008Q1	0.931661	-0.41682	-0.01212	0.499674	-1.09525	-0.21484	0.550613	-2.41794	-0.45149	0.904349	0.574139	-0.02284
2008Q2	0.998118	-23.3045	0.019052	0.753872	-1.43291	0.102819	0.849098	3.028221	0.138822	0.73626	0.164409	0.039222
2008Q3	0.382512	-0.00512	-0.00365	0.28421	0.219963	0.123452	0.273516	0.595941	-0.39027	0.578906	-0.07893	1.229221
2008Q4	0.618641	-0.29341	-0.08848	0.537717	-0.17659	-0.03924	0.54738	-1.43066	-0.31361	0.8485	-0.42275	-0.0478
2009Q1	0.880997	1.526054	0.083645	0.302518	-1.18215	0.578298	0.800138	-6.10602	0.360136	0.879921	-0.76886	0.040805
2009Q2	0.831681	-0.14986	0.013523	0.698919	-0.65197	0.064907	0.801433	1.110357	-0.07422	0.907097	-1.34435	-0.08126
2009Q3	0.762227	-1.25711	0.184778	0.174209	-0.84571	-0.92767	0.82467	-0.25893	0.013777	0.881976	0.625452	0.185981
2009Q4	0.813642	-0.28313	0.035667	0.969208	11.76122	0.102226	0.98389	3.502734	0.015444	0.93933	0.063316	-0.00271
2010Q1	0	-0.43657	NA	0.65307	-0.2265	-0.0282	0.955599	5.411566	0.061349	0.871304	-0.09458	NA
2010Q2	0.740332	0.157845	0.028362	0.636946	3.237006	0.443537	0.728488	-0.88722	0.091171	0.952873	0.875076	-0.01521
2010Q3	0.45192	0.717783	-0.42323	0.974908	-102.994	-0.619	0.752517	0.569674	-0.0485	0.896839	-0.5233	-0.17242
2010Q4	0.893239	-0.28124	-0.02153	0.558568	0.218689	0.04629	0.941076	0.310986	0.005387	0.980878	-2.31292	0.031054
2011Q1	0.847283	-0.00212	-0.00017	0.552646	-0.25673	-0.04795	0.348719	-0.43004	-0.21922	0.932955	-0.65782	-0.01914
2011Q2	0.896953	-2.33631	-0.13096	0.497543	1.27408	0.30965	0.844429	0.345783	0.018189	0.865575	-0.47998	0.065509
2011Q3	0.667938	-0.42064	-0.10057	0.706908	1.37166	-0.12521	0.622149	0.167329	-0.02632	0.697185	-0.06935	-0.08856

Appendix B.

The Model from the Sight of Saving and Current Account

Under the initial framework in section 3.3.3 and substituting $B^S - G_o$ and $(CA - (F + TR))$ for $(G_c - T)$ and $\left(X - M(Y)\right)$ respectively, the saving equation will become

$$S(Y, r) = I(r) + (B^S - G_o) + (CA - (F + TR)) \tag{5a}$$

After taking a total differential in the equation (5a) and (2), the equations will become

$$(S_y - CA_y)dY + (S_r - I_r)dr = (dB^S - dG_o) - (dF + dTR) \tag{6a}$$

$$L_y dY + L_r dr = dm^S \tag{7a}$$

Combining equation (6a) and (7a), dY can be presented as

$$(S_y - CA_y)dy + (S_r - I_r)\frac{dm^S - L_y dY}{L_r} = (dB^S - dG_o) - (dF + dTR)$$

$$dY = \frac{\frac{I_r - S_r}{L_r} dm^S + (dB^S - dG_o) - (dF + dTR)}{\left(S_y - CA_y + \frac{L_y(I_r - S_r)}{L_r}\right)} \tag{8a}$$

And dr can be organized by equation (7a) like this:

$$dr = \frac{dm^S - L_y dY}{L_r} \tag{9a}$$

After substituting equation (8a) and (9a) for $h' = \frac{dY}{R_f}$, we can derive $h'(ca)$, as

$$h'(ca) = \frac{dY}{R_f} = \frac{dY}{dr} = \frac{L_r dY}{dm^S - L_y dY} = \frac{(I_r - S_r)dm^S + L_r((dB^S - dG_o) - (dF + dTR))}{(S_y - CA_y)dm^S - L_y((dB^S - dG_o) - (dF + dTR))} \tag{10a}$$

Thus, $\frac{dk}{dY}$ can be shown by h'.

$$\frac{dk}{dY} = \left(\frac{(\rho^* - \rho_0) f(\rho^*)}{R_f \cdot F(\rho^*)} - \frac{[(\rho^* - \rho_0)F(\rho^*) - \int_0^{\rho^*} F(\rho) d\rho]}{{R_f}^2} \right) \cdot \frac{1}{h'(ca)}$$

$$= \left(\frac{(\rho^* - \rho_0) f(\rho^*)}{R_f \cdot F(\rho^*)} - \frac{[(\rho^* - \rho_0) F(\rho^*) - \int_0^{\rho^*} F(\rho) d\rho]}{{R_f}^2} \right) \cdot \left(\frac{(S_y - CA_y) dm^S - L_y [(dB^S - dG_o) - (dF + dTR)]}{(I_r - S_r) dm^S + L_r [(dB^S - dG_o) - (dF + dTR)]} \right) \quad (11a)$$

Therefore, $\frac{dk}{dY}$ can be measured by $h'(\text{ca})$.

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