

The Dynamics of Greek and German Long-Term Sovereign Bond Yields - A Portfolio Balance Approach.

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The Greek Macroeconomic Environment

During the previous decade, the Greek economy was particularly shaped by the country's sovereign debt crisis which started in late 2009. There seems to be a consensus that the preconditions for this crisis were created through policy decisions and economic imbalances in the decades before 2009 and that such factors have then come to the surface at once, mainly due to the global financial crisis which started in 2008. (Dellas and Tavlas, 2012; Higgins and Klitgaard, 2011; Arghyrou and Kantonikas, 2012; Corsetti et al., 2019; Lane, 2012) Greece had accumulated significant amounts of debt, with debt levels above 150 per cent of GDP in 2011. (Figure 1) During the crisis, due to the deteriorating ability of the Greek government to service its debt payments, yields on Greek government bonds increased sharply (Figure 2).

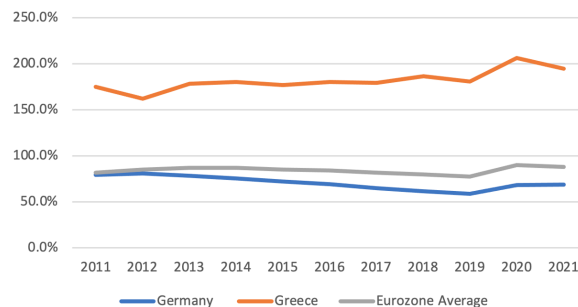


Figure 1: Greek Annual Government Debt (in per cent of GDP)

Source: Factset

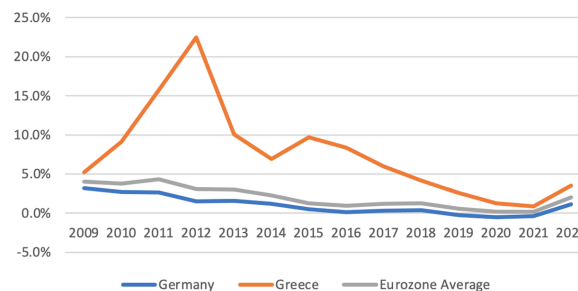


Figure 2: 10-Year Government Bond Yields for Germany and Greece

Source: Factset

This made it even more difficult for Greece to repay their debt leading to less confidence and creating the so-called doom loop (Dellas and Tavlas, 2012, p. 9; Corsetti, Eichengreen, Hale, and Tallman, 2019).

In May 2010, the EU and the IMF decided to lend Greece 110 billion euros over the following three years. Greece had to implement severe austerity measures in exchange for the loan. (Ardagna and Caselli, 2014, p. 293) More such agreements were made during the last decade. (Economides, Papa-georgiou, and Philippopoulos, 2021, p. 437) Overall, the various policy measures seem to have restored

confidence in Greece's creditworthiness in the short-term since there has been a decrease in yields of 10-year Greek government bonds until 2013. However, yields increased again in 2014 and went down in 2015 before increasing until 2017. Bond yields have since decreased, even throughout 2020 when Greek's debt-to-GDP ratio has increased again due to the Covid-19 pandemic. Following Greek austerity policies and the global financial crisis, government and consumer spending decreased and hence did GDP, initiating a period of deflation and negative economic growth. The Greek economy has since been able to slowly recover.

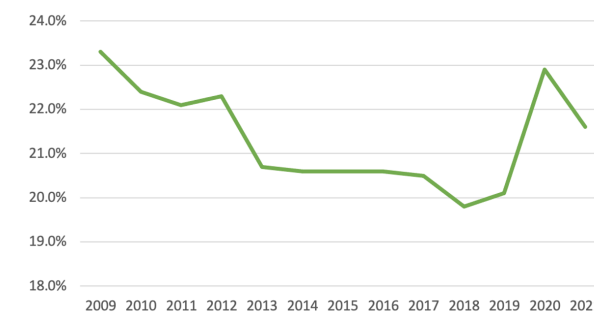


Figure 3: Greek Government Spending (in per cent of GDP)

Source: Factset

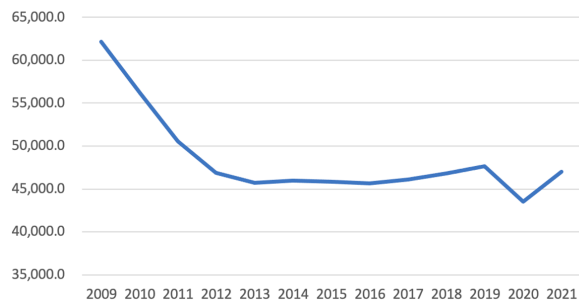


Figure 4: Greek Real GDP (in Millions of Chained 2010 Euros)

Source: Federal Reserve Bank of St. Louis

The German Macroeconomic Environment

While Greece was far from an economic recovery in 2011 and 2012, the German economy generally started to improve again. The Deutsche Bundesbank (German Federal Bank) stated in its annual report of 2011 that “the German economy was characterised by a broad-based upturn across the real sector, although its thrust was perceptibly blunted towards the end of the year by [...] the escalating European sovereign debt crisis.” (Deutsche Bundesbank, 2011, p. 51) Yields on German 10-year government bonds started going down from 2011 onwards, a trend which has continued until today. Part of this development is likely partly due to the very accommodating unconventional monetary policy of the ECB which was started in the aftermath of the global financial crisis. (Malliaropulos and Migiakis, 2018; Mudde, Samarina, and Vermeulen, 2021)

Government debt as a percentage of GDP in Germany has remained relatively constant until 2019 with a slight downward trend beginning in 2016. (Figure 1) Of course, because of the Covid-19 pan-

dem, government spending went up in 2020 and was at 68.6 per cent in 2021. The average debt-to-GDP ratio in the Eurozone was at about 87.9 per cent in 2021. Overall, the EU is more indebted than it was 10 years ago. (Eurostat, N.A.) Figure 6 shows the German real GDP (again in millions of chained 2010 Euros for inflation reasons) from 2009 to 2021.

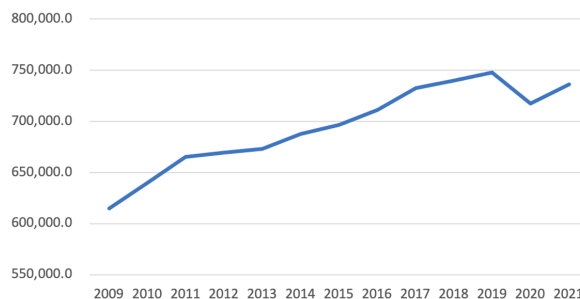


Figure 5: German Real GDP (in Millions of Chained 2010 Euros)

Source: Federal Reserve Bank of St. Louis

There has been an overall upward trend in real GDP in Germany since 2011. The Covid-19 Pandemic also affected aggregate demand in Germany negatively, however, GDP can be seen to have increased again in 2021 during an economic recovery.

The Portfolio Balance Approach

In this section, the dynamics of German and Greek yields will be analysed using a simple portfolio balance model. (Pilbeam, 2013) The domestic (foreign) bond schedule represents the market for domestic (foreign) long-term government bonds and “r” is hence the yield on domestic long-term government bonds. An increase in demand for short-term government bonds and a subsequent decrease in short-term yields will translate into higher demand

for long-term government bonds, due to arbitrage, which decreases yields on longer-term bonds. Hence, we can model the effects of open market operations (OMOs) on long-term yields in the same way as with short-term bonds. (Pilbeam, 2013, p. 87-89)

The exchange rate S is defined as an index of the Euro’s value against a basket of foreign currencies. An increase in S signifies a depreciation of the Euro.

The Case of Greece

We assume that the Greek economy, in mid-2009, is initially at point A (figure 7), where the domestic money market, the domestic bond market and the foreign bond market are in equilibrium.

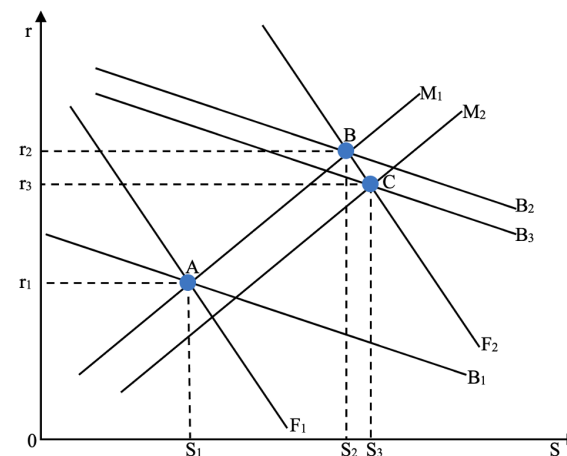


Figure 6: Simple Portfolio Balance Model Dynamics from 2009 to 2012

Source: Based on Pilbeam (2013)

In the fall of 2009, when the Greek government announced that the fiscal deficit would probably be 12.7 per cent instead of 6.0 per cent risk aversion increased and confidence in Greek’s ability to repay its debt declined sharply. (Dellas and Tavlas, 2012, p. 9) As Greek (domestic) bonds were perceived

to have become riskier compared to foreign bonds, the demand for foreign bonds increased while the demand for Greek bonds decreased, leading to a rightward shift of the foreign and domestic bond schedules (F1 to F2 and B1 to B2). This resulted in an increase in the interest rate from r_1 to r_2 and a depreciation of the exchange rate from S_1 to S_2 . Additionally, the ECB increased the money supply because of the effects of the global financial crisis causing a rightward shift of the money supply curve from M_1 to M_2 and a leftward shift from B_2 to B_3 , decreasing the interest rate (r_2 to r_3) but worsening the depreciation (S_2 to S_3). (Hobelsberger, Kok, and Mongelli, 2022) It is assumed that the Greek economy was at point C in 2012.

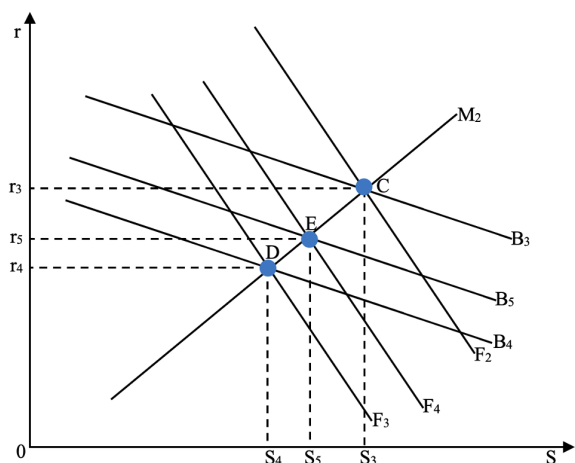


Figure 7: : Simple Portfolio Balance Model Dynamics from 2012 to 2015

Source: Based on Pilbeam (2013)

From 2012 to 2014, we observe a fall in Greek sovereign yields. Hardouvelis et al. (2018, p. 76) construct an index for economic uncertainty in Greece. The index shows that economic uncertainty has decreased overall from mid-2012 to 2015 indicating

reduced perceived credit risk of Greek bonds leading to a leftward shift of the foreign and domestic bond schedules as shown in figure 8 (B3 to B4 and F2 to F3 in figure 8). Hence, Greek interest rates fell (r_3 to r_4), and the exchange rate appreciated (S_3 to S_4).

In 2014/15 there was an increase in yields. Hardouvelis et al. (2018, p. 77) also construct an index for political uncertainty in Greece which increased sharply in early 2015 due to the elections in Greece. A 10 per cent increase in political uncertainty is estimated to increase risk premia of European peripheral countries by circa 3.5 per cent. (Manzo, 2013, p. 17) The increase in uncertainty led to a rightward shift of B_4 and F_3 (to B_5 and F_4) and a consecutive rise in yields (r_4 to r_5) as well as a currency depreciation (S_4 to S_5). At the end of 2015, the Greek economy is assumed to be at point E.

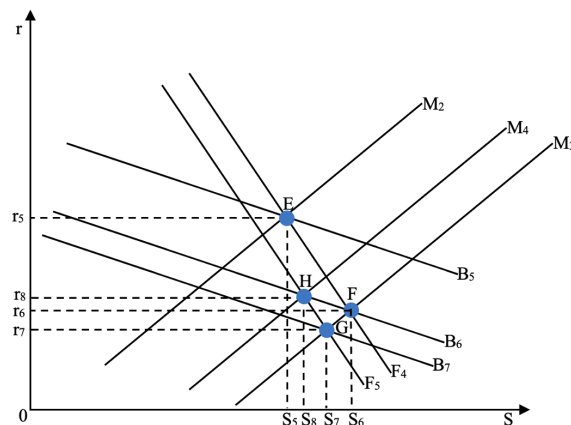


Figure 8: Simple Portfolio Balance Model Dynamics from 2015 to 2022

Source: Based on Pilbeam (2013)

From 2015 to 2021, yields fell partly due to quantitative easing (QE) by the ECB (European Central

Bank, N.A.). During QE, the ECB bought long-term bonds with newly created money. This led to an increase in the money supply (M_2 to M_3) and a shift of the domestic bond schedule to the left (B_5 to B_6) lowering long-term yields (r_5 to r_6) and increasing the exchange rate (S_5 to S_6). Malliaropoulos and Migiakis (2018) provide empirical evidence for this decrease in yields. Because economic uncertainty in Greece has generally fallen since 2015, Greek bonds have become less risky. (Hardouvelis et al., 2018, p. 76) Hence, B_6 and F_4 both shifted to the left (B_6 to B_7 ; F_4 to F_5), as the demand for domestic bonds increased and demand for foreign bonds decreased. This decreased the Greek interest rate (r_6 to r_7) and the exchange rate appreciated (S_6 to S_7).

In 2022, rates have gone up because the ECB reduced the money supply causing a leftward shift of the money supply schedule (M_3 to M_4) and a rightward shift of the domestic bond schedule (B_7 to B_6) in figure 9, which caused the Greek interest rate to go up (r_7 to r_8). (ECB, N.A.) Today, the Greek economy is assumed to be at point H in figure 9.

The Case of Germany

We assume that the German economy is initially at point A (in mid-2009). Following the global financial crisis, the ECB increased the money supply and lowered short-term interest rates, which are assumed to translate into lower long-term yields due to arbitrage. (Hobelsberger, Kok, and Mongelli, 2022) The money supply schedule shifted from M_1 to M_2 , and the domestic bond schedule shifted from B_1 to B_2 , resulting in a lower interest rate (r_1 to r_2) and a depreciation of the currency (S_1 to S_2). Furthermore, as risks around the world increased,

the demand for German bonds increased as they were seen as relatively safe in comparison to other bonds. This is called a “flight-to-safety” response. Boeing-Reicher and Boysen-Hogrefe (2017, p. 15) find that this response can explain a significant share of the decrease in German long-term government bond yields from 2007 to the end of 2015.

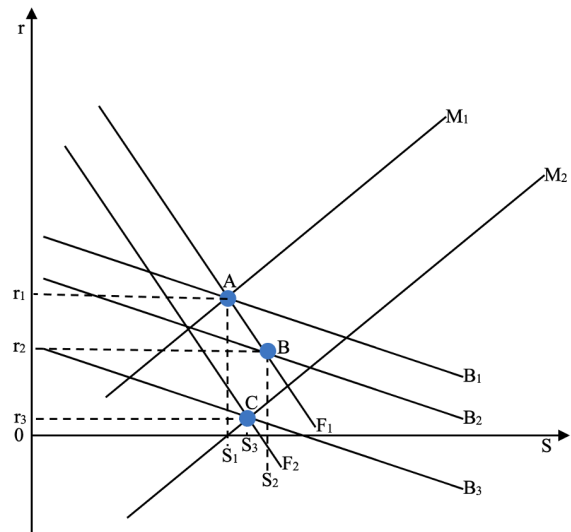


Figure 9: : Simple Portfolio Balance Model Dynamics from 2009 to 2015
Source: Based on Pilbeam (2013)

This led to increased demand for domestic bonds (decreased demand for foreign bonds), leading to a leftward shift from B2 to B3 and from F1 to F2 causing rates to go down (r_2 to r_3) and the exchange rate to appreciate (S_2 to S_3). In 2015, the German economy is assumed to be at point C, with long-term yields close to zero. The ECB’s QE policies, which started in 2015, had a similar effect on German yields as they did on Greek yields. (ECB, N.A.; Malliaropulos and Migiakis, 2018) Again, the ECB bought long-term government bonds which

increased the money supply (M2 to M3), increased the demand for domestic bonds (B3 to B4) and lowered the interest rate (r_3 to r_4), which even became slightly negative consequently. Additionally, the exchange rate depreciated (S_3 to S_4).

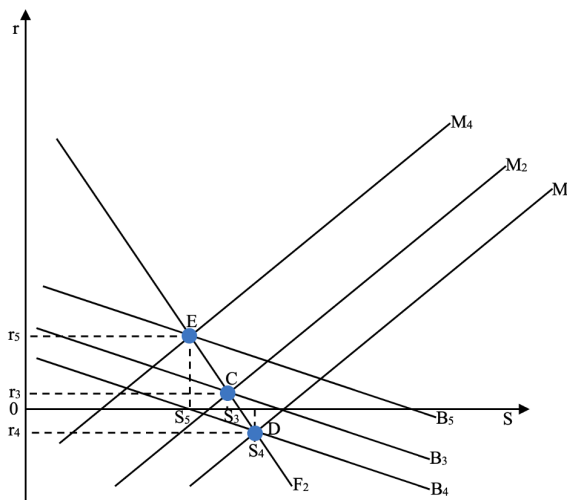


Figure 10: Simple Portfolio Balance Model Dynamics from 2015 to 2022
Source: Based on Pilbeam (2013)

In 2022, as short-term rates increased progressively, the money supply schedule started shifting left again, from M3 to M4, while the supply of domestic bonds decreased, from B4 to B5. (ECB, N.A.) As a result, yields rose (r_4 to r_5), and the exchange rate appreciated (S_4 to S_5). By 2022, the German economy is assumed to be at point E in figure 11, with long-term government bond yields below their 2009 levels, which is consistent with the data. (Figure 2)

Conclusion

The analysis has shown that several factors de-

termined the evolution of long-term yields in Greece and Germany. It can easily be deduced from figure 2 that Germany’s and Greece’s long-term yields have converged since 2011. The model has shown the spread initially widened significantly until 2012 due to an increase in Greek sovereign yields (following an increase in risk) and due to a flight-to-safety response which increased demand for “safe” German bonds, lowering German sovereign yields. Since 2012, Greek yields have decreased radically, which is likely also due to lower economic uncertainty. Both yields were lowered, since 2015, by the ECB’s QE policies and rose again in 2022 as the ECB decreased the money supply. (ECB, N.A.; Malliaropulos and Migiakis, 2018)

There are a few weaknesses within this analysis. The exchange rate (S) is assumed to reflect the Euro’s value in terms of a basket of other currencies. The problem is that the dynamics in Greece and in Germany only partially impacted the exchange rate, as the Euro is the national currency of several more countries. In the analysis of Greece, the exchange rate decreases overall, while in Germany’s case, it increases. This would be true if both countries had their own unique national currencies but obviously doesn’t work when they have the same, as is the case. The explanatory power of this analysis regarding exchange rates is hence limited.

The model assumes static exchange rate expectations, which is not in line with empirics. Moreover, the model doesn’t differentiate between different kinds of risks. An increase in the perceived risk of one type of bond may be due to economic, political, or other kinds of risk. (Pilbeam, 2013, 200-201) In

addition, a more complex model would be required to include the effects of unemployment and inflation on bond yields.

Overall, the portfolio balance model performs relatively well in explaining the dynamics of German and Greek long-term government bond yields, in a way which is largely consistent with the data.

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