

## A Behavioural Model of European Bond Markets

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### Abstract

This paper builds a new theory of euro area sovereign bond markets. The theory explains the anomalous bond pricing and increasing spreads during the 'Euro-Crisis'. I show that the malfunctioning of euro area bond markets is triggered by asymmetric information and weak reputation in economic and fiscal policy. Both factors trigger a standard bond market to turn into turmoil. In the end, those markets are prone to self-fulfilling bubbles due to animal spirits. Consequently, mispricing of sovereign debt is inherent in the Eurozone and creates more macroeconomic instability than in a stand-alone country.

**Keywords:** Bond market; Euro area; Euro crisis; JEL-Code: G12, G15, G24

### Introduction

The European debt crisis poses serious questions on the financial theory in general and bond markets in particular. According to standard theory bond yields reflect default risk and default risk is determined by a number of fundamental variables, such as government debt-to-GDP or the current account balance. The standard theory states that a higher government debt-to-GDP ratio increases the burden of debt service and thus increases the probability of default. Since the beginning of the euro crisis in 2010, spreads of government bonds have widened considerably. Hence, the high spreads show that investors demand a higher risk premium to compensate for the potential default risks of some Eurozone member states. However, the increase in spreads has been significantly larger than the changes in the underlying fundamentals [1,2]. This raises the question of whether markets have just mispriced the current risks or orthodox bond theory is not applicable to a monetary union.

Indeed, euro area member states do not have control over their own currency. Thus, in contrast to stand-alone countries, they cannot guarantee the pay-out of bondholders. It is not remarkable that stand-alone countries with debt-to-GDP ratios equally high or even higher than the indebted European member states were not affected by a similar debt crisis. This may be evidence that mispricing of sovereign risk is augmented in a currency union. Consequently, government bond markets are more fragile and vulnerable to self-fulfilling crises in the Eurozone. Such self-fulfilling crises produce multiple equilibria including a kind of trap-equilibrium. The policy lesson is simple: A monetary union only works efficient if the institutional rules, i.e. the economic and fiscal governance, are based on market incentives or imitate the market forces of a stand-alone country [3].

The remainder of this paper is structured as follows: Section 2 is an introduction to the standard bond market and thereafter discusses the new elements of the behavioural theory. Section 3 elaborates the key mechanisms of the behavioural model in detail. Finally, Section 4 concludes the paper.

### Bond Market: Standard versus Behavioural Theory

This paper provides an in-depth study of euro area bond markets. The paper focuses on the bond market turmoil in particular during the Euro-Crisis of 2010 [4]. In normal times, bond markets follow standard supply and demand determinants. Table 1 summarizes the main supply and demand determinants of a standard bond market model. These factors determine the bond market equilibrium in normal times [3]. However, in times of turmoil the bond market reacts and behaves quite differently. I demonstrate within a new behavioural model how Eurozone bond markets have behaved during turmoil.

European sovereign bond markets are unique due to country-specific characteristics and the supranational monetary framework. As a matter of fact, every euro area country still has its own bond market based on the sovereignty of national fiscal policy. Thus, bond pricing is primarily based on domestic fundamentals such as public deficit, debt, current account balance, and growth prospects. However, the institutional linkage to the supranational framework, especially monetary policy, eliminates several important market incentives. The European Central Bank (ECB) sets a common interest rate for 18 euro area countries and thus triggers either positive or negative stimulus depending on the domestic stage of the business cycle. As opposed to the national central banks, the supranational ECB is the only institution that is able to guarantee the pay out of euro debt obligations. This unique interplay between national fiscal policy and supranational monetary policy characterizes the sovereign bond markets in Europe. In times of turmoil, the division between domestic fiscal policy and European monetary policy is an important vulnerability.

A comparison to highly indebted G7 member states such as Japan, the UK, and the US, reveals that euro area countries are less flexible and more exposed to sudden market reversals. On average, despite high

An Increase in	Demand Curve shifts to the		Supply Curve shifts to the	
	Standard Theory	Behavioural Theory	Standard Theory	Behavioural Theory
Deficit and Debt level	Left and down	Left and up	Right and down	Right and down
Expected inflation rate	Left and down	Left and up	Right and down	Right and down
Riskiness of bond	Left and down	Left and up	-	-
Expected interest rate	Left and down	Left and up	-	-
Liquidity of bond	Right and up	Right and down	-	-
Wealth	Right and up	-	-	-
Slope of Curve	Downward	Upward	Upward	Upward

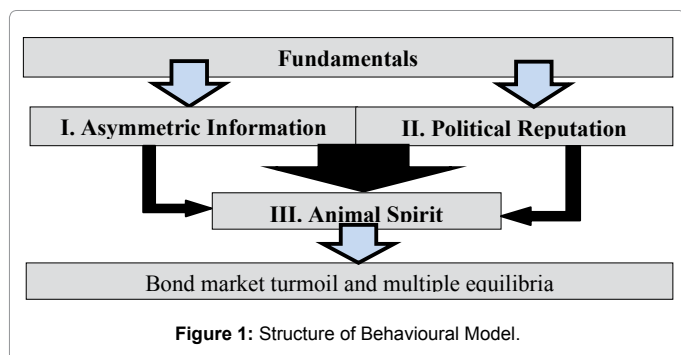
Table 1: Properties of Standard versus Behavioural Theory.

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debt-to-GDP and deficit-to-GDP levels, individual euro area countries cannot shape possible bond buying programs or implement public support for a country because of prohibition in European law. In fact, Article 123 of the Treaty on the Functioning of the European Union prohibits monetary financing, while Article 125 (the so-called “no-bailout clause”) prohibits any support for or bailout of other countries. This challenge does not exist in Japan, the UK, or the US. In addition, the US benefits from the unique safe haven status of the US dollar.

In 2010, financial markets have reassessed the creditworthiness of several euro area countries [4]. However, the relatively abrupt reversal of sovereign yields has produced a situation similar to a bank run, but in the sovereign bond market. Spreads have increased considerably and caused unprecedented turmoil for euro area countries. These self-reinforcing effects are highly contagious, creating temporary liquidity problems and evolving into an enduring solvency crisis.

The following behavioral theory develops a new model to understand this particular tipping point in the sovereign bond markets of the euro area [Figure 1]. It is obvious that the fundamentals, such as the long-term sustainability of public finances, the current account balance, and economic growth rates, are insufficient to explain the euro crisis in general [4]. It is difficult to understand why the market reaction was negligible in countries with similar or even higher deficit and debt levels, such as the UK, the US, or Japan. Therefore, I have to take into account further vulnerabilities to explain bond market reversals in the European Monetary Union (EMU). I propose the following three vulnerabilities:

**Asymmetric Information:** Countries with weak fundamentals and whose governance and accounting systems lack transparency and credibility generate high levels of asymmetric information. In the end, that may trigger market concerns and subsequently market turmoil. The economic mechanism is as follows: an increase in asymmetric information increases the transaction cost and reduces the liquidity effect of bonds. Consequently, the bond price drops and the yields rise considerably.

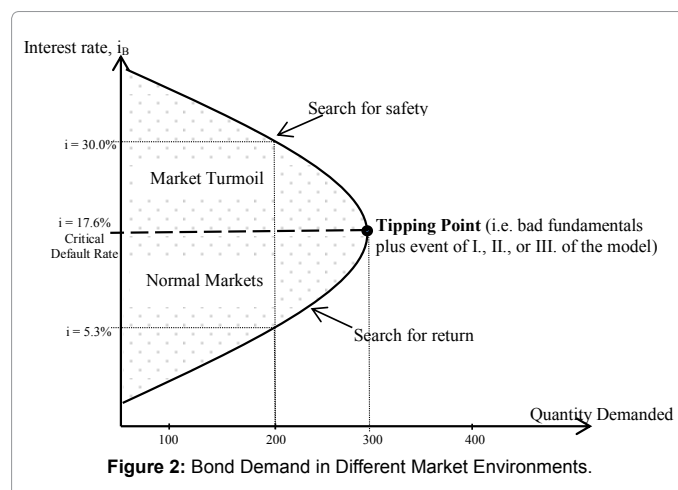
**Political Reputation:** Although the degree of asymmetric information together with the fundamentals is decisive, it does not sufficiently explain the sudden reversals in some euro area countries. The second relevant trigger in bond markets is the degree of political reputation. Countries that express sufficient willingness to undertake structural reforms, such as those designed to regain competitiveness or towards fiscal sustainability, have a good reputation. Hence, good reputation helps to diminish market concerns about the respective sovereign bond quality and thus default risk. However, bad fundamentals, together with no commitment lead to weak reputation and to a self-reinforcing downward spiral. As long as policymakers show no willingness to undertake needed structural reforms, countries

will lose their reputation. The loss of reputation triggers a tipping point, too.

**Animal Spirits:** Last but not least, both mechanisms are gradual and generate a vicious circle due to animal spirits. In other words, some people follow the old and some the new risk assessment. Thus, the agent’s behaviour matters and may lead to market exaggerations.

Thus, the new elements of the behavioural European bond market theory are asymmetric information, political reputation as well as animal spirits. These elements have a substantial effect on the European bond market dynamics. Asymmetric information and political reputation trigger a sudden loss in market confidence with a race to the bottom due to animal spirits. Weak reputation and high levels of asymmetric information impair the quality, liquidity and riskiness of bonds. In other words, market turmoil lowers the price and demand due to bad quality assets. This is contrary to normal markets, where demand for a bond increases with lower prices. Consequently, in market turmoil the bond demand curve becomes upward-sloping. An upward-sloping demand curve sounds strange, however it is not uncommon. In 2001, Akerlof, Spence, and Stiglitz received the Nobel Prize in the following paragraphs, I develop the idea of an upward-sloping demand curve in the European bond markets in turmoil. First I assume that the level of the sovereign yields is characterised by economic and financial fundamentals in the respective country according to the model [Figure 1]. Higher yields indicate always higher risks. In other words, a higher yield indicates a less sound situation and thus a higher default risk. However, risk and return is only linked positively as long as the country is solvent and able to repay its debt obligations in future. Thus, there exists a tipping point in the Eurozone due to the institutional constraints at which the default probability is so high that a high yield is unable to compensate for the prospective default. At that point, bond demand declines despite high yields. Figure 2 illustrates this new idea graphically.

The region below the tipping point depicts the situation of normal markets. Above the tipping point, bond markets are in turmoil. This market environment reflects a “liquidity aversion” in which bond supply is greater than demand and hence yields are extremely high. In normal markets, the investor is in search of yields and purchases bonds that are almost safe assets (low default probability) but offer a relatively high rate of return. These are points close, but below the tipping point. As an unforeseen event occurs or the policymakers lose credibility and reputation, these countries jump to the top segment of this demand schedule. This implies that despite higher yields, the demand of assets



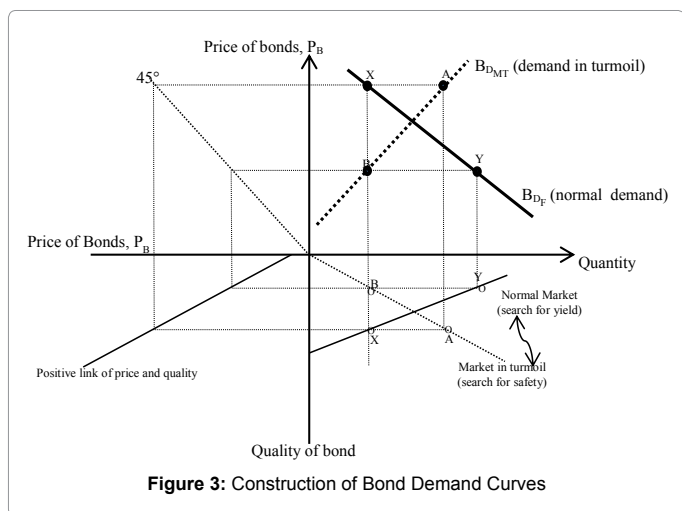


Figure 3: Construction of Bond Demand Curves

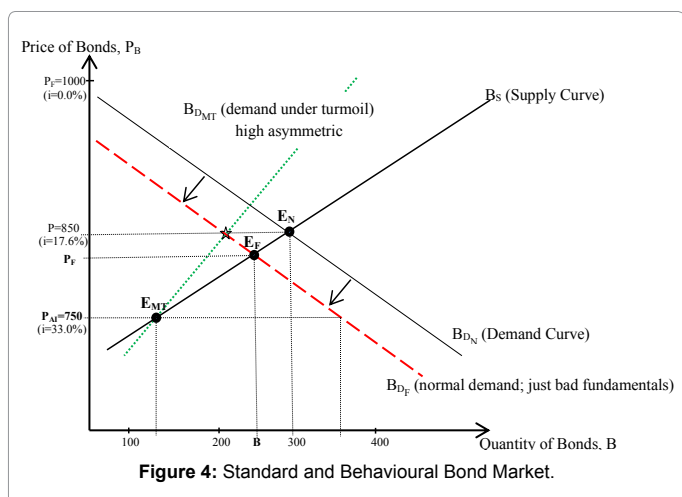


Figure 4: Standard and Behavioural Bond Market.

is equal or lower. Thus, it result a demand shortage or a “liquidity aversion.” In this market environment investors start the search for safety [5]. Of course this is sometimes a gradual process and therefore animal spirits, the 3rd element in my model is important, too.

Using this new idea, it is simple to derive the respective bond demand curve in normal markets as well as in market turmoil. The demand curve in normal markets is characterized by the upward-sloping segment. The demand curve in turmoil is characterized by the downward-sloping part. It remains to be shown that the bond demand curve, which is a price-quantity relationship, follows the behavioural model. I illustrate this feature in Figure 3.

In Figure 3, I construct the respective demand curves within the 4-quadrant system. The first quadrant on the top-right side illustrates the two different demand curves and they will be derived based on the model assumptions. The bold downward-sloping curve depicts demand in normal markets. The dotted upward-sloping curve demonstrates demand in turmoil. In the second quadrant on the top-left, I have a 45°-line that is needed for construction purposes. The third quadrant on the bottom-left illustrates the assumed positive relation between the price and quality of an asset. The most important feature is depicted in the fourth quadrant. This is the critical ingredient for the construction process of the two demand curves. Without the loss of generality, I assume non convex curves. The dotted curve depicts the situation of market turmoil according to the model in Figure 2. Thus, in market

turmoil the demand for bonds with high quality increases significantly despite low yields. Indeed, this pattern – the flight to safety such as German Bunds – has appeared in the European sovereign debt crisis in 2010. Given this relationship, everyone can see how the upward-sloping dotted demand curve, through points A and B in quadrant I, results by construction in the behavioural model. The solid curve depicts the situation of normal markets respectively. In normal markets, investors have confidence and they are in search of yields. Hence, there is still a high demand for assets with high yields. This results in a standard downward-sloping demand curve through points X and Y.

### Mechanisms of the Behavioral Model

As illustrated above, under asymmetric information and weak political reputation the demand curve slopes upward. Figure 4 utilizes this idea and discusses the new equilibrium effects. If the upward sloping demand curve has a slope steeper than the supply curve, a new equilibrium of market turmoil,  $E_{MT}$ , exists. But there is a second equilibrium,  $E_F$ , at the intersection of the still downward-sloping demand curve with bad fundamentals and the supply curve. The difference between both equilibria is that the equilibrium  $E_F$  captures normal markets with just bad fundamentals. On the contrary, equilibrium  $E_{MT}$  reflects market turmoil. In market turmoil, we obtain both bad fundamentals and either asymmetric information or weak political reputation. These elements trigger that normal markets turn into turmoil. Thereafter, we get a gradual re-assessment of the bond quality that follows animal spirits, the final part in my behavioural model [Figure 1].

If the bond market switches from normal into turmoil, some investors stick to their previous assessment and thus still follow a standard (downward-sloping) demand curve. However, some investor’s respond immediately with a new assessment, i.e. higher expected default risk. Consequently, the behavioural model has an ‘upward-sloping’ demand curve during market turmoil and behaves differently than in standard theory. As a result this behavioural model gets multiple equilibria [Figure 4].

According to Figure 4, the bond market with just bad fundamentals still behaves like a normal bond market. The respective demand curve ( $B_{DF}$ ) shifts to the left as indicated by the determinants in Table 1. However, the behavioural bond market, proposed in my model, is different. Asymmetric information and political reputation change the slope of the demand curve and affect the determinants that shift the new behavioural demand curve ( $B_{DMT}$ ). Table 1 summarises the demand and supply determinants as well as the factors that shift the curves in the standard and behavioural theory. Overall, the behavioural model demonstrates a far richer and sophisticated pricing dynamics of euro area bond markets.

During the European sovereign debt crisis, there was strong empirical evidence in line with this new behavioural model. Bond yields of countries such as Greece, Italy, Spain, and Portugal increased dramatically, despite having similar or even better fundamentals than other countries. We argue that asymmetric information and political reputation problems in these countries are mainly responsible for the sudden and intense reversals. As a result, there are more bonds with bad quality in the market and the quality of assets matters significantly in a behavioural model.

Herzog and Müller [6] find evidence that the quality of financial assets in the Eurozone is a new vulnerability due to different degrees in asymmetric information and political reputation. They computed a ‘Political Risk Index’ (PRI) which highlights countries with a large degree of asymmetric information and weak reputation in fiscal and

economic policy. The index number ranges from 1.0 to 6.0, i.e. from very sound to very unsound countries respectively. Not surprisingly, Greece and Italy show the worst performance of the PRI of 6.0 and 5.5 respectively. Consequently, to tackle the European debt crisis with austerity measures on the one hand and with 'technocratic' governments, such as in Italy led by Mario Monti, on the other hand is an appropriate response to restore confidence. Of course, all this mitigates – but does not solve – the asymmetric information and reputation problem. At the same time, countries have to undertake structural reforms to get back their competitiveness and policymakers have to design an efficient fiscal and economic governance system in the Eurozone [7].

## Conclusion

This paper develops a behavioural and thus new bond market theory for the Eurozone. I find that euro area bond markets are different because of the institutional setup of the EMU. First, member countries have fiscal authority without monetary authority. Thus, Eurozone member states cannot guarantee payment of bondholders in all cases. Second, a monetary union reduces the incentive to maintain sustainable finances despite the existence of the no-bailout clause and the Stability and Growth Pact. Consequently, this creates latent

disconnect between market fundamentals and the respective yield. The key trigger mechanisms are asymmetric information and/or political reputation. Finally, animal spirits amplify the market reversals and they are leading to self-reinforcing crises. Thus, the behavioural model provides valuable insight for all financial investors in Europe.

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