U.PORTO

FEP FACULDADE DE ECONOMIA
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EXIT FROM CURRENCY UNIONS: WHY, HOW AND CONJECTURES
FOR PORTUGAL

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Dissertation

Master in Economics

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2017/2018

Acknowledgements

Abstract

With the recent Financial and Sovereign Debt Crisis, the debate about a possible EMU exit by some state members as increased. So, it is important to understand how a country can proceed in an eventual exit. In this regard, this dissertation aims to review the exit strategies presented in the literature that a country can use to withdrawal from a currency union and the corresponding costs, with a particular focus on the EMU, a rather unexplored issue. Despite the limited literature on this subject, there is divergence about the defined strategies. In addition, this study pretends to verify if the 2008 Financial Crisis increased the expected exit probability of Portugal from the EMU. To do so, we will use a "pooled" probit estimation with a sample that covers data from 1948 to 2014, 148 distinct countries and territories and nine different variables. Then, it will be extrapolated some conclusions about the exit situation of Portugal from the EMU.

Keywords: European Economic and Monetary Union (EMU), Currency Union, Exit, Strategies, Probability.

JEL Codes: E42, F15, F33, F45

Resumo

Com as recentes crises financeira e de dívida soberana, o debate sobre uma possível saída da Zona Euro por parte de alguns membros de estado tem vindo a aumentar. Assim, é importante entender como é que um país pode proceder numa eventual saída. Deste modo, esta dissertação pretende rever as estratégias de saída apresentadas na literatura que um país pode usar para proceder a uma saída de uma união monetária e os custos correspondentes, com um foco particular na UEM, uma questão bastante inexplorada. Apesar da literatura restrita sobre o assunto, há divergência sobre as estratégias definidas. Além disso, este estudo pretende verificar se a Crise Financeira de 2008 aumentou a probabilidade de saída esperada de Portugal da Zona Euro. Para isso, foi usada uma regressão "pooled" Probit, com uma amostra que cobre dados de 1948 a 2014, 148 países e territórios distintos e 9 variáveis diferentes. No final, serão extrapoladas algumas conclusões sobre a situação de saída de Portugal da Zona Euro.

Palavras-chave: União Económica e Monetária, União Monetária, Saída, Estratégias, Probabilidade.

Códigos JEL: E42, F15, F33, F45

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Abbreviations

ECB – European Central Bank

EMU – European Economic and Monetary Union

EU – European Union

FE – Fixed Effects

IMF – International Monetary Fund

LMP - Lex Monetae Principle

NCB – National Central Bank

NLC – New Local Currency

OCA – Optimum Currency Area

PIIGS – Portugal, Ireland, Italy, Greece and Spain

PWT – Penn World Table

RE – Random Effects

WDI – World Development Indicators

1. Introduction

The European Economic and Monetary Union (EMU), the example of a monetary union that is mostly under analysis in this dissertation, is an agreement, currently between nineteen members of the European Union (EU), to be under a common monetary policy, the same currency (the Euro), while coordinating economic and fiscal policies (European Commission, 2017).

The Euro Area was created in 1999 and was formed with the intention of being an irrevocable monetary union (Bootle, 2012). Moreover, the Euro project represents one solution to solve the monetary policy trilemma: loss of monetary policy autonomy together with exchange rate (irreversible) stability and a large level of financial integration (Krugman *et al.*, 2018). However, in the recent past, after the financial crisis in 2008, the 2010 sovereign debt crisis and the Brexit referendum in 2016, the hypothesis of a country leaving the Euro Area (or even its full breakup) became increasingly debated: "*Suddenly the unthinkable is thinkable. The possibility that one or more of the members of European Economic and Monetary Union (EMU) might leave is no longer being dismissed, even by Eurozone politicians*" (Cliffe *et al.*, 2010, p. 1).

Indeed, the recent above-mentioned events brought us some valuable lessons. The fast-moving asymmetric financial shocks, alongside with real distortions, called into question the stability of monetary unions (Aizenman, 2016). According to some authors, *e.g.* Arghyrou and Tsoukalas (2010), the EMU does not meet the conditions of an Optimum Currency Area (OCA). The time has come that, perhaps for some countries, the costs of staying in the EMU outweigh its benefits.

When a country is in a situation where its maintenance in a monetary union involves more costs than benefits and exiting becomes a feasible hypothesis, it is essential to identify alternative exit strategies that minimize costs for both the exiting country and the group of countries that keep the union membership. In this context, the first question this dissertation will try to address is: what are the exit strategies from a monetary union available in the literature?

Moreover, this dissertation will try to identify if Portugal was in an exit situation from EMU in 2014 and what was the impact of the 2008 Financial Crisis on the expected exit probability of this country in the post-crisis. To do this, it will be made an extension of the model created by Rose (2007), namely a Probit Estimation, with a rather large panel data set for several countries and with data that covers from 1948 to 2014, excluding EMU countries.

Then, the conclusions that may arise from this estimation will be extrapolated to the Portugal case.

Accordingly, the objectives of this study are: 1) to briefly review the costs and benefits of belonging to a monetary union; 2) to review the available exit strategies in the literature; 3) to explore the conclusions reached by the literature about the characteristics (*e.g.* in terms of total population, government expenditure, inflation) that lead to the increased probability of a country leaving the monetary union and 4) to conclude about the impact that 2008's financial crisis had on the exit probability of Portugal from EMU.

This dissertation will be useful to enrich the existing literature in this field since, to the best of our knowledge, there is no literature review that brings together all these topics and, in particular, there is no summary of requirements to proceed with (alternative) exiting strategies. Due to the recent European experience and the problems that some countries are facing, this contribution becomes even more important as it will be beneficial to guide options for countries belonging to the EMU. This, hopefully, would make identifiable the risks of exiting within the Euro Area, a rather quantitatively unexplored issue. Finally, by providing a comprehensive list of the possible exit strategies found in the literature, this work can improve on policymakers' decisions as well: by analyzing one by one, policy makers can choose the strategy that fits best the country economic structure and thus optimize its exit.

This dissertation is structured as follows: after this introduction, section 2 comprises a literature review divided into 4 subsections. The first one contains a brief review on the OCA theory. The second subsection presents the costs and benefits of being part of a currency union. The third subsection comprises the literature that concerns the characteristics of a country that left a currency union and the last subsection identifies the alternative exit strategies from a currency union available on the literature. Section 3 presents the methodology and data used and the results analysis, with a particular focus on Portugal. Finally, in section 4 are presented the conclusions, limitations and future research considerations.

2. Literature Review

2.1. Optimum Currency Areas - an Overview

In order to analyze the costs and benefits that a monetary union brings to the countries, we briefly rely on the literature related to OCA theory.[1]

First, we can define an OCA as an optimal geographic area for multiple currencies or for the creation of a single currency shared between several countries, where the exchange rates are irrevocably pegged. In both cases, the currency or currencies only fluctuate in unison against other currencies and the sovereign countries belonging to this area define the OCA borders (Mongelli, 2008).

The seminal works on OCA theory were developed by Mundell (1961), McKinnon (1963) and Kenen (1969). These authors identify some characteristics that must be present in countries to form an OCA.

Mundell (1961) tries to answer what is the appropriate domain and what conditions make a country able to join an optimum currency area. According to Mundell (1961), the OCA is a region and not necessarily a country defined by physical borders. The author states that a country in a flexible exchange rate regime, facing balance of payments disequilibria, can appreciate/depreciate is own currency to correct such imbalance. This does not happen in a currency union. However, a country can correct these disequilibria by having labor mobility and price and wage flexibility, even if it belongs to a currency area. Mundell (1961) relies on Ricardian factor mobility assumption: if there is low internal and high external factor mobility, then a fixed exchange rate system is the best option and vice versa. According to Mundell (1961), an optimum currency area is, therefore, a region with a high degree of factor mobility and low price rigidity.

Two years later, McKinnon (1963) introduced another condition, a large trade openness degree of the economy, assessed with the ratio of tradable to non-tradable goods. The author states that the more open an economy is the more suitable is for a country to adopt a fixed exchange rate regime.

Later, Kenen (1969) stated that well-diversified economic structures suit better fixed exchange rates. An economy with a wide range of industries reflects into external diversification, reducing the likelihood of asymmetric shocks, the need for changes in exchange rate and helps to stabilize investment. Besides that, Kenen (1969) also argued that

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[1] For a comprehensive review see, for example, Ishiyama (1975).

correlated business cycles (reflecting, *e.g.*, similar economic structures) benefit from a common currency.

Moreover, Kenen (1969) stated that it is needed an efficient fiscal system which covers many single-product regions and should be coextensive with a single currency area, to combat localized recessions and mitigate economic disturbances.

Summing up, and as noted by Buiter (1999), this theory highlights six characteristics, which at least one of them must be present to build an OCA: high degrees of i) labor mobility and of ii) trade openness across countries; iii) low degree of nominal rigidity in domestic prices; iv) similarity of economic structures; v) well diversified production and demand structure; and vi) existence of significant supranational fiscal tax-cum-transfer mechanisms.

This theory began to have some resistance and new contributions emerged. Fleming (1971) and Ishiyama (1975) were some of the pioneers to state that the creation of an OCA should not only rely on the analysis of a single criterion; instead, it should rely on a comprehensive analysis of the costs and benefits involved in this decision. Even if a group of countries have similar economic structures, for instance, one may find it costly to give up from a flexible exchange rate regime. Overall, "*a country's decision to join an exchange rate area is determined by the difference between the monetary efficiency gain from joining and the economic stability loss from joining*" (Krugman *et al.*, 2018; p. 397).

2.2. The Benefits and Costs of a Currency Union

As was mentioned in the previous section, an OCA can be formed by a group of different currencies or by a single currency. However, in the next section, we will only focus on the benefits and costs that a single currency can bring to the respective countries.

2.2.1. Benefits

The ultimate decision taken by a group of countries, of giving up their own currencies to be part of a monetary union, needs to carry some benefits; otherwise, they would keep their currencies and let their exchange rates to float freely. The main benefit of a common currency is the "monetary efficiency gain", realized when trade and payments are not subject to exchange rate risk (Krugman *et al.*, 2018).

A common currency decreases transaction costs because of the linkage created between countries (Alesina and Barro, 2002). This brings direct benefits such as the

disappearance of exchange rate conversion costs (Goodhart, 2007; Santos Silva and Tenreyro, 2010; De Grauwe, 2016). With the same currency, agents from different countries do not have to pay any tax-conversion whenever they want to buy something from another country that belongs to the monetary union. These cost savings are, however, more pronounced in a group of countries where agents trade a large amount of goods and services between them (De Grauwe, 2016).

Furthermore, a common currency brings indirect benefits. The introduction of the same currency makes consumers more comfortable to compare prices, leading to a greater price transparency. This improves competition between firms, which is good for the economy (De Grauwe, 2016). However, for De Grauwe (2016) this transparency is not the major source of benefits, but rather the possible economic integration that can arise between countries in other areas (*e.g.*, institutional, political, financial). According to Santos Silva and Tenreyro (2010), a common currency should provide more liquid financial markets and increase cross-border investments. We can notice that individual enterprises improved their share of trade within the euro area, which reduces the impact of shocks from external instabilities on these individual enterprises (Goodhart, 2007).

In addition, the volatility of the exchange rate causes an uncertainty about future revenues of firms. This leads to a loss of welfare, once the individuals are risk-adverse. We can conclude that with the creation of a monetary union the exchange rate risk disappears, reducing uncertainty. Altogether, these benefits improve both consumers' and firms' wellbeing (De Grauwe, 2016).

Beetsma and Giuliodori (2010), Santos Silva and Tenreyro (2010), Aizenman (2016) and Krugman *et al*. (2018) also state that a group of countries that anchor to a stable currency or adopt a common (stable) currency finds it easier to achieve a low domestic inflation because of price convergence. This mostly concerns with weak institutions (Beetsma and Giuliodori, 2009).

In sum, the main benefit of a common currency is a monetary efficiency gain, which is magnified when different countries from the currency area have a high degree of economic integration, both in products markets and in production factors markets (Krugman *et al*., 2018)

2.2.2. Costs

However, belonging to a monetary union also brings some costs to the member economies. The main cost of joining a currency area is the "economic stability loss", following the inability to use the exchange rate and the monetary policy as instruments for economic stabilization (Krugman *et al.*, 2018).

A country that relinquishes its national currency loses the ability to implement autonomous monetary policy (Nitsch, 2004; Goodhart, 2007; Beetsma and Giuliodori, 2010; Santos Silva and Tenreyro, 2010; De Grauwe, 2016; Krugman *et al.*, 2018). Hence, the country can no longer decide on the quantity of money in circulation, on its prices and on the short-term interest rate. It cannot either rely on nominal exchange rate adjustments in order to solve for asymmetric shocks (De Grauwe, 2016; Ritzen and Haas, 2016).

So, the main problems come with desynchronized business cycles. Take as an example two countries that belong to the EMU, Portugal and Spain. Suppose the first one faces a recession and the second one faces an economic boom. If investors keep their trust in Portugal, which suffers a budget deficit caused by recession, the interest rate will be kept unchanged since investors will compensate the lack of Spanish government bonds supply by the high Portuguese government bonds supply because they trust the capacity of both countries to pay for the bonds (De Grauwe, 2016). However, if investors' trust decreases when the government faces a budget deficit, investors will start to buy Spanish bonds and sell Portuguese bonds. The result is an increase in the long-term interest rate in Portugal. Hence, the investors' fear will prolong and amplify Portuguese recession. Thus, being in a currency union may lead to a bigger volatility of employment and output.

De Grauwe (2016) also states that governments may lose capacity to finance their budget deficits because they do not have direct control over their currencies. Without such control, it is harder for governments to convince investors (bondholders) that they will be paid when the government bonds reach maturity. If the investors lose confidence in these governments, they will sell bonds, raising the interest rate and causing a liquidity crisis. The problem is that there is no national central bank that can provide liquidity to fight the crisis. In the absence of a "lender of last resort", financial markets can force a default on any country that relinquishes their own currency. This is a situation that started to have more emphasis after the 2010 European sovereign debt crisis.

According to De Grauwe (2016), countries that share the same currency witness larger costs in the case of high real (and nominal) wage rigidity and of limited labor mobility, which

is in line with the theory of Mundell (1961), making costlier the adoption of a common currency. Such rigidities crucially depend on cross-country differences in labor market institutions and legal systems (*e.g.*, centralized *vs.* decentralized wage bargaining) which contribute for similar shocks to have different (more asymmetric) impacts (De Grauwe, 2016).

In summary, most of the costs and benefits of adopting a common currency overlap those of adopting a fixed exchange rate regime; a currency union is the hardest form of exchange rate peg (see, *e.g.*, IMF, 2016).

2.3. Exits from a Currency Union: Why?

Even when governments make an analysis over costs and benefits and decide to join a currency union, Aizenman (2016) states that net benefits might become negative in a future time. Taking the EMU as an example: *"What may have seemed like a viable and successful currency union destined to "live together happily ever after" (the first euro decade) may have turned into a bad union with strong centrifugal forces at times of asymmetric shocks that test the union's viability (the second euro decade)"* (Aizenman, 2016, p. 3).

In this context, it is crucial to analyze the empirical results on the likelihood of a member state leaving a currency union, in order to conclude on the explanatory variables used in this literature and which will be used in the empirical section of this dissertation. There are some studies that approach this subject, like Nitsch (2004) and Rose (2007).

Nitsch (2004) uses an annual panel data set that analyses 245 country-pairs that belong to the same currency area, between 1948 and 1997. The objective of his study is to characterize currency union exits. The author relies on the OCA theory to find some factors that may help to characterize currency unions' exits. According to Nitsch (2004), we can see a departure or even a dissolution of the currency union because of the members not being part of an optimum currency area. So, the criteria to identify an optimum currency area (mentioned in Section 2.1) must be present in this analyze. However, even if, for instance, the entire group has the desirable degree of economic integration among them, the costs can outweigh the benefits of being part of the same currency area (as mentioned in Section 2.2). The author states that discrepancies between domestic economic variables and the exchange rate commitment or even the practice of poor policies may occur. This can increase the costs of being part of a monetary union. Besides that, Nitsch (2004) affirms that many currency union exits occurred when a colony gained independence. So, the author also relates the

political status of a territory with currency unions' dissolutions, which refutes in some way the relation between domestic economic fundamentals and currency unions' withdrawals.

In this regard, the variables that are present in his study are divided as follows: (1) macroeconomic indicators (*e.g.,* real Gross Domestic Product (GDP) per capita, total consumption growth (%), inflation (%)); (2) financial variables (*e.g.,* money supply (M_2)/GDP growth (%), interest rate spread (%), credit to private sector (% of GDP)); (3) fiscal variables (*e.g.,* public expenditures (% of GDP), public budget deficit (% of GDP), central government debt (% of GDP)); (4) openness variables (*e.g.,* current account (% of GDP), trade/GDP (%), bilateral trade growth (%)); and (5) an institutional variable (change in political union).

Thus, according to Nitsch (2004), a high inflation differential across currency union members increases the likelihood of a currency union dissolution. According to Frankel and Rose (2002), Glick and Rose (2002) and Rose and Engel (2002) common currencies promote bilateral trade between currency union members and overall openness. Nitsch (2004) states that if the percentage of trade between countries that belong to the same currency union is small, then it is likely that the union will be dissolved. Furthermore, when a political union is dissolved, it is probable to see a full withdrawal from the currency union. In turn, fiscal aspects and asymmetries in output between member countries appear to have no predictive power in exits from currency unions (Nitsch, 2004).

Rose (2007) applies a Multivariate Panel Probit estimation in order to identify the main characteristics that affect the probability of a country to leave a monetary union. The author uses a sample of 69 countries, territories and other entities that have left currency unions and 61 entities that have remained within a currency union, between 1946 and 2005.

First, regarding the 69 countries that have left a currency union, about 10% withdraw from their currency union before they got the political independence, and about 20%, before exiting, waited at least a decade after the political independence. This means, according to Rose (2007), that there is a weak link between monetary and political independence. So, according to the author, the problem may be in on the macroeconomic variables. Consequently, as Nitsch (2004), Rose (2007) relies on the OCA theory to identify possible factors that may help to explain currency union exits. First, the problem with handling asymmetric cyclic shocks can be handled with fiscal policy, so it is important to understand the role of government spending (Rose, 2007). Second, the trade in the economy needs a special attention too, once more open economies benefit more from currency unions due to transactions costs savings. Finally, the creation and operation of a monetary institution

require high levels of expenditures, meaning that, according to Rose (2007), and, for instance, Alesina and Barro (2002), richer and larger countries can easily handle with these expenses. Therefore, size (in terms of population) and income are important factors to consider. Besides that, since exit countries need to establish a new monetary framework, Rose (2007) also examines inflation and money supply growth.

Hence, in his study Rose (2007) uses as the dependent variable a dummy variable (Out/In) which is 1 for countries that are not in a currency union and 0 for countries inside a currency union. The independent variables are also divided as follows: (1) macroeconomic indicators (*e.g.* population, real GDP per capita, inflation, investment (% of GDP)); (2) financial variables (*e.g.* money supply (M_1) growth (%)); (3) fiscal variables (*e.g.* the percentage of GDP spent directly by the government, government budget imbalance (% of GDP and positive for surplus)); (4) openness variables (*e.g.* trade (% of GDP), trade imbalance (% of GDP)); and (5) institutional variables (*e.g.* political (in)dependence, polity variable for evaluating the degree of autocratic/democratic state).

The main conclusions of Rose (2007) are that income and size of the country are positively associated with flexible exchange rates, which is in line with Alesina and Barro (2002) but in disagreement with Nitsch (2004), relative to output. Countries with larger government-sizes and more democratic are more likely to leave a currency union, even if they can more easily deal with asymmetric shocks. The inflation rate has also an important impact, being higher in countries that have left a union. This result seems to be in accordance with Nitsch's (2004). Though, according to Alesina and Barro (2002), countries that have a history of high inflation have the strongest incentive to give up their own currencies and join a currency union. We can conclude that even if these two arguments might seem contradictory they can coexist, because one refers to countries that are already in a currency union (Nitsch, 2004; Rose, 2007) and another refers to countries that have their own currencies and are not in a currency union (Alesina and Barro, 2002).

A summary of the significant variables used by the authors is shown in Table 1.

Table 1 – Summary of the significant variables

Variable	Author(s)
Inflation	Nitsch (2004), Rose (2007)
Trade	Nitsch (2004)
Trade Imbalance	Rose (2007)

Independence (Political union)	Nitsch (2004)
GDP per capita	Rose (2007)
Population	Rose (2007)
Polity	Rose (2007)
Government spending	Rose (2007)

Source: Author's own computation.

Even taking into account these variables and the weight that they may have on the exit decision, as Eichengreen (2010) states, different countries with different realities can make the decision to exit EMU. According to Athanassiou (2009) an exit from EMU implies: i) the reintroduction of the old national currency or creation of a new one; ii) the recovery of the contribution made by the National Central Bank (NCB) to the ECB (European Central Bank) capital, and refund of its foreign reserve assets transferred to the Eurosystem; and iii) the transfer of the full monetary sovereignty back to the NCB.

However, the reasons behind this choice will probably not be the same. Eichengreen (2010) takes as an example Portugal and Germany to present two distinct scenarios of exit from the EMU. First, we can see Portugal departure from EMU and reintroducing its currency (Escudo) in order to create a big real depreciation in direction to full employment, because of its high labor costs and slow economic growth (Eichengreen, 2010). On the other side, German government can take the same decision and reintroduce its currency (Deutschemark) with the objective to avoid excessive inflation, since ECB has relaxed its commitment to price stability.

Yet, these two distinct scenarios have some aspects in common. They have some technical and legal difficulties on the national currencies reintroduction (Eichengreen, 2010).

2.4. Exit from a Currency Union: How? – The Case of EMU

In the literature, there are some suggestions about how a currency union can improve its stability and avoid a break-up or an exit from a country. Benczes (2013) argues that the original design of the EMU was not viable and, the response taken by the official authorities (for instance, the creation of the European Stability Mechanism and the Banking Union), was the right way to rescue the euro. On the other hand, Vollaard (2014) suggests that the EMU needs a fiscal union, in order to reinforce convergence between countries. The

proposal to split the euro temporarily into two currencies (a strong and a weak euro), which would fluctuate between them but stay fixed in relation to other currencies, is another idea to correct the sovereign debt crisis in the EMU and prevent exit hypotheses (Arghyrou and Tsoukalas, 2010). Dor (2011) states that this proposal would carry even more difficulties than the euro exit by some countries.

However, Watts *et al.* (2014) argue that the only viable solution to re-establish policy sovereignty is the full exit from the EMU. Now, suppose that this scenario occurs and that one or more member states decide to leave the currency union. What are the (best) strategies to enact? This is a question for which no clear answers exist (but rather suggestions) and there are only a few contributions.

According to Bootle (2012), it is more likely to occur a unilateral or a limited group of countries withdrawal[2] from the EMU, because the break-up idea is not universal among all member states. In this way, the author analyses a withdrawal by a weak country and takes Greece and its new currency drachma as an example. However, the analysis made by the author can be made for any of the PIIGS[3] countries (Bootle, 2012).

In the rest of section 2.4, it will be presented the major implications that an exit from EMU can bring and some "exit plans/routes" existing in literature that can be adopted by a country in order to exit from EMU.

2.4.1. Legal and political barriers to exit

Legal implications can be one of the main problems linked with a withdrawal from the Euro Area.

The major question that arises is that if the EMU withdrawal must be accompanied with a full exit of the EU or not. According to Athanassiou (2009), Dor (2011), Proctor (2011) and Bootle (2012) the legal base foundation of the withdrawal must be the Article 50[4] of the consolidated version of the European Union Treaty. This Article mentions that a member state has the right to leave the EU with a majority approval of the other member states, and to do so it needs to negotiate an agreement that explains all the process of its withdrawal. However, there is not any mention for a partial exit, *i.e.* exiting EMU and still

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[2] An expulsion from the EMU may be possible, however this would bring so much implications (*e.g.* legal, conceptual, and practical) that the likelihood of this to occur is close to zero (Athanassiou, 2009).
[3] PIIGS - Portugal, Ireland, Italy, Greece and Spain.
[4] See Annex A.

remaining a member of the EU. In this regard, one solution is the country which wants to withdrawal from EMU to use the Article 50 to exit EU (and implicitly EMU) and then apply to re-join EU without taking the euro as its currency. This hypothesis carries a big risk because it will need the major support from the rest of EU member states (Dor, 2011; Proctor, 2011; Bootle, 2012).

Nevertheless, governments can rely on other legal routes that allow countries withdrawal, as the application of an international treaty, namely the Articles 61[5] and 62[6] from the Vienna Convention on the Law of Treaties (Dor, 2011; Bootle, 2012). If a country cannot accomplish the obligations that were assigned in the specific Treaty, then the respective government can justify the withdrawal using the Article 61 from the Vienna Convention (Dor, 2011; Bootle, 2012). According to the authors, the Greek government, for example, could state that the evolution of the macroeconomic conditions does not allow Greece to respect all the obligations of being a member of EMU. From another point of view, if the circumstances based on the signature of the treaty drastically change, it is possible that the country justifies its withdrawal from the EMU through Article 62 (Dor, 2011). Once again, by applying this scenario to Greece, Dor (2011) states that the Greek government can argue that the disadvantages outweigh the advantages of having the euro as a currency because of its strong position, which leads to a loss of competitiveness in Greek's economy. Besides this, the Article 44[7]of the Vienna Convention allows a country to use certain conditions to withdraw from some clauses of the respective treaty but keeping with the remainder (Dor, 2011; Bootle, 2012). According to Bootle (2012), an EMU exit may (or not) force the complete exit from the EU but is expectable that an exit by a country like Greece from EMU does not bring a full exit from EU.

Regarding to political barriers, according to Eichengreen (2010), a member state that leaves the EMU with the objective to introduce its national currency due to inadequate international competitiveness, slow growth and high unemployment might have political costs. How? Being relegated to second class status in negotiations that concerns other themes and losing an important role as a respected interlocutor (*e.g.* discussions about the power of European Parliament and the European Constitution).

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[5] See Annex B.
[6] See Annex B.
[7] See Annex B.

2.4.2. The "new" currency and its exchange rate

Assuming that all the legal and political issues have been overcome, one of the major questions that a unilateral exit brings is the currency redenomination process. According to Watts *et al.* (2014), the new national currency should be introduced in a flexible exchange rate regime. Dor (2011) and Bootle (2012) suggest that a country like Greece, characterized by its high debt level and lack of competitiveness, should introduce the new drachma at parity with the euro (1:1). This can prevent retailers to round-up and make the period without the new coins and notes more controllable. However, after the full exit of the euro zone, and according to Bootle (2012), it will be necessary a devaluation of the national currency in order to restore the competitiveness that was lost during the euro path. The author argues that, in the case of Portugal and Greece, a 40% real exchange rate depreciation will be needed. Nevertheless, the author predicts that there is a good chance that this depreciation reaches even higher values (70%, or even more). To combat this situation, Bootle (2012) suggests i) an introduction of a credible fiscal and monetary framework with an inflation target, similar to the strategy of the British government just after its exit from the Exchange Rate Mechanism of the European Monetary System in 1992; and ii) a determination of a target range for the exchange rate, with the objective to guide market's expectations.

Nevertheless, Eichengreen (2010) states that much of the literature does not have a positive opinion about what devaluation can bring in this scenario (high debt level and lack of competitiveness). For example, a country like Portugal, characterized by high real wages and exchange rate dependency, may aim to reintroduce its national currency with the objective to follow an expansionary monetary policy and pushing down labor costs. However, workers will anticipate and react to these government's decisions and the only result will be a higher wage inflation, as they will demand higher wages (Eichengreen, 2010; Ritzen and Hass, 2016). Similarly in a country like Italy, where high Debt/GDP combines with slow growth to affirm the debt unsustainability, the decision to withdrawal EMU and reintroducing Lira, with the objective to adopt an inflationary monetary policy and depreciating the value of debt, would result in a fall of credit rating, an increase in interest costs and higher sovereign spreads because, as in the Portuguese example, the economic agents will anticipate and react to these government's actions (Eichengreen, 2010).

However, Eichengreen (2010) highlights that reintroducing the national currency, followed by a devaluation, can bring positive effects. Taking Portugal again as an example, if all the workers are willing to accept lower real wages and do not exist any kind of incentives

for them and for the syndicates to push the wages up to offset the increase in prices, the national currency devaluation can really lead to an increase in the price level and reduction of the real wages. This leads the economy to a full-employment equilibrium. Although, this scenario is made under the crucial assumption that the lower real wages acceptance was the result from extrinsic reasons to the economy (*e.g.* irrationality by the workers), what is very unlikely to happen (Eichengreen, 2010). So, according to Ritzen and Haas (2016), one of the major steps in order to make possible a controlled exit is an acceptance by the country authorities that the national currency devaluation implies a lower real income (measured in "Purchasing Power Parity").

Watts *et al.* (2014) conclude that the net effects of a currency depreciation are unclear. Benefits may arise from enhanced external competitiveness, but only if translated into output gains, largely dependent on export and import elasticities, inflation and the size of the export sector. On the other hand, a currency depreciation may cause negative effects because of balance sheet effects related to foreign-currency-denominated liabilities and a rise in the short-term interest rate.

Toporowski (2013) argues that even if the need of increasing external competitiveness requires depreciation of the national currency, this will inflate the value of the newly externalized euro debt and liabilities of governments' banking system. This implies a reduction in the private and public investment. So, according to Toporowski (2013), the only strategy that minimizes costs of exiting is the creation or reintroduction of a currency with a stable, or slightly appreciated, value against the euro. Thus, the euro debt can be converted into the new currency at a favorable rate. However, the benefits of a devaluated currency are lost. The author concludes that it does not exist an optimal exchange rate capable to deal with both trade and debt needs.

2.4.3. Redenomination process and the "lex monetae" principle

Another important fact is that the euro will continue to coexist with the new currency (Dor, 2011; Proctor, 2011). In this context, all the debt that was issued in euros prior to withdrawal will probably remain in euros after the exit. Thus, a devaluation proposal of the new currency will increase the debt-to-GDP ratio (Cliffe *et al.*, 2010). If a given company needs to repay its debts in euros, while its revenues are denominated in the new national currency (devalued), then its financial situation may deteriorate (Proctor, 2011; Amiel and Hyppolite, 2015).

Therefore, another main problem that comes with an exit situation is the conversion of the marketable debt securities (both public and private) into the new national currency (Dor, 2011; Bootle, 2012; Nordvig and Firoozye, 2012; Amiel and Hyppolite, 2015). So, the question that arises is in which currency the contracts will be redenominated? The answer to this question goes through the examination of the "Lex Monetae" Principle (LMP).

According to Dor (2011), Proctor (2011) and Bootle (2012), the LMP states that everything that concerns the currency of a country can legally be determined by the national government that issued it. But, taking Greece as an example, the main problem arises because the euro is both the currency of this country and the same international currency of the EMU (Bootle, 2012). So, if a withdrawal occurred and there was any mention to the "euro currency", it would be uncertain to know if it would mean the national currency of Greece at the time the payment is due or a meaning of the EMU common currency.

In the case of Greece, approximately 94% of sovereign debt is issued under the local laws (Watts *et al.*, 2014). So, this could be redenominated into the new currency, applying the LMP (Bootle, 2012).

Bootle (2012) recommends that the government could legislate in order to redenominate the private sector debt, governed by the local law, to the new national currency, mainly for financial sector debt, with the objective to reduce the risk of a banking collapse.

2.4.4. Exit strategies

According to Dor (2011) and Bootle (2012), the exit decision needs to be made in secrecy to provide an orderly and organized withdrawal, minimizing possible costs such as banks run, fall in asset prices, a large amount of capital outflows from the country and loss of consumer and business confidence. However, according to Bootle (2012), this also carries some disadvantages, like citizens dissatisfaction, because their opinions were not considered, and a cross-party political consensus, due to a possible sub-optimal exit strategy since secrecy rules out wide discussion and weakens the new policy arrangements. The author also alerts to the greater difficulty to keep such a decision in secret, in the euro case, comparative to another historical examples. Bootle (2012) states that the optimal decision is to keep the number of people who have direct access to this information as small as possible, as well as the delay between decision and publication.

In this regard, Bootle (2012) presents an exit plan for Greece with the objective to withdrawal from the EMU. Such a plan needs to respect the following steps: i) the Prime

Minister, Finance Minister and Central Bank Governor should meet to plan and discuss the exit process in secret and only notify partners from the EMU when the plan is complete; ii) before the public exit announcement, other international organizations (*e.g.* International Monetary Fund (IMF) and the world's major Central Banks) should be warned in order to be ready to support the global financial system, and all the transition made in a short, and specified, number of days; iii) just after this announcement, all the domestic banks and financial markets should be closed, and the optimal time to do that is over the weekend, to avoid bank runs; iv) reaching the D-Day (the day when the new national currency is introduced), the new currency should be introduced at parity with the euro (1:1), but the authorities should permit euro notes and coins to continue to be used for small transactions; v) right after D-Day, the government should reopen domestic banks and financial markets and redenominate its debt in the new national currency and announce its intention to renegotiate the terms of it; vi) therefore, the national Central Bank needs to be ready to inject a great amount of liquidity into the national banking system and announce a regime of an inflation target, adopt some tough fiscal rules, forbid wage indexation and continue with structural reforms in order to restore confidence.

With another point of view, Amaral (2013) states that the withdrawal needs to be announced in simultaneous by the national and international authorities, and not in secret like Bootle (2012) suggests, because such a decision would be politically unacceptable and would require the declaration of a state of exception.

According to Amaral (2013), to ensure a controlled way out from the EMU, with a particular focus on the Portuguese exit, there are five conditions that have to be met: i) all the financial applications in the Portuguese's institutions would remain their value in euros to avoid panic in the transaction to the new national currency and the government continue to pay its debt in euros; ii) the banks' balance sheets would not be harmed, implying that all the credit to companies, families and government would raise in the new national currency according to the devaluation; iii) in order to avoid a general default on the part of the debtors to the Bank, the government would replace them in the amount of the increase of the national currency debt that resulted from the devaluation; iv) Portugal would enter in the Exchange Rate Mechanism II[8], which means that the new national currency would keep in a maximum floating band of ±15% against a reference rate for the new currency relatively to

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[8] Mechanism that intends to regulate the exchange rate relations of the EMU members with the rest of the EU countries that had not adopted the single currency.

euro; v) it would require the cooperation of the government and ECB, where the first one would authorize a new loan to honor the debt and sustain the balance of payments for a year and a half (time needed until the currency devaluation has the desired effects) and the second one would commit to renovate the Portuguese banks debt and help to guide the new national currency in the floating band. If necessary, the ECB should open a temporary credit facility to Portuguese banks during the transition to the new currency.

Also supporting that the exit from the EMU should be a signaled process implemented with transparency, Vieira (2012) states that the withdrawal needs to be made in a smooth transition process[9], requiring financial help from ECB, EU and the IMF to ensure the external and debt compromises of the exiting country. According to the author, the essential measures[10] to be implemented are: i) there should be a redenomination of wages to the "new" local currency (NLC); ii) a risk spread should be applied to credit contracts which are indexed to the EURIBOR; iii) bank deposits, debts and financial contracts must continue denominated in euros; iv) public transfers need to be redenominated in the NLC; v) there must be an inflation target in terms of the NLC; vi) the remaining contracts would continue denominated in euros. Besides that, according to Vieira (2012), there are other measures that must be implemented to simplify the adjustment process, but not crucial to achieving the main objective[11] of the withdrawal, which are: (1) affixation of the prices in the NLC; (2) redenomination of taxes and public transfers in the NLC; (3) the possibility for debtors to redenominate the credit contracts to the NLC; (4) the continuity of euro currency as a payment alternative.

Watts *et al.* (2014) also present some practical steps to follow in order to withdrawal EMU. The first one should be the imposition of a currency law and definition of the conversion rates between the new currency and the euro, to restore the currency sovereignty (also as Bootle (2012), Watts *et al.* (2014) suggest that the official exit must happen over the weekend). The second one would be the redenomination of financial obligations, such as loans, bonds and derivatives.

As we can see, it is common between the authors the preoccupation and focus on the legal, political and economic implications that an EMU exit can bring. However, when the

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[9] To avoid a decline in the standard of living of the exit country and the reduction in the value of the actives of the local banking system (Vieira, 2012).

[10] The primary objective is a decrease in the real wages and an increase in the local real interest rate (Vieira, 2012).

[11] According to Vieira (2012), the aims of the exit are the current account balance and the reduction in the unemployment rate.

issue is related to how the exit should be made, step by step, on the one hand we have, for example, Dor (2011) and Bootle (2012) that supports the secrecy in all the exit arrangement and on another hand, we have, for example, Amaral (2013) and Vieira (2012) who focus on a signalized and smooth withdrawal.

However, this subject has some restrictions. There is a lack of literature regarding this theme, so this analyzes relies only on a few authors. Besides that, there is not a big diversity on the reached conclusions (*e.g.* countries covered).

3. Exiting from a Monetary Union: an Empirical Application

Recently, Estella (2015) tried to compare Spain with the conclusions that resulted from Rose (2007) and concern to countries that exited from a currency union (*e.g.*, in terms of size and democracy). The author found that Spain fits well with the characteristics of those countries that have given up, in the past, from a monetary union.

PIIGS, in general, face the same problems, which are a high debt to Gross Domestic Product (GDP) ratio, high unemployment and slow economic growth. In a first interpretation, we can extend the conclusions reached by Estella (2015) about Spain to the rest of PIIGS countries once they have similar problems. However, it is important to note that the euro is a much more relevant currency than the others which were involved with a break up in the past, and financial markets are, in these days, much more integrated and relevant (Bootle, 2012).

Therefore, in this section and with a particular focus on Portugal, we aim at empirically identifying i) the conditions that might force a country to exit from a monetary union, ii) if Portugal is, according to model forecasts, currently facing the risk of exiting from the (EMU) and iii) if the expected exit probability of this country increased after the 2008's financial crisis. In order to proceed with this analysis, we estimate a "pooled" multivariate probit model, closely following the methodology in Rose (2007) as a guideline. This model will enable the computation of the exit probability of a country from a currency union, based on the behavior of selected explanatory variables as detailed by the literature explored in the subsection 2.3. The analysis of the results, based on model estimation for a significant sample of countries, will be extrapolated to Portugal in order to predict its expected exit probability from the EMU.

In what follows, we describe the data and methodology. We then proceed with the analysis of results.

3.1. Methodology and Data

3.1.1. Description of the sample

In regards to the selection of the countries in the sample, we took the countries that belong/were part of a currency union, following the definition presented by Rose (2007):

"By "currency union" I mean essentially that a country's money was interchangeable with that of another country at a 1:1 par for an extended period of time, so that there was no need to convert prices when trading between a pair of countries. Hard fixes of exchange rates, such as those of Hong Kong, Estonia, or Denmark, do not qualify as currency unions, even if they are currency boards" (Rose, 2007, p. 1).

Therefore, we considered in the panel data sample all countries and territories that, between 1948 and 2014, were part of a currency union, during, at least, ten consecutive years. This accounted for 146 countries and territories included in the sample. This information has been collected from Lebastard (2017) and complemented by IMF (2016) and it is displayed in Annex C.

As was mentioned before, in Chapter 4, the sample in Rose (2007) covered 130 countries and territories, with data ranging between 1948 and 2005. Our sample adds to Rose's (2007) sample, 9 more years and additional 16 countries and territories. As in Rose (2007), EMU countries were not part of the sample for reasons further detailed in section 6.4. From now on, we will refer to "countries and territories" as countries, in order to simplify.

3.1.2. Selected variables and descriptive statistics

The set of variables[12] to be used in the model is based on those of Rose (2007) to which we added one more explanatory variable – public debt as a percentage of output. Below, we describe each variable, the corresponding data source and the expected effect on the exit probability according to the literature.

"Out/In" (OUT_IN) is the dependent variable of the model and has a binary nature: it takes the value of "0" when a country is IN a currency union; it takes the value of "1" when a country is no longer part of a currency union (OUT). As the objective is to compute the exit probability from a currency union, the value of "0" is only attached when a country joins a currency union for the first time in the time space 1948-2014. The periods before the first entry in a currency union are not included in the sample. Therefore, the value of "1" is only given to those countries that are no longer in a currency union but that were once part of one in the past. Countries that never were in a currency union are not considered. The information was collected from Lebastard (2017) and from the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (2016).

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[12] For more information, see section 2.3, above.

Selected explanatory variables include:

(1) "Independent" (INDEP): This variable is also displayed as a "dummy" variable which takes "0" for Dependent territories and "1" for Independent territories. By Dependent territory we mean that it does not have full political independence as a sovereign state, and by Independent territory otherwise. It is expected to have a positive effect on the exit probability because, even though there is no consensus between Nitsch (2004) and Rose (2007), the fact is that, historically, many of the exits from currency unions that occurred in the past occurred after a colony gained political independence (Nitsch, 2004). The information was taken from Rose's (2007) database and from Lebastard (2017);

(2) "Population" (POP): This variable is displayed as the natural logarithm of a country's total population. According to Alesina and Barro (2002) and Rose (2007), the size of a country has a positive impact on the exit probability. So, this variable it is expected to have the same effect in our estimation. The information was taken from the Penn World Table (PWT) and complemented by that in the World Development Indicators (WDI) and in the IMF International Financial Statistics;

(3) "Real GDP *per capita*" (RGDPPC): This variable is displayed as the logarithm of the real GDP *per capita*, chained in PPP (Purchasing Power Parity), at 2011 prices, in US (United States) dollars. As Rose (2007) states, a countries' income is positively associated with flexible exchange rates, so it is also expected to have a positive effect in this estimation. In fact, a more developed country is expected to be more disciplined and thus with less incentives to import, *e.g.*, inflation discipline from adopting a more rigid exchange rate regime; a richer country also has more means to create and operate a monetary institution (Alesina and Barro, 2002). Information on this variable was retrieved from PWT;

(4) "Public Expenditure" (GOVEXP): This variable is displayed as the general Government final consumption expenditure, as a percentage of GDP. According to Rose (2007), the public expenditure of a country has a positive impact on the exit probability. In this way, countries with higher expenditure are expected to be more likely to leave a currency union. Indeed, a stronger use of fiscal policy may reflect that the common (or leader's) monetary policy is unable to solve stabilization costs. This information was retrieved from WDI;

(5) "Investment" (INVEST): This variable is displayed as the gross capital formation, as a percentage of GDP, which is expected to have a positive effect on the exit probability.

This variable is crucially related not to present but to the future level of development of a country. Data was retrieved from WDI;

(6) "Trade" (TRADE): This variable is displayed as the country total trade, as a percentage of GDP. It is expected to have a negative effect on the exit probability, since, according to Nitsch (2004), a small percentage of trade between countries that belong to the same currency union increase the exit probability from a currency union. Indeed, according to the model of optimum currency area, a larger economic integration increases the monetary benefits from adopting a common currency (*e.g.*, the absence of exchange conversion fees) and reduces the costs of participating in a monetary union as shocks might become more symmetric. The information on this variable was retrieved from WDI;

(7) "External Balance" (EXTBAL): This variable is displayed as the external balance on goods and services, as a percentage of GDP. It is expected to have a negative effect on the exit probability. External disequilibria imply nominal rate adjustments when prices are too sticky; as pressures for depreciation imply a downward trend in nominal wages and prices under fixed exchange rates; since prices are more rigid downwards, the case for flexible exchange rates is stronger under permanent external deficits. Data on this variable was retrieved from WDI;

(8) "Government Budget Balance" (GOVBAL): This variable is displayed as the general government net lending over net borrowing (revenues minus total expenditure), as a percentage of GDP. Symmetrically to public expenditure, it is expected to have a negative effect on the exit probability. The information was retrieved from the IMF World Economic Outlook;

(9) "Inflation" (INFLATION): This variable is displayed as the growth rate of Consumer Price Index (CPI) inflation. As Nitsch (2004) and Rose (2007) state, countries with higher inflation tend to exit from currency unions as it increases the competitiveness costs when exchange rates are rigid. Thus, it is expected to have a positive effect on the exit probability. The information was retrieved from WDI;

(10) "M1" (M1): This variable stands for the growth rate of money supply. It is expected to have a positive effect on the exit probability as it proxies future pressures on inflation, as predicted by the quantitative theory of money. The information was retrieved from IMF International Financial Statistics;

(11) "Polity" (POLITY): This variable is displayed as a country polity measure, ranging from -10 (extremely autocratic state) to 10 (extremely democratic state). According to Rose

(2007), more democratic countries are more likely to leave a currency union. Hence, it is expected to have a positive effect on the exit probability. The information was retrieved from the polity data series "Polity IV" from Systemic Peace;

(12) "Government Debt" (DEBT): This variable is displayed as the general government gross debt, as a percentage of GDP. It is expected to have a positive effect on the exit probability. Relying on the optimum currency area framework, countries with high debt-to-GDP ratios may find it costly to remain in a currency union because, in face of asymmetric shocks, countries face excessive costs in incurring into additional debt and are unable to use monetary policy either for stabilization purposes or to reduce debt service costs. This variable is added to those in Rose (2007) because of the importance it had after the recent crisis, namely the 2010 sovereign debt crisis. The information was retrieved from the IMF Historical Public Debt Database.

Table 2 provides the correlation matrix between the variables, taking the whole sample (1948-2014) – individual sample, in order to conclude on possible multicollinearity problems. Table 3 and Table 4 present the set of descriptive statistics for all variables, taking the complete sample and the common sample, respectively. The common sample refers to the balanced-panel adjusted sample that only includes as observations those for which all explanatory variables are available for a given country/year.

As it can be seen from the records in Table 2, "M1" exhibits a strong correlation (0.70) with "INFLATION". Besides that, "M1" presents a significant number of gaps in the data (see Table 3): compared to the 9539 entries for the dependent variable, "M1" has only 1312 entries. This variable was thus dropped from the sample because of its high correlation with inflation and because it would restrict too much the common sample of the balanced panel.

Furthermore, the variable "INDEP" always exhibits the value of 1 (Independent) when considering the common sample. So, this means that multicollinearity occurs with the constant term(s) of the model and no volatility is introduced. Therefore, this variable was also dropped from the sample.

Besides that, it is important to note that the high mean value for "INFLATION" (about 33%) is due, for instance, to the values of inflation verified in Zimbabwe in 2006 and 2007 (about 1097% and 24411%, respectively).

Table 2 - Correlation Matrix

	OUT/IN	INDEP	POP	RGDPPC	GOVEXP	INVEST	TRADE	EXTBAL	GOVBAL	INFLATION	M1	POLITY	DEBT
OUT/IN	1	-	0.3659	0.1603	-0.0658	-0.0671	-0.0550	0.0527	-0.1623	0.1334	0.0468	0.2561	0.0653
INDEP	-	-	-	-	-	-	-	-	-	-	-	-	-
POP	0.3659	-	1	-0.3287	-0.2468	-0.2476	-0.3511	0.0089	-0.1606	0.0782	0.0211	0.2037	-0.0774
RGDPPC	0.1603	-	-0.3287	1	0.2027	0.2469	0.4108	0.5604	0.2774	-0.0881	-0.0454	-0.2691	-0.2215
GOVEXP	-0.0658	-	-0.2468	0.2027	1	0.0609	0.0179	-0.1304	-0.1091	0.1940	0.0643	-0.0914	-0.0470
INVEST	-0.0671	-	-0.2476	0.2469	0.0609	1	0.2409	-0.1107	0.0476	-0.1092	-0.0336	-0.1135	-0.1222
TRADE	-0.0550	-	-0.3511	0.4108	0.0179	0.2409	1	0.1021	0.3094	0.0167	0.0532	-0.2640	0.1734
EXTBAL	0.0527	-	0.0089	0.5604	-0.1304	-0.1107	0.1021	1	0.4000	-0.0065	0.0699	-0.3694	-0.3356
GOVBAL	-0.1623	-	-0.1606	0.2774	-0.1091	0.0476	0.3094	0.4000	1	-0.0283	0.0763	-0.2851	-0.1552
INFLATION	0.1334	-	0.0782	-0.0881	0.1940	-0.1092	0.0167	-0.0065	-0.0283	1	0.7007	0.0174	0.0509
M1	0.0468	-	0.0211	-0.0454	0.0643	-0.0336	0.0532	0.0699	0.0763	0.7007	1	-0.0363	0.0387
POLITY	0.2561	-	0.2037	-0.2691	-0.0914	-0.1135	-0.2640	-0.3694	-0.2851	0.0174	-0.0363	1	0.0678
DEBT	0.0653	-	-0.0774	-0.2215	-0.0470	-0.1222	0.1734	-0.3356	-0.1552	0.0509	0.0387	0.0678	1

Source: Author's own Computation.

Table 3 - Descriptive Statistics (Individual Sample)

Variable	Observations	Mean	Std. Dev.	Min	Max
OUT_IN	9539	0.28378	0.45086	0	1
INDEP	9715	0.52877	0.49920	0	1
POP	6611	13.74084	2.40161	8.38389	19.03881
RGDPPC	4401	3.58738	0.62346	1.53210	6.66205
GOVEXP	3657	17.08561	10.01279	2.04712	163.57930
INVEST	3601	22.38771	12.82310	-2.42436	219.06940
TRADE	4074	83.64908	56.92843	0.02010	860.80000
EXTBAL	4159	-9.22680	24.51662	-344.75080	81.69724
GOVBAL	2205	-2.77290	22.24285	-557.49900	122.18800
INFLATION	3539	20.57954	420.37090	-35.83668	24411.03000
M1	1312	0.42235	1.36170	-.43445	13.55132
POLITY	3927	-1.74943	6.58232	-10	10
DEBT	3665	61.30607	63.58927	0.00391	784.35100

Source: Author's own computation.

Table 4 - Descriptive Statistics (Common Sample) with M1 dropped

Variable	Observations	Mean	Std. Dev.	Min	Max
OUT_IN	1259	0.63066	0.482818	0	1
INDEP	1259	1	0	1	1
POP	1259	15.70011	1.48610	12.83741	19.03881
RGDPPC	1259	3.57826	0.56258	1.99639	5.19542
GOVEXP	1259	15.25449	6.22046	2.73606	76.22213
INVEST	1259	24.12301	15.94314	1.09681	219.06944
TRADE	1259	85.26016	60.15854	0.17500	531.73744
EXTBAL	1259	-7.31512	26.76894	-344.75077	49.76069
GOVBAL	1259	-3.04260	25.87607	-557.49900	43.30300
INFLATION	1259	32.82781	698.45600	-35.83668	24411.03081
POLITY	1259	0.40588	6.24090	-10	10
DEBT	1259	63.42963	54.42595	0.47441	523.38200

Source: Author's own computation.

3.1.3. Model's specification

As mentioned before, the model that it will be used is a binary choice model, in particular, a "pooled" multivariate probit model. This type of model is commonly used in situations where the dependent variable is a qualitative variable and only exists two possible choices, mutually exclusive (in this case, "0" means that a country is IN a currency union and "1" means that a country is OUT of a currency union).

According to Greene (2011), the binary choice model is motivated as latent variables specification, being this result from the latent variable represented as follows:

$$y_{i=}^* x_i'\beta + \epsilon_i \tag{6.1}$$

where: $i = 1,...,n$; ϵ_i is a random perturbance; $\epsilon_i \sim N(0, \sigma^2)$.

Then, the observed dependent variable is determined by whether y_i^* exceeds a threshold value:

$$y_i = \begin{cases} 1, if & y_i^* > 0 \\ 0, if & y_i^* \leq 0 \end{cases} \quad i = 1,...,n \tag{6.2}$$

Thus, the probabilities of the response variable are:

$$P(y_i = 1|x_i) = P(y_i^* > 0|x_i) = P(\epsilon_i > -x_i'\beta|x_i) = P(\epsilon_i < x_i'\beta|x_i) = F(x'\beta) \tag{6.3}$$

where F=Φ and Φ is the cumulative distribution function of the standard normal distribution. This function is represented as follows:

$$\Phi(w) = \int_{-\infty}^{w} \frac{1}{\sqrt{2\pi}} exp\{-\frac{1}{2}t^2\}dt. \tag{6.4}$$

Thus, the probit model is a regression given by:

$$E(y_i|x_i) = \Phi(x_i'\beta) \tag{6.5}$$

Relatively to the interpretation of the coefficient values, there is not a direct interpretation because they cannot be straightly interpreted as the marginal effect on the dependent variable. So, the marginal effect of x_i in the conditional probability is computed through using

$$\frac{\partial P(y_i = 1|x_i)}{\partial x_i} = \frac{\partial E(y_i|x_i)}{\partial x_i} = \Phi(x_i'\beta)\beta \tag{6.6}$$

Thus, a change of one unit in x_i increases probability of $y_i = 1$ in $\Phi(x_i'\beta)\beta$ points.

3.2. Analysis of Results

3.2.1. Pooled *vs* random effects (RE) *vs* fixed effects (FE)

Using *Stata v.14.2 software*, we estimated both a pooled model (Table 5) against a RE panel data model (Table 6). Indeed, the latter model clearly exhibits that panel-level variance component is important, as shown by the log-likelihood ratio test in the bottom of the output (Table 6, line 15) and thus a panel probit should be estimated. However, data is not a random draw from a large sample as it covers for the countries that have actually engaged in monetary unions since 1948. So, apparently, on the one hand, unobserved heterogeneity would come from country-specific fixed effects than from country-specific error-term effects; on the other hand, it is likely to expect country-specific error component to be correlated with regressors since cross-sections are not random drawings from a larger sample (*e.g.*, lack of international credibility - absent - is related to weak economic performance indicators in the model). In this case, FE panel data model would be more appropriate and RE estimators would be biased (Gujarati, 2003).

However, FE model is not available for computation in panel probit using *Stata*. So, we defined alternative dummies to capture country-specific fixed effects in regular "pooled" probit estimation. As we can see in Annex D, this probit estimation with alternative dummies[13] shows that, indeed, fixed effects exist between these regions of countries. We can say that, *e.g.*, countries from Asia, in average, have a bigger probability to exit from a currency union than those from Africa in 0.07365[14] percentage points and countries from America, in average, have a lower probability to exit from a currency union than those from Africa in 0.10549[15] percentage points.

Even defining alternative dummies to capture country-specific fixed effects in regular "pooled" probit estimation, computation is too expensive in terms of degrees of freedom and does not allow forecasting exit probabilities for the specific case of EMU countries. In face of this trade-off, together with i) the outcomes from "pooled" probit estimation are strongly in line with what is expected from economic theory and ii) "pooled" probit estimation was followed by reference paper for our study, Rose (2007), we decided to analyze outputs from the "pooled" probit model, referring to it as the baseline model.

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[13] These dummies were allocated as follows: 1- Africa; 2- Asia; 3- America; 4-Oceania; 5- Europe.
[14] See Annex E.
[15] See Annex E.

According to Greene (2004) "pooled" estimator is the simple probit estimator that treats the entire sample as if it were a large cross section. This estimator is consistent but inefficient. So, average or expected values of the estimators are equal to the true values. However, their variance is larger, so it makes it less accurate for statistical inference, but this problem is expected to be limited given that cross-section units in the sample are close to population's.

Table 5 - Pooled probit estimation

Variable	Coefficient	Robust Std. Err.	P>|z|
POP	0.47411***	0.03436	0.000
RGDPPC	1.41871***	0.13369	0.000
GOVEXP	0.0052	0.00772	0.504
INVEST	-0.00821**	0.00413	0.047
TRADE	-0.00147*	0.00083	0.077
EXTBAL	-0.00752**	0.00308	0.015
GOVBAL	-0.00185	0.00117	0.113
INFLATION	0.00965*	0.00565	0.088
POLITY	0.03746***	0.00683	0.000
DEBT	0.00347***	0.00087	0.000
CONSTANT	-12.23132***	0.82843	0.000
McFadden pseudo R^2 = 0.2340			
Log likelihood = -635.12187			
Total observations: 1259			

Note: * (significant at 0.10); ** (significant at 0.05); *** (significant at 0.01).

Source: Author's own computation.

Table 6 - RE probit estimation

Variable	Coefficient	Std. Err.	P>|z|
POP	1.54022***	0.5012168	0.002
RGDPPC	2.93620	2.329939	0.208
GOVEXP	-0.0695462	0.0467445	0.137
INVEST	0.0718718*	0.0425254	0.091
TRADE	-0.0163106	0.0162756	0.316
EXTBAL	-0.0054728	0.0153574	0.722
GOVBAL	0.0226983	0.0288623	0.432
INFLATION	0.0021299	0.0021099	0.313
POLITY	0.013131	0.0517738	0.800
DEBT	0.0048809	0.0032268	0.130
CONSTANT	-31.164	-	-
Number of groups: 65			
Log pseudolikelihood = -86.60758			
Likelihood ratio test = 1097.03 and Prob≥chibar2 = 0.000			
Total observations: 1259			

Note: * (significant at 0.10); ** (significant at 0.05); *** (significant at 0.01).

Source: Author's own computation.

3.2.2. Assessing exit probabilities

Regarding the results on the pooled probit estimation (Table 5), eight out of the ten explanatory variables are statistically significant (within 90% of confidence). However, "government budget balance (GOVBAL)" is very close to the threshold of 10% significance level (GOVBAL is significant at 11.3% and exhibits the correct sign). The variable "Public expenditure (GOVEXP)", in contrast to the conclusions reached by Rose (2007), is not significant at 90% confidence.

Moreover, all the significant variables appear to have the expected impact (sign) on the likelihood of exiting from a monetary union. As referred before, in Section 3.1.3, the resulted coefficients cannot be directly interpreted. Thus, the computation of marginal effects is in order to assess the effect of an unit change in a given variable on the exit probability $P(Y = 1|X)$. The marginal effects of each explanatory variable are represented in Table 7, and their interpretation is as follows, "ceteris paribus": *e.g.*, an increase of 1% in real GDP *per capita*

leads to an increase, in average, of 0.40511 percentage points on the expected exit probability whereas an increase of 1 percentage point in trade as percentage of GDP leads to a decrease, in average, of 0.00042 percentage points on the expected exit probability.

Table 7 - Marginal effects

Variable	dy/dx	Std. Err.
POP	0.13538	0.00795
RGDPPC	0.40511	0.03236
GOVEXP	0.00147	0.00221
INVEST	-0.00234	0.00117
TRADE	-0.00042	0.00024
EXTBAL	-0.00215	0.00087
GOVBAL	-0.00053	0.00033
INFLATION	0.00275	0.00159
POLITY	0.01070	0.00191
DEBT	0.00099	0.00025

Source: Author's own computation.

3.2.3. Model goodness-of-fit

We have performed a Pearson χ^2-type test of goodness-of-fit. The objective is to compare actual values with fitted expected values by group. After running the test, we have got a Prob $> \chi^2 = 0.0004$, which means that the predicted probabilities from the model differ significantly from the observed probabilities in the data. So, we can conclude that our model does not fit the data well. However, this result is biased by robust standard errors.

With this, we also performed a classification table. This compares the fitted and actual values based on a 0.50 cut-off point. The overall rate of correct classification is estimated to be 74.8%.

As we can see in Table 5, the baseline model has a McFadden's pseudo R-squared equal to 0.2340. This means that only 23.4% of the results are explained by the variables that we used in the model.

Besides that, as was referred above in section 3.2.1, it was estimated a FE model to capture some country-specific effects in the baseline model (Annex D). We can see that the results from the FE model are similar to those in the baseline model, in terms of magnitude

and coefficients' signal. Only the variable GOVBAL changed from non-significant to significant at 5%. In general, these results give robustness to our baseline model.

3.3. Model Extension: the Case of Portugal in the EMU

The purpose of this section is to use the baseline model to assess the probability of Portugal to exit the EMU. Additionally, we also conjecture on how the recent economic and financial crisis may have impacted on the expected probability of Portugal leaving EMU.

In order to proceed, we first characterize the countries which exhibit a probability of exiting a currency union (forecast exit probability above 50%) and those who are expected to remain members of a currency union (forecast exit probability below 50%), based on the results from the baseline model and using the most recent data collected, 2014. Secondly, using data for Portugal, we conjecture if the country was more or less likely to exit EMU in 2014. Finally, and because the depth of the recent-past economic and financial crisis relaunched the debate on the sustainability of the EMU, we also assess the impacts the economic and financial crisis had on the expected exit probability of Portugal from EMU.

3.3.1. Stylized conditions for exiting a currency union and the case of Portugal

First, we selected sample countries that were in a currency union in 2014 in order to compute the forecast of the corresponding expected exit probabilities. In 2014, 82 countries from the whole sample were in a currency union in 2014. However, we only have complete data, for that year, and for all the variables, for 22 out of those 82 countries. For each of these countries, Table 8 depicts the corresponding expected exit probabilities.

We then proceed with splitting these countries into two groups: one group for those countries exhibiting an expected exit probability lower than 50%, and other including countries to which expected exit probability is higher than 50%. Since only 7 out of 22 countries that have an expected exit probability below 50%, we decided to use, instead, the median as a threshold (0.55488). Group 1 includes countries with expected exit probability below 0.55488; Group 2 includes the remainder. Accordingly, country distribution is presented in Table 9.

After this, we computed[16] the median values for all the ten explanatory variables for both groups. The purpose was to check whether the Portuguese profile is more identical to that of Group 1 or of Group 2 and, hence, to conclude about its exit probability. Note that, despite of exhibiting, on average, higher inflation and debt and lower government budget and external balances, countries in Group 1 have lower exit probabilities than those on Group 2. From the records in Table 10, Portugal's profile is more identical to those countries of group 2. So, we can conclude that, in 2014, Portugal had an expected exit probability higher than 0.55488. This might even be reinforced by out-of-sample records of much higher debt and government deficits, while mitigated by the lower inflation and positive external balance records.

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[16] See Table 10.

Table 8 - Countries belonging to a currency union in 2014 and the respective expected exit probabilities

Country	Expected exit probability in 2014
Benin	0.6351
Bhutan	0.52674
Burkina Faso	0.67684
Cameroon	0.10132
Central African Republic	0.19278
Chad	0.52973
Congo	0.38200
Ecuador	0.87181
El Salvador	0.78427
Equatorial Guinea	0.30426
Gabon	0.56246
Ivory Coast	0.79205
Lesotho	0.51380
Liberia	0.46369
Namibia	0.73086
Niger	0.54731
Qatar	0.89641
Senegal	0.77612
Swaziland	0.26877
Togo	0.38274
United Arab Emirates	0.92602
Zimbabwe	0.73444

Source: Author's own computation.

Table 9 – Group definition based on median expected exit probability

Group 1	Group 2
Bhutan	Benin
Cameroon	Burkina Faso
Central African Rep	Ecuador
Chad	El Salvador
Congo	Gabon
Equatorial Guinea	Ivory Coast
Lesotho	Namibia
Liberia	Qatar
Niger	Senegal
Swaziland	United Arab Emirates
Togo	Zimbabwe

Source: Author's own computation.

Table 10 - Groups variables sample mean compared to Portugal (2014)

	Group 1	Group 2	Portugal
POP	15.30171	15.70803	16.15754 (2)
RGDPPC	3.30134	3.91127	4.43212 (2)
GOVEXP	14.65722	18.07949	18.60756 (2)
INVEST	27.99690	25.39681	15.30302 (2)
TRADE	90.40526	89.94225	79.95976 (2)
EXTBAL	-14.49826	-5.85143	0.18899 (2)
GOVBAL	-3.69245	-0.26145	-7.16600(1)
INFLATION	5.09282	2.24178	-0.27815 (2)
POLITY	-0.90909	3.09091	10 (2)
DEBT	39.64257	38.91495	130.16539 (1)

Notes: The group number towards which the values for Portugal are closer to is presented in brackets

in the last column of the table.

Source: Author's own computation.

3.3.2. The impact of the recent economic and financial crisis on Portugal's expected exit probability

As mentioned in the introduction of this dissertation, the 2008's financial crisis launched the debate about the possible exit from the EMU of some of its member states. In this context, we will try to understand how this crisis might have changed Portugal's expected exit probability.

First, we computed, for Portugal, the annual change in the variables capturing the determinants of the exit probability, starting in 2000 (from EMU's inception onwards). Then, we multiplied these changes by the marginal effects we got from the baseline model presented in Table 7. This gives us the change in the expected exit probability caused by the variation of each particular variable. Finally, we summed all the effects to account for the total change (in percentage points) on the expected exit probability, in a given year. Results on the latter are displayed in Table 11, including or not, the marginal effects from debt changes.

In the four years after the financial crisis (2008), and including debt effects, Portugal's expected exit probability from EMU has always increased by more than one percentage point, with a reduction only in 2013. We can also see that public debt accounts for a strong positive impact on this increase. Between 2000 and 2014, public debt dramatically changed from around 50% to around 130% of GDP.

In Figure 1 we can have a comparative perspective of the evolution of the expected exit probability with and without the contribution of public debt. Between 2001 and 2006 both series practically followed the same path. Thus, the contribution of the ratio of debt-to-GDP to the overall change on the expected exit probability did not have a significant impact. However, one year before the crisis and in the following years, this scenario clearly changed. Between 2011 and 2013, if the ratio of debt over GDP had been kept constant, the expected exit probability would have decreased by 1.8 percentage points; instead it (predicted) increase was of roughly 1.6 percentage points. Since 2006 (two years before the crisis), if the ratio of debt over GDP had been kept constant, the expected exit probability would have increased only about 1.1 percentage points; instead, it was predicted to increase about 7.8 percentage points, considering debt effects.

Table 11 - Total effect on the expected exit probability of Portugal (percentage points)

Year	With Debt	Without Debt
2001	1.05055	0.78240
2002	0.29363	0.03513
2003	0.31334	0.11339
2004	-0.08920	-0.26332
2005	2.55391	2.05179
2006	0.13367	0.22415
2007	1.16359	0.48858
2008	0.51622	0.19682
2009	1.36108	0.17908
2010	2.16934	0.92490
2011	1.26021	-0.24477
2012	1.11079	-0.35597
2013	-0.49577	-0.77199
2014	0.56924	0.45399
Total effect since 2006	7.78837	1.09478

Source: Author's own computation.

Figure 1 - Annual changes in Portugal's expected exit probability from EMU
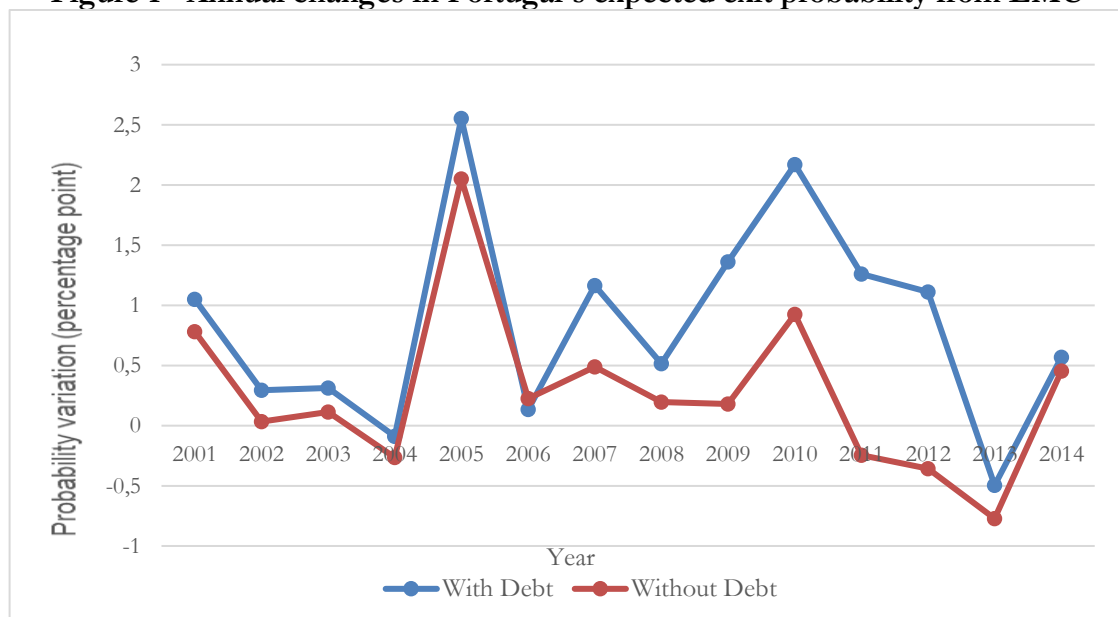
Source: Author's own computation

3.4. The Reason for Excluding EMU Countries from the Baseline Model

Consider now the inclusion of the EMU countries[17] in the sample to estimate the "pooled" probit model.

In general, the results are not robust when we introduce Euro area member-states in the sample. The countries are structurally different, with, *e.g.,* larger levels of GDP *per capita* and of public debt. Moreover, although being a small group of countries, they are highly interdependent as they belong to the same union (and none ever left), as argued by Rose (2007). This causes the quality of adjustment to drop substantially. The Pseudo R^2 changed from 0.2340 to just 0.0742 (see Table 12) and the model succeeds on the correct prediction of only 60.72% of the cases.

If we compare the coefficients from this estimation (Table 12) with those from baseline (Table 5), we conclude that POP, RGDPPC and INFLATION are robust, since they continue significant at 10% level and keep the same signal. However, *e.g.,* DEBT is not significant anymore at 10% level and the signal of the estimated coefficient changed. This variable is very high in European countries, especially during and in the post-crisis periods and countries did not withdrawal from EMU. Besides that, POLITY, even though it remained significant the signal changed because these countries are democratic but have always been in a monetary union since its inception.

Table 13 shows the probability forecast using the baseline model to each EMU country, for 2014. We can see that the expected exit probabilities, besides being almost of 100% are too identical among these state members (it only differs for the case of Luxembourg, a very small country). Model successful prediction for exiting the EMU is thus of 0%.

Indeed, the inclusion in the sample of 12 countries belonging to the EMU strongly biases baseline results because they are very dependent and reduce sample volatility. There are apparently reasons beyond the purely economic ones that determine the permanence of these countries in the EMU.

We also tried to introduce EMU countries in the FE model, however the output is totally identical to that shown in Annex D. The software (*Stata*) omits the variable for Europe

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[17] We only have into account the countries that had the euro as their national currency for at least ten years before 2014.

countries because it can predict "failure" perfectly (as we stated before, there was no exit from EMU so far).

Table 12 - Pooled probit estimation including EMU countries

Variable	Coefficient	Robust Std. Err.	P>|z|
POP	0.1678908 ***	0.0266707	0.000
RGDPPC	0.1534631*	0.0928397	0.098
GOVEXP	-0.0302297***	0.0075129	0.000
INVEST	-0.0056001	0.0036113	0.121
TRADE	-0.0006069	0.0006756	0.369
EXTBAL	-0.0027793	0.0023679	0.241
GOVBAL	0.0017758	0.0015935	0.265
INFLATION	0.013551*	0.0074106	0.067
POLITY	-0.0242447 ***	0.005767	0.000
DEBT	-0.0009484	0.0007012	0.176
CONSTANT	-2.438125	0.5629375	0.000
Pseudo R^2 =0.0742			
Log likelihood = -925.12479			

Source: Author's own computation.

Table 13 – Exit probability forecast for EMU countries in 2014

Country	Probability Forecast
Austria	0.99104
Belgium	0.98134
Finland	0.98106
France	0.99961
Germany	0.99969
Greece	0.99543
Ireland	0.97429
Italy	0.99967
Luxembourg	0.67796
Netherlands	0.99534
Portugal	0.99192
Spain	0.99904

Source: Author's own computation.

4. Conclusion

This dissertation intends to review the main determinants for joining/withdrawal from a monetary union and collect and group the available exit strategies from a currency union (in particular from the EMU). In contrast with the former, the latter issue is rather unexplored and non-comprehensively reviewed among the related literature.

According to Buiter (1999), there must be present one of the next six characteristics, among the respected countries, in order to build an OCA: 1) high degree of labor mobility; 2) low degree of nominal rigidity in domestic prices; 3) high degree of trade openness across countries; 4) similarity of economic structures; 5) well diversified production structures and 6) existence of supranational fiscal tax-cum-transfer mechanisms. However, even that a country decides to join a currency union, in the future, can be reached to the conclusion that the respective costs are higher than the benefits.

In this way, in an exit context and with a particular focus on EMU, we found that worries on the legal, political and economic implications that a withdrawal from the EMU can entail are common in the literature. Most of the related literature analysis focuses on Greece, because of the increased risk the recent crisis triggered on its exit. Formally, to withdraw, a country must use the Article 50 to exit EU and then apply to re-join EU, but without taking the euro as a currency. Second, there is a consensus regarding the exchange rate regime to adopt: it must be in a flexible one. However, there is no unanimity on whether there should be an appreciation or a depreciation of the new national currency. Bootle (2012) defends that a country like Greece needs to depreciate its new currency against the euro to restore its competitiveness. But according to Toporowski (2013), this depreciation would inflate the value of Greek debt, even taking account the needs for increasing external competitiveness. So, according to the author, the new currency should be introduced with a stable, or appreciated, value against the euro.

Some of the literature also focuses on how an exit should be made in practice. Some authors support the need for keeping secret throughout the entire exit arrangement, *e.g.* Dor (2011) and Bootle (2012), to minimize possible costs like banking runs or fall in asset prices. Although, Amaral (2013) and Vieira (2012) argue in favor of a signalized and smooth withdrawal. One argues that an exit made in secret would be politically unacceptable and it would be necessary the declaration of a state of exception, and the other states that a signaled and smooth transition exit process could avoid a decline in the standard of living of the exit country.

In the second part of this dissertation, the ultimate objective is to analyze the feasibility of Portugal to be part of the EMU and how the 2008's financial crisis shaped its expected exit probability from EMU. In order to accomplish this, we need a model to predict exit probabilities from monetary unions. Thus, we set a "pooled" probit estimation following Rose (2007), where a set of ten literature-based variables were used to explain exit probability as a latent, dependent variable. Collected data covers 145 countries and territories from 1948 to 2014, but data for estimation include only 1259 observations out of 9715 total entries, due to existing gaps. EMU countries were not accounted for in the baseline model because the results were not robust, and the model performed substantially worse since EMU countries are structurally different from the remainder in the sample (mainly countries from Africa and American islands) and skew the results.

We conclude, as expected, that smaller (in terms of population) and more autocratic countries, with smaller GDP *per capita*, lower inflation rates and lower debt (as a percentage of GDP), have a lower probability of exiting from a monetary union. However, countries with lower trade, lower investment, lower external balance and lower government budget balance (all these variables as a percentage of GDP), have a higher probability of exiting from a monetary union.

Using exit probability forecasts for the countries in the sample that were members of a currency union in 2014, we split countries into two groups, with high and low than average exit probability. We then characterize each group regarding the determinants for exiting a monetary union. We find that using data for 2014, Portugal profile was close to that of sample countries with an expected exit probability higher than 0.555. We also found that the financial crisis of 2008 had a positive impact on the expected probability of Portugal exiting from EMU. Moreover, if we do not consider the impact of the changes on the debt-to-GDP ratio, the expected exit probability would have decreased in 2011 and 2012. We can conclude that despite all the effort made by the Portuguese political authorities to cope with the crisis, if it there is no stabilization in this ratio or even a reduction, this probability may continue to increase, making eminent an exit situation.

This study has, however, some limitations. First, there are not many studies that focus on how a country can make a successful withdrawal from a currency union, and thus this analysis relies only on very few authors. Second, in regard to the empirical application, also only very few studies assess the probability of a country to exit from a currency union. Moreover, there are a lot of gaps in the sample which crucially reduces potential sample to a

common sample for balanced-panel estimation. Unbalanced-data panel estimation, accounting for country-specific fixed effects, is clearly an avenue for a future better assessment of exit probabilities. Finally, we followed the definition of currency union as in Rose (2007) and did not use EMU countries in the baseline sample. However, for future research, the sample can be extended over the Bretton Woods agreement and the Monetary Snake periods, further including, *e.g.*, conventional pegs and horizontal bands, in order to investigate, for example, the probability of a country to give up a peg.

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Annexes

Annex A - Article 50 from the consolidated version of the European Union Treaty

Article 50

1. Any Member State may decide to withdraw from the Union in accordance with its own constitutional requirements.

2. A Member State which decides to withdraw shall notify the European Council of its intention. In the light of the guidelines provided by the European Council, the Union shall negotiate and conclude an agreement with that State, setting out the arrangements for its withdrawal, taking account of the framework for its future relationship with the Union. That agreement shall be negotiated in accordance with Article 218(3) of the Treaty on the Functioning of the European Union. It shall be concluded on behalf of the Union by the Council, acting by a qualified majority, after obtaining the consent of the European Parliament.

3. The Treaties shall cease to apply to the State in question from the date of entry into force of the withdrawal agreement or, failing that, two years after the notification referred to in paragraph 2, unless the European Council, in agreement with the Member State concerned, unanimously decides to extend this period.

4. For the purposes of paragraphs 2 and 3, the member of the European Council or of the Council representing the withdrawing Member State shall not participate in the discussions of the European Council or Council or in decisions concerning it.

A qualified majority shall be defined in accordance with Article 238(3)(b) of the Treaty on the Functioning of the European Union.

5. If a State which has withdrawn from the Union asks to rejoin, its request shall be subject to the procedure referred to in Article 49.

Annex B – Article 44, 61 and 62 from the Vienna Convention on the Law of Treaties

Article 44 - Separability of treaty provisions

1. A right of a party, provided for in a treaty or arising under article 56, to denounce, withdraw from or suspend the operation of the treaty may be exercised only with respect to the whole treaty unless the treaty otherwise provides or the parties otherwise agree.

2. A ground for invalidating, terminating, withdrawing from or suspending the operation of a treaty recognized in the present Convention may be invoked only with respect to the whole treaty except as provided in the following paragraphs or in article 60.

3. If the ground relates solely to particular clauses, it may be invoked only with respect to those clauses where: (a) The said clauses are separable from the remainder of the treaty with regard to their application; (b) it appears from the treaty or is otherwise established that acceptance of those clauses was not an essential basis of the consent of the other party or parties to be bound by the treaty as a whole; and (c) continued performance of the remainder of the treaty would not be unjust.

4. In cases falling under articles 49 and 50 the State entitled to invoke the fraud or corruption may do so with respect either to the whole treaty or, subject to paragraph 3, to the particular clauses alone.

5. In cases falling under articles 51, 52 and 53, no separation of the provisions of the treaty is permitted.

Article 61 - Supervening impossibility of performance

1. A party may invoke the impossibility of performing a treaty as a ground for terminating or withdrawing from it if the impossibility results from the permanent disappearance or destruction of an object indispensable for the execution of the treaty. If the impossibility is temporary, it may be invoked only as a ground for suspending the operation of the treaty.

2. Impossibility of performance may not be invoked by a party as a ground for terminating, withdrawing from or suspending the operation of a treaty if the im possibility is the result of a breach by that party either of an obligation under the treaty or of any other international obligation owed to any other party to the treaty.

Article 62 – Fundamental change of circumstances

1. A fundamental change of circumstances which has occurred with regard to those existing at the time of the conclusion of a treaty, and which was not foreseen by the parties, may not be invoked as a ground for terminating or withdrawing from the treaty unless: (a) the existence of those circumstances constituted an essential basis of the con sent of the parties to be bound by the treaty; and (b) the effect of the change is radically to transform the extent of obligations still to be performed under the treaty.

2. A fundamental change of circumstances may not be invoked as a ground for terminating or withdrawing from a treaty: (a) if the treaty establishes a boundary; or (b) if the fundamental change is the result of a breach by the party invoking it either of an obligation under the treaty or of any other international obligation owed to any other party to the treaty.

3. If, under the foregoing paragraphs, a party may invoke a fundamental change of circumstances as a ground for terminating or withdrawing from a treaty it may also invoke the change as a ground for suspending the operation of the treaty.

Annex C - Countries of interest

Country/Territory	Currency Union	Peg 1:1	Year
Algeria		FF	1948-1963
American Samoa	USD		1948-2014
Andorra	FF, PST, EURO		1948-2014
Angola		ESC	1948-1975
Anguilla (UK)	ECD		1948-2014
Antigua and Barbuda	ECD		1948-2014
Aruba	CAC		1948-1985
Bahamas		PSTER, USD	1948-1965; 1971-2014
Bahrain	IR	IR	1948-1965
Bangladesh	PR		1948-1971
Barbados	ECD	ECD	1948-1975
Benin	CFAXOF		1948-2014
Bermuda	PSTER, USD		1948-2014
Bhutan	IR		1948-2014
Bonaire, Sint Eustatius and Saba (Netherlands)	CAC		1948-2010
Bosnia and Herzegovina		GDM	1948-1999
Botswana	SAR	PSTER	1948-1976
British Indian Ocean	PSTER, USD	IR	1948-2014
Brunei	MD	MD	1948-2014
Burkina Faso	CFAXOF		1948-2014
Burundi		BF	1948-1963
Cameroon	CFAXAF		1948-2014
Cape Verde	ESC	ESC	1948-1976

Cayman Islands (UK)	ECD, JMD		1948-1972
Central African Rep	CFAXAF		1948-2014
Chad	CFAXAF		1948-2014
Christmas Island (Australia)	AD, MD		1948-2014
Comoros	CFAXMCF		1948-1993
Congo	CFAXAF	BF	1948-2014
Cook Islands (New Zealand)	NZD		1948-2014
Cuba		USD	1948-1958; 1986-2014
Curaçao (Netherlands)	CAC		1948-2014
Dominica	ECD		1948-2014
Dominican Republic		USD	1948-1984
Ecuador	USD		2001-2014
El Salvador	USD		2001-2014
Equatorial Guinea	CFAXAF, PST	PST	1948-2014
Faeroe Islands (Denmark)	DK		1948-2014
Falkland Islands (UK)	PSTER		1948-2014
Fiji		PSTER	1948-1968
French Guiana (France)	FF		1948-2014
French Polynesia (France)	CFPF	CFPF	1948-2014
Gabon	CFAXAF		1948-2014
Gambia		PSTER	1948-1971
Ghana		PSTER	1948-1965
Gibraltar (UK)	PSTER		1948-2014
Greenland (Denmark)	DK		1948-2014
Grenada	ECD		1948-2014
Guadeloupe (France)	FF	FF	1948-2014

Guam	USD		1948-2014
Guernsey (UK)	PSTER		1948-2014
Guinea	CFAXOF		1948-1959
Guinea Bissau	CFAXOF, ESC	ESC	1948-1976; 1997-2014
Guyana		ECD, USD	1948-1970
Iraq		PSTER	1948-1966
Isle of Man (UK)		PSTER	1948-2014
Ivory Coast	CFAXOF		1948-2014
Jamaica	ECD, JD		1948-1969
Jersey (UK)		PSTER	1948-2014
Jordan		PSTER	1948-1966
Kenya	EACA		1948-1977
Kiribati	AD		1948-2014
Kosovo	GDM, EURO		1948-1998; 2002-2014
Kuwait	IR	IR, PSTER	1948-1966
Lesotho	SAR	PSTER	1948-2014
Liberia	USD		1948-2014
Libya	EP	PSTER	1948-1966
Liechtenstein	SF		1948-2014
Madagascar	CFAXMCF		1948-1981
Malawi		PSTER	1948-1970
Maldives	PSTER	PK, IR	1948-1975
Mali	CFAXOF		1948-1961; 1984-2014
Marshall Island	USD		1948-2014
Martinique (France)	FF, EURO	FF	1948-2014
Mauritania	CFAXOF		1948-1972

Mauritius		IR	1948-1965
Mayotte (France)	CFAXMCF	FF	1948-2014
Micronesia	USD		1948-2014
Montserrat (UK)	ECD		1948-2014
Morocco	FF, PST		1948-1959
Mozambique		ESC	1948-1976
Myanmar		PK, IR	1948-1970
Namibia	SAR	SAR	1948-2014
Nauru	AD		1948-2014
Nepal	IR		1948-1965
New Caledonia (France)	CFPF	CFPF	1948-2014
New Zealand		PSTER	1948-1967
Niger	CFAXOF		1948-2014
Nigeria	PSTER	PSTER	1948-1966
Niue (New Zealand)	NZD		1948-2014
Norfolk Island (Australia)	AD		1948-2014
Northern Mariana Islands (USA)	USD		1948-2014
Oman	IR	IR	1948-1965
Pakistan	IR		1948-1949; 1956-1966
Palau	USD		1948-2014
Palestine	INS		1948-2014
Panama	USD		1948-2014
Papua New Guinea	AD		1948-1975
Pitcairn Islands (New Zealand)	NZD		1948-2014
Puerto Rico (USA)	USD		1948-2014
Qatar	IR, QDR	IR, QDR	1948-2014

Reunion (France)	CFAXCFG, FF		1948-2014
Samoa		PSTER	1948-1967
San Marino	IL		1948-2014
Sao Tome & Principe		ESC	1948-1977
Saudi Arabia		PSTER, QDR	1948-1966
Senegal	CFAXOF		1948-2014
Seychelles		MR, IR	1948-1975
Sierra Leone	PSTER		1948-1965
Singapore	MD		1948-1966
Sint Maarten (Netherlands)	CAC		1948-2014
Solomon Islands	AD		1948-1978
Somalia		EACA	1948-1971
South Africa		PSTER	1948-1960
South Georgia and the South Sandwich Islands (UK)	PSTER		1948-2014
South Sudan	EP		1948-1961
Sri Lanka		IR	1948-1965
St. Helena (UK)		PSTER	1948-2014
St. Kitts and Nevis	ECD		1948-2014
St. Lucia	ECD		1948-2014
St. Pierre and Miquelon (France)	CFAXCFG, FF, EURO		1948-2014
St. Vincent	ECD		1948-2014
Sudan	PSTER	PSTER	1948-1961
Suriname		CAC	1948-1994
Svalbard and Jan Mayen	NK		1948-2014
Swaziland	SAR		1948-2014
Tanzania	EACA	EACA	1948-1977

Timor Leste	USD		1948-2014
Togo	CFAXOF		1948-2014
Tokelau (New Zealand)	NZD		1948-2014
Tonga	AD		1948-1990
Trinidad and Tobago	ECD, PSTER	ECD	1948-1975
Tunisia	FF		1948-1959
Turks and Caicos Islands (UK)	USD	PSTER	1952-1965
Tuvalu	AD		1948-2014
Uganda	EACA	EACA	1948-1977
United Arab Emirates	IR, QDR	IR, QDR	1948-2014
United States Minor	USD		1948-2014
Vanuatu		CFPF	1948-1969
Virgin Islands (UK)	ECD, PSTER		1948-2014
Virgin Islands (USA)	USD		1948-2014
Wallis and Futuna (France)	CFPF	CFPF	1948-2014
Yemen Arab Republic	IR	EACA	1948-1971
Zambia		PSTER	1948-1966
Zimbabwe		PSTER	1948-2014

Notes: (1) AD- Australian Dollar; BF- Belgian Franc; CAC- Central America and the Caribbean; CFAXAF- Central African CFA Franc; CFAXCFG-San Pierre CFA Franc ; CFAXMCF- Madagascar/Comores CFA Franc; CFAXOF- West African CFA Fran; CFPF- Franc Pacifique; EACA- East African Currency Area; EB- Ethiopian Birr; ECD- East Caribbean Dollar; EP- Egyptian Pound; ESC- Escudo; FF- French Franc; FIP- French Indochina Piastre; GDM- German Deutsch Mark; IL- Italy Lira; INS- Israel New Sheqel; IR- Indian Rupee; JD- Jordanian dinar; JMD- Jamaica Dollar; MD- Malaya Dollar; MR- Mauritius Rupee; NG- Netherlands Guilder; NK- Norway Krone; NZD- New Zealand Dollar; PR- Pakistan Rupee; PST- Peseta; PSTER- Pound Sterling; QDR- Qatar-Dubai Riyal; SAR- South Africa Rand; SF- Swiss Franc; SR- Soviet Ruble; USD- United States Dollar.

(2) The Territories that are not independent have their respective State mentioned in brackets.

Source: Author's own computation.

Annex D – FE probit estimation without EMU countries

Variable	Coefficient	Robust Std. Err.	P>|z|
POP	0.5302213***	0.0400133	0.000
RGDPPC	1.410809***	0.1412659	0.000
GOVEXP	0.0008141	0.0080914	0.920
INVEST	-0.0072839	0.0045887	0.112
TRADE	-0.0019162**	0.0008347	0.022
EXTBAL	-0.0079387**	0.0032701	0.015
GOVBAL	-0.0029765**	0.0012592	0.018
INFLATION	0.0109467*	0.0056016	0.051
POLITY	0.0391924***	0.0073515	0.000
DEBT	0.0037371***	0.0008932	0.000
CONSTANT	-13.06682***	0.9095265	0.000
Id			
2	0.2768125**	0.1157402	0.017
3	-0.3718095***	0.1420011	0.009
4	0	-	-
5	0	-	-
Pseudo R² =0.2761			
Log pseudolikelihood = -563.59755			
Total observations: 1171			

Note: * (significant at 0.10); ** (significant at 0.05); *** (significant at 0.01).

Source: Author´s own computation.

Annex E – Marginal effects from the FE probit estimation without EMU countries

Variable	dy/dx	Std. Err.
POP	.1437416	.0077399
RGDPPC	.3824666	.0318032
GOVEXP	.0002207	.0022001
INVEST	-.0019746	.0011816
TRADE	-.0005195	.0002769
EXTBAL	-.0021522	.000784
GOVBAL	-.0008069	.0006072
INFLATION	.0029676	.000591
POLITY	.010625	.0021259
DEBT	.0010131	.0002117
ID		
2	0.0736464	0.0333546
3	-0.1054906	0.0390336
4	-	-
5	-	-

Source: Author´s own computation.