

5 – Replication Period

All equations of the model were tested and chosen according to how well they performed for the 2003-2017 period. However the model parameters were obtained by fitting the model to the 2013-2017 data. More specifically, they were obtained by fitting each equation, separately, with the observed data, using observed data as inputs. The parameters of the model can be found in appendix [wecwec](#) at the end of the paper. Here we will show how the model replicates the 2013-2017 period.

The data we will be comparing the model with, referenced as National Accounts data, is given by the model variables we described in section 3 obtained using observed National Accounts data. So for instance when we say gross capital formation of the Non-financial Sector in National Accounts this includes gross capital formation of the Financial Sector as well.

We begin by showing in figure 23 the final demand components that are endogenously defined in the model and total final demand.

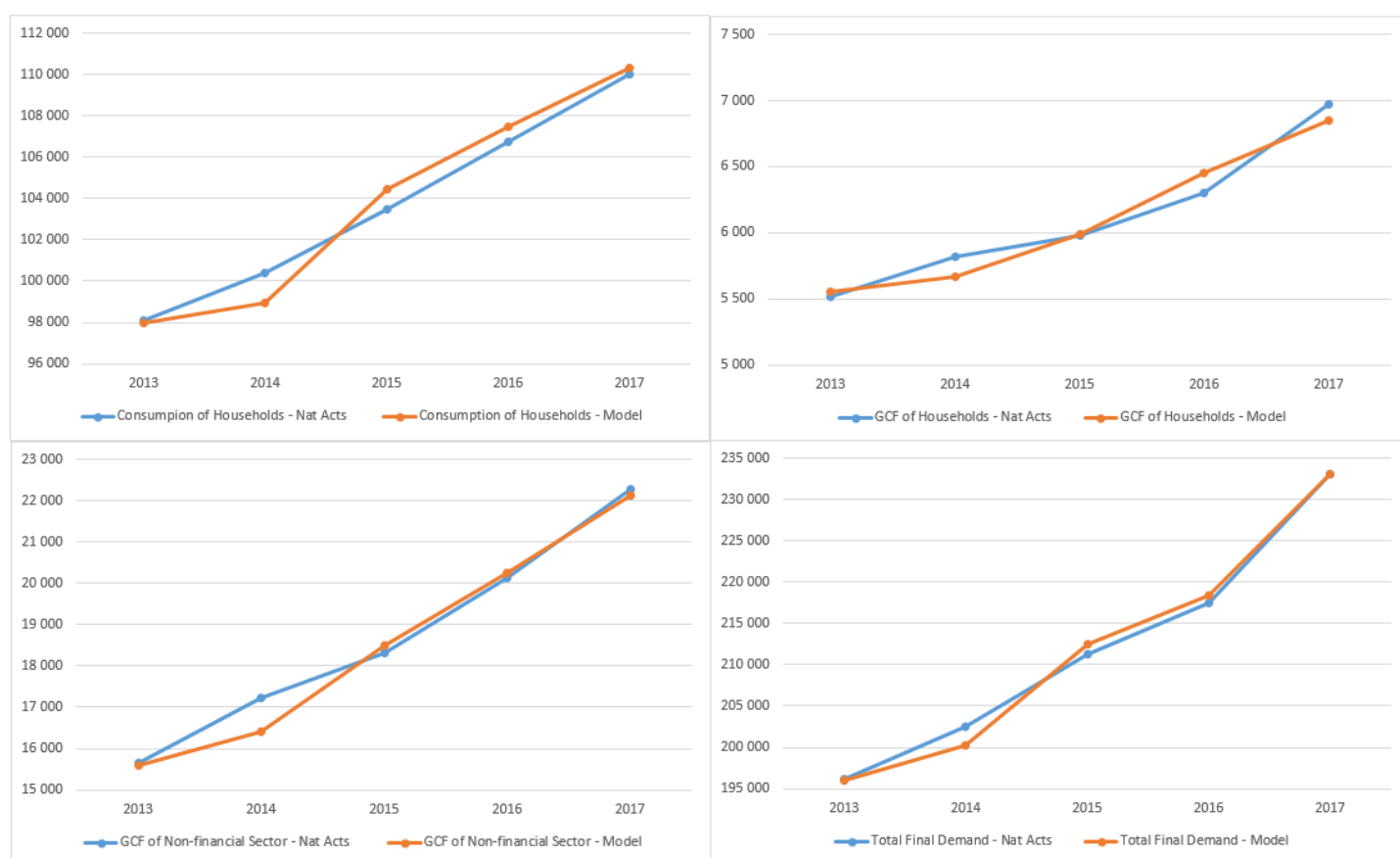


Figure 13 - Final Demand - Model vs Expected

Overall the model stays close to the observed data, with the biggest deviation happening in 2014 where Households' consumption is € 1 439 million below observed data. This shortfall influences gross capital formation of the Non-financial Sector, which depends on final demand components, explaining most of the € 809 million gap.

The distribution of final demand into taxes on production, imports, private wages and gross operating surplus in the model and how it compares with observed data can be seen in figure 24.

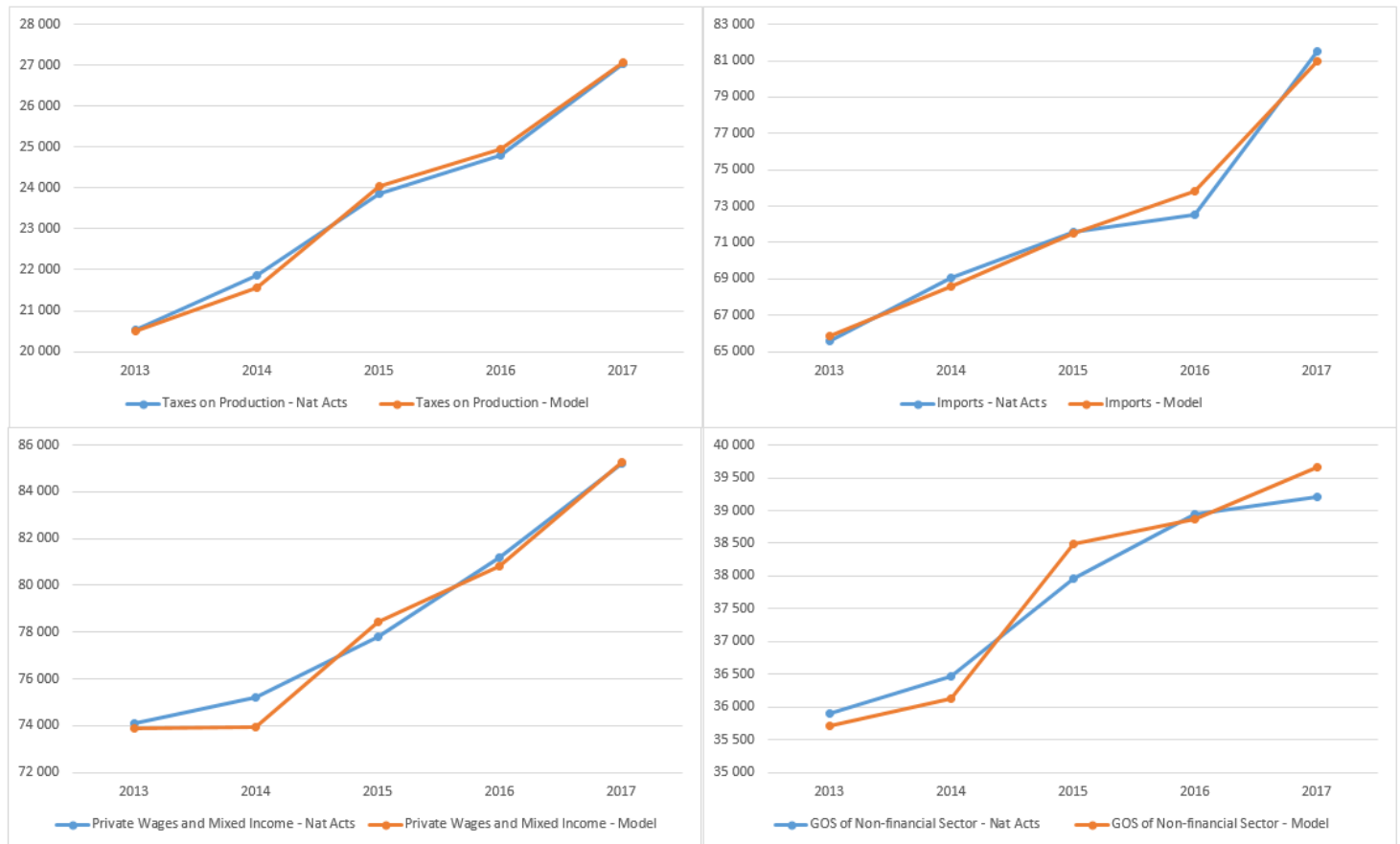


Figure 24 - Income Distribution - Model vs Expected

The first thing to notice is the € 1 279 million underestimation of private wages and mixed income in 2014. This is obviously related with the gap observed for consumption and it highlights the problem with estimating parameter's equations separately. What is a much smaller error when estimating the consumption function, are passed through to households' income which amplify the previously observed error. The calibration procedure is definitely an aspect with much room for improvement.

Another non-negligible deviation occurs in 2016 in the case of Imports, where the model overestimates it by € 1 248 million. The effect of this on the Rest of the World net lending/borrowing position can be seen in figure 25 as well as net lending/borrowing for every sector.

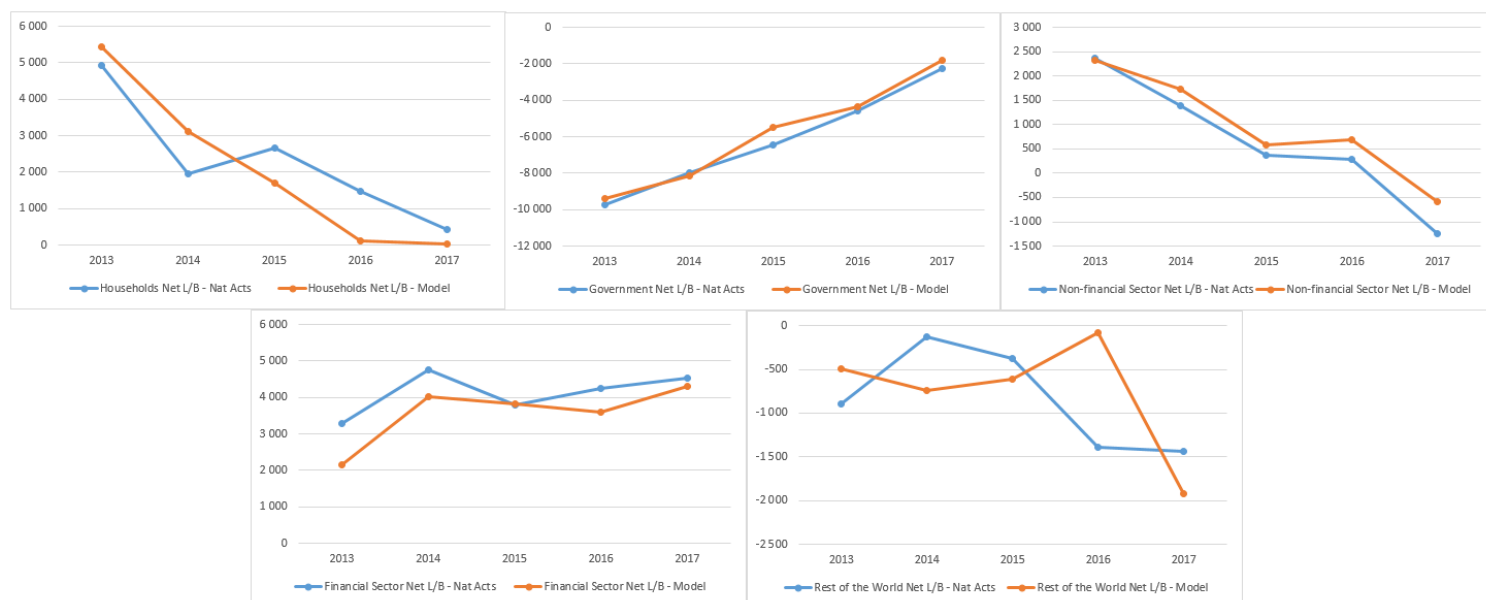


Figure 24 - Net lending/borrowing - Model vs Expected

The gap in 2016 for the Rest of the World sector (€ 1 307 million) along with Households' (€ -1 364 million) for the same year are the most salient deviations from observed data regarding the sector's net lending/borrowing position.

Next graphs in figure 25 show us interest payments whose rates are endogenously determined in the model. The gaps are not significant except for interest on consumption and other loans, which was kind of expectable considering the way we allocated the interest payments between Housing and CO using the interest rates from the Bank of Portugal data. The way this was done was to use the observed interest rate on housing loans to define interest paid on housing loans which meant that interest paid on consumption and other loans was residually defined and the implied interest rate ended up with a different trajectory then the one indicated by interest rates on consumption and other loans from the Bank of Portugal data.



Figure 25 - Interest Payments - Model vs Expected

Finally we take a look at assets and liabilities. As mentioned before, since the model doesn't include the revaluation of financial instruments it can't replicate the observed values from National Accounts balance sheets being limited by having its evolution defined by each sector's net lending/borrowing. So the way we defined observed assets and liabilities was by having for each sector one financial instrument that is residually defined so that the evolution of the sector's net worth is given by its net lending/borrowing. For example in the case of Households, we use observed data of Loans and Currency and Transferable Deposits while Other Assets is defined so that the evolution of household's net worth is given by its net lending/borrowing. For the Non-financial sector the residually defined financial instrument is Loans, while for the Financial Sector is Private External Debt. For the government sector, total debt was defined by the sector's net lending/borrowing with the division between domestic and foreign given by observed weights.

In figure 26 we can see how Households' assets and liabilities compare with the expected values. It's not a perfect fit but the overall behaviour is captured by the model.

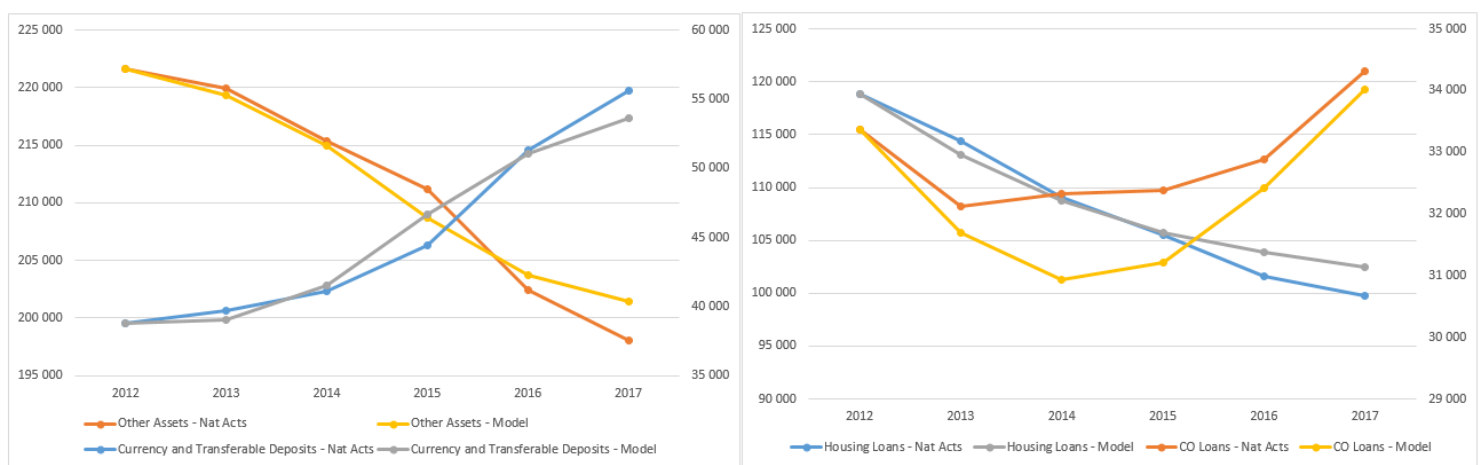


Figure 26 - Households Assets and Liabilities - Model vs Expected

The same can be said for the Non-financial Sector's balance sheet items as shown in figure 27.

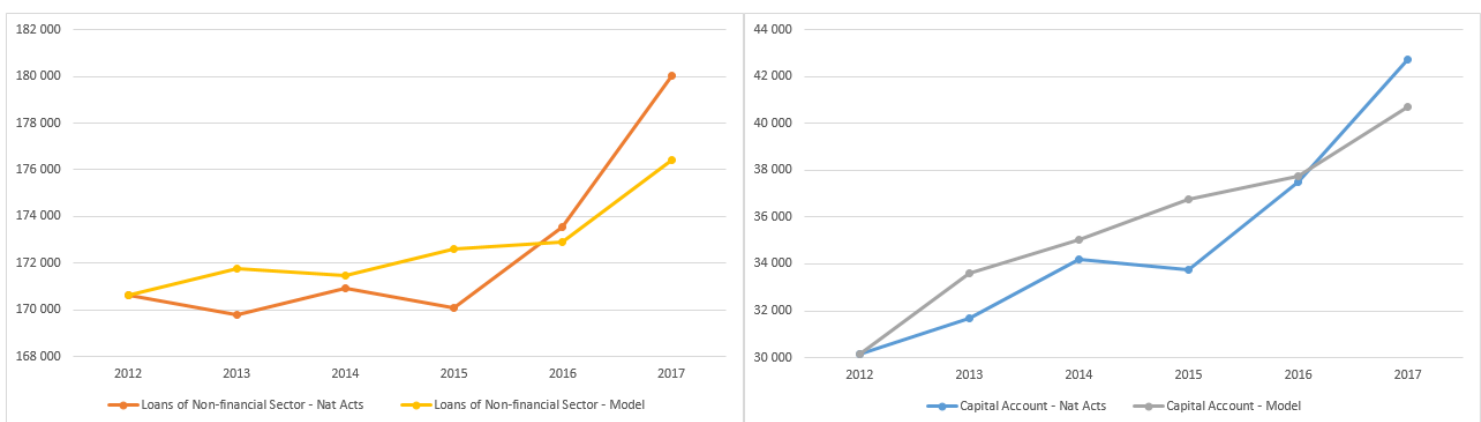


Figure 27 - NFS Assets and Liabilities - Model vs Expected

Government Debt, shown in figure 28, follows pretty closely observed values, which is expectable given how close it got to the sector's net lending/borrowing.

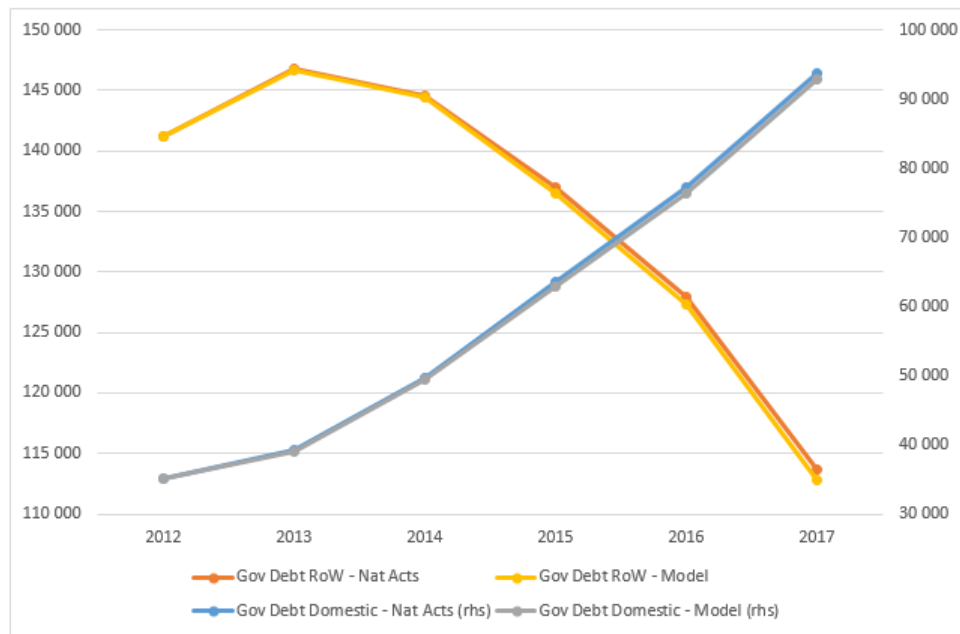


Figure 28 - Government Debt - Model vs Expected

Finally we look at Private External Debt and External Assets in figure 29.

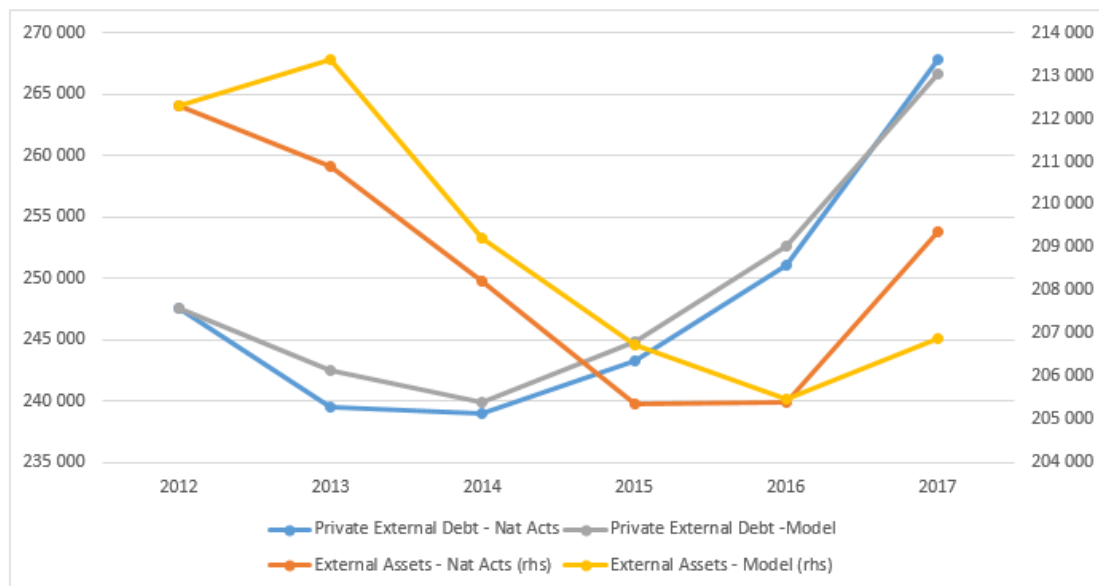


Figure 29 - Private External Debt and External Assets - Model vs Expected