

# **Solving for Country Portfolios in Open Economy Macro Models**

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August 2007

## **Summary**

Open economy macroeconomic models typically represent international financial linkages in terms of net foreign assets and the current account. Recent data show, however, that there are large cross-country gross asset and liability positions. Lane and Milesi-Ferretti (2001, 2006) show that these gross portfolio holdings have grown rapidly, particularly in the last decade. The existence of large gross positions offers a number of interesting challenges for open economy macro theory. For instance, can international macroeconomic models offer any explanation for the observed structure of portfolio holdings? What are the important macroeconomic determinants of the size and composition of gross portfolio positions? The importance of gross asset positions, however, goes beyond questions about the determinants of portfolio choice. This is because gross asset and liability positions can themselves have important effects on macroeconomic dynamics. For instance a change in the nominal exchange rate or equity prices can give rise to capital gains and losses for gross positions which can have very large effects on the value of net foreign assets.

While these issues are obviously of interest to open economy macroeconomists and policymakers, current theoretical models and current solution methods cannot be used to analyse the implications of gross portfolio holdings in any very systematic way. This is because it is difficult to solve portfolio choice problems within standard general equilibrium macroeconomic models with complex asset markets.

In this paper we develop and present a solution method which overcomes these problems. Our method can be applied to any standard open economy model with any number of assets, any number of state variables and complete or incomplete markets. We find a general formula for asset holdings which fits naturally into the standard solution approach for DSGE models. In fact, our solution formula can be applied directly using a standard first-order accurate solution that is generally derived in the analysis of DSGE models. It is not necessary to repeat the derivation of our formula for every model. The technique is simple to implement and can be used to derive either analytical results (for sufficiently small models) or numerical results for larger models. In the case of numerical solutions, the execution time of the solution code is no longer than required to obtain a standard log-linear solution.