The public-private savings mirror and causality relations among private savings, investment and (twin) deficits: A full modelling approach

Peeters, Marga

University of Warwick, Department of Economics, Macroeconomic Modelling Bureau

1996

Online at https://mpra.ub.uni-muenchen.de/29630/
MPRA Paper No. 29630, posted 19 Mar 2011 19:05 UTC
THE PUBLIC–PRIVATE SAVINGS MIRROR AND
CAUSALITY RELATIONS AMONG PRIVATE SAVINGS,
INVESTMENT AND (TWIN) DEFICITS: A FULL
MODELLING APPROACH
Marga Peeters

Discussion Paper No.42 January 1996

University of Warwick
Coventry CV4 7AL
The public-private savings mirror and causality relations among private savings, investment and (twin) deficits:

A full modelling approach

Marga Peeters*
ESRC Macroeconomic Modelling Bureau
Department of Economics
University of Warwick
Coventry CV4 7AL
United Kingdom
E-mail: ecsbm@snow.csw.warwick.ac.uk
January 1996

Discussion Paper No.42

Abstract
Relations between national public and private savings, domestic investment and the current account are analyzed with the Global Econometric Model (National Institute, London). Simulation results obtained with this full modelling approach for the US, Japan, Germany and the UK are compared with estimation results from the partial modelling approaches adopted in the literature. The results from the two approaches are rather different. The simulation results indicate that private savings largely offset public savings (and vice versa) in the short run. In contrast with findings in partial models, a smaller effect of aggregate savings on investment is found and government deficits tend to increase current account imbalances.

*For helpful comments on this paper I want to thank Kenneth Wallis, Joanne Sauls, other members of the Macroeconomic Modelling Bureau, and Ray Barrell. For financial support I gratefully acknowledge a RCM grant from the EC.
1 Introduction

In a closed economy fiscal and monetary policy have a full effect on private consumption and private investment. In an open economy the effectiveness of these policies depends upon the degree of capital mobility. In order to investigate the effectiveness of government policies many studies have drawn attention to international capital mobility in recent decades.

Following Feldstein and Horioka (1980), several empirical studies have analysed national savings and investment, either with time series or cross-sections of countries. A main conclusion of these studies is that national savings, consisting of public and private savings, affect investment positively and the effect is rather high because of relatively low international capital mobility. According to these models government deficits thus hinder investment and therefore economic growth. Others have indicated that government deficits are (also) a nuisance because they may lead to current account deficits (see Obstfeld and Rogoff (1995)). Eisner (1994), on the other hand, investigates the role of public savings on future national savings in a dynamic model and finds a positive effect of government deficits on future savings and hence potential economic growth.

In all these studies the models used can be called partial models. They focus only on two or three variables instead of the whole set of variables needed to describe an interdependent economic system.\(^1\)

In contrast to these partial and rather aggregate modelling approaches a disaggregate and full modelling approach is considered in this paper. The Global Econometric Model (GIGEM, for short), which is developed and estimated by the National Institute of Economic and Social Research, is used to carry out simulations and the relations between public and private savings, investment and the current account in the short and long run are analyzed. A main advantage of GIGEM is that all relevant variables as well as their (trade) linkages are modelled explicitly. So no important channels are neglected.

The main aim of this study is to verify whether this full model corroborates the results of the partial studies, being basically that (i) public as well as private savings affect investment positively (ii) investment as well as government deficits affect current account balances negatively and (iii) government deficits affect future savings positively.

Knowing about these (causal) relations is of particular importance for those countries having twin deficits, i.e. a government and a current account deficit, like the US. It is often argued that

\(^1\)In many of the partial studies the neglect of important parts of the economic system is mentioned as a major shortcoming in the analyses: ...Beware: these simple correlations are merely suggestive and have no structural interpretation... (Obstfeld and Rogoff (1995), pp.31) and ...Results in full-scale, multi-equation macroeconomic models may prove more persuasive to some than the essentially reduced forms considered in this paper... (Eisner (1994), pp.184).
Some empirical studies that focus on relations between savings, investment and/or the current account are considered below.

2.1 Partial Modelling Approaches

In many studies the degree of ICM has been investigated through savings-investment relations. Studies with cross sections of countries have been followed by time series analyses, regional analyses, short and long-run analyses etc. These studies followed Feldstein and Horioka (1980) who adopted the model

$$ I - \frac{Y}{V} = \alpha + \beta_1 \frac{S}{V}, $$

(3)

where $\alpha$ and $\beta_1$ are parameters that can be estimated by simple regressions. They found that $\beta_1$ is insignificantly different from one and interpreted this as evidence for low capital mobility, an interpretation which prompted a lot of discussion. As follows from the last subsection, the estimate for $\beta_1$ is insignificantly different from one in case of no ICM. The value of $\beta_1$ is, though, not sufficient to draw a conclusion on capital (im)perfectness: $\beta_1 \approx 1$ can even occur when capital is mobile since imports and exports can match perfectly.

An important criticism concerns the partial modelling approach. Two aggregate variables are modelled that are both known to be affected by important factors like GDP, technology shocks, etc. that are not modelled (see for instance Obstfeld (1986) and Baxter and Cruciat (1993)).

Nevertheless, numerous studies on only national savings and domestic investment relations have appeared. Most empirical studies on savings-investment relations that followed were concerned with the question why the estimate of $\beta_1$ obtained by Feldstein and Horioka (1980) was so high. A further example is Feldstein and Bacchetta (1991), who disaggregate savings, to obtain

$$ I - \frac{Y}{V} = \alpha + \beta_{1p} \frac{S_p}{V} + \beta_{1m} \frac{S_m}{V} $$

(4)

and find significant parameter estimates with $\beta_{1p} \approx \beta_{1m}$ and, moreover, close to one. Elaborating on these results, they draw the conclusion that private investment is crowded out by government deficits ($S_p < 0$).

Many other empirical studies on investment, savings and/or the current account have been performed by single-equation regressions with one or two explanatory variables. We take two examples that do not consider ICM but investigate effects on the current account balance. Firstly, Sachs (1981) specifies

$$ \frac{X - M}{V} = \alpha + \gamma S_{pop} + \delta I - \frac{V}{Y}. $$

(5)
where $Y_{asp}$ is GDP in deviation from a deterministic trend. He finds $\beta_i < 0$ and significantly different from zero. This result is interpreted as an association between current account deficits (surpluses) with investment booms (slumps).

Secondly, Feldstein and Bacchetta (1991) specify

$$\frac{X - M}{Y} = \alpha + \beta_y \frac{S^g}{Y}. \quad (6)$$

and find $\beta_y > 0$, though, not significantly different from zero in recent years. This result is interpreted as government deficits deteriorating current account balances, but in more recent years, current accounts being determined by other factors than government deficits alone.

2.2 A Full Modelling Approach: The Global Econometric Model

In contrast to the partial modelling approaches the NIGEM is a full modelling approach. Most OECD countries are modelled in detail by about 30-40 equations. Other (blocks of) countries are represented by smaller equation sets. Data used in NIGEM are quarterly and seasonally adjusted. The model is now Keynesian since demand and supply sides, a monetary and financial sector are modelled, capacity utilization and unemployment rates are derived and price adjustments are sluggish.

The model differs across countries in functional form and in the (de)aggregation of variables. For this reason it is not possible to present the model specification in such detail and only the main relations are presented here. For a detailed information on specifications and parameter estimates, we refer to NIGEM (1994).

We focus on the relations between investment, savings and the current account and let $f$ represent a log-linear functional form. A stylized model per country is then given by:

**Investment**

$$I = I^h + I^a + I^s \quad \text{where} \quad I^h = f(Y, Y^d, PCED) \quad (7)$$

$$I^a = f(Y^d, r^d, PCED)$$

$$I^s = f(Y)$$

**Savings**

$$S = S^s + S^g \quad \text{where} \quad S^s = T - C^r - C^d \quad (8)$$

$$S^g = Y - C - T$$

and where

$$C = f(Y^d, W, PCED)$$

$$T = f(Y)$$

Current account

$$X = f(WT, pX) \quad (9)$$

$$M = f(Y, PM)$$

Prices and interest rates

$$p = f(\text{PM}, \text{CU})$$

$$p_Y = f(\text{PC}, \text{PX})$$

$$PCED = f(T, \text{PM}, p, \text{CU})$$

$$PC = f(\text{PCED})$$

$$r^d = f(r^d(\text{+1}))$$

$$r^s = f(\text{PCED, target}) \quad (10)$$

where

$I = $ Total investment; $I^h = $ Business investment; $I^a = $ Housing investment; $I^s = $ Inventories;

$S = $ Total savings; $S^s = $ Government surplus; $S^g = $ Private savings;

$Y = $ National income; $Y^d = $ Disposable income; $CU = $ Capacity utilization rate;

$G^r = $ Government consumption; $C^r = $ Government investment; $T = $ Taxes;

$C = $ Consumption; $W = $ Wealth; $X = $ Exports; $M = $ Imports;

$WT = $ Import demand in the country's export markets based on 1987 trade weights;

$p = $ Wholesale price index; $pc = $ Consumer price index;

$p_X = $ GDP deflator; $PCED = $ Consumer expenditure deflator;

$PM = $ Export prices; $PM = $ Import prices;

$r^d = $ Long-term interest rate; $r^s = $ Short-term interest rate.

In this study results will be presented for the US, Japan, Germany (i.e. West-Germany) and the UK. For these countries total investment (see (7)) is disaggregated into business, housing and inventory investment. Total savings (see (8)) comprise public and private savings, constructed from GDP, consumption and taxes. Except for the US, the government expenditures are disaggregated into consumption and investment.

The current account consists of exports and imports of goods and services where each component has its own (behavioural) equation. In addition to these goods and services (the exports and imports of) interests, profits and dividends (IPD) are taken into account in our analysis. Imports and exports of IPD are components of the capital account and are important because IPD credits are part of national savings. Similarly, "unrequited transfers" are also important in savings studies. These transfers are also included in the calculations of $X - M$. 

4
Simulations can be carried out with forward-looking wages, exchange rates and long-run interest rates. In equation (10) this is indicated by the dependence on future (+1) short-term interest rates. In order to solve for the rational expectations a terminal condition is needed. In NIGEM this is the fiscal solvency rule that prevents the stock of government debt from exploding (see for instance Barrell (1994)). This is achieved by manipulating the direct tax rates in such a way that the government deficit returns to base at the end of the horizon (i.e. 2013 in NIGEM).

The interest rates in the model are endogenous. The long rates depend on the short rates (as follows from (10)) which in turn, depend on a target (indicated by 'target' in (11)).

The behavioural equations are log-linear with high autocorregressive dynamics. Single-equation estimation methods are employed for almost all behavioral equations and for most equations the overall fit is probably thanks to the high dynamics-good. The parameter estimates and residuals are then used to forecast. The period over which the historical data and forecasts are provided in NIGEM is 1984.I-1994.IV and 1995.I-2013.I, respectively. In our simulations the last period is neglected because of the solvency rule imposed.

3 Savings, Investment and the Current Account 1984-2004

In Table 1 historical data for 1984, 1994 and forecasts for 2004 from NIGEM are used to calculate \( \hat{\eta}_t, \hat{\psi}_t, \hat{\phi}_t \) and \( X_t^{P+M} \) (in percentages). All variables are measured in real terms. The government budget, the IPD flows and the unrequited transfers are deflated by the GDP deflator. Private savings are calculated as the current account \( X - M \) (including IPD flows and unrequited transfers) plus investment minus the government budget.2

The ratios show that, except for the forecast for Japan in 2004, the governments have deficits ranging from 0.2% to 5.6% of GDP. The US has a current account deficit of about 2.0%. In the US these twin deficits persist over the entire sample and forecast period. Japan and the UK have, like the US, in some years also twin deficits; Japan in 1984, for instance, and the UK in 1984 and 1994. During the whole period Germany has a relatively high current account surplus of about 5.0%. Also of note is that the US and the UK have lower private savings rates than Japan and Germany.2 We now turn to an investigation of the relationships between the four variables for each country.

In Table 2 OLS estimates of the \( \beta \)-coefficients of the models (3)-(6) using the NIGEM historical database (1984.I-1994.IV) are presented. These allow comparisons with the existing partial studies discussed in section 2.1, and with the full-model simulations presented in the next section.

\(^2\)Statistics presented here differ from NIGEM-statistics because of differences in the measurement of variables.

\(^2\)For a comparison of savings rates on disposable income for the US, Japan and Germany, see Atius (1995), and for analyses on the low savings rates of the US, see for instance also Hakkin (1995).

### Table 1: Public savings, private savings, investment and the current account

<table>
<thead>
<tr>
<th>Year</th>
<th>( \hat{\eta}_t )</th>
<th>( \hat{\psi}_t )</th>
<th>( \hat{\phi}_t )</th>
<th>( X_t^{P+M} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>US</td>
<td>1984</td>
<td>-2.9</td>
<td>18.2</td>
<td>18.3</td>
</tr>
<tr>
<td>1994</td>
<td>-1.8</td>
<td>17.5</td>
<td>18.0</td>
<td>-2.3</td>
</tr>
<tr>
<td>2004</td>
<td>-1.7</td>
<td>19.9</td>
<td>19.4</td>
<td>-1.3</td>
</tr>
<tr>
<td>Japan</td>
<td>1984</td>
<td>-2.1</td>
<td>24.8</td>
<td>20.1</td>
</tr>
<tr>
<td>1994</td>
<td>-2.2</td>
<td>24.9</td>
<td>22.8</td>
<td>-0.0</td>
</tr>
<tr>
<td>2004</td>
<td>0.1</td>
<td>23.0</td>
<td>24.8</td>
<td>-1.8</td>
</tr>
<tr>
<td>Germany</td>
<td>1984</td>
<td>-1.9</td>
<td>24.7</td>
<td>18.0</td>
</tr>
<tr>
<td>1994</td>
<td>-3.0</td>
<td>26.7</td>
<td>17.9</td>
<td>5.8</td>
</tr>
<tr>
<td>2004</td>
<td>-0.2</td>
<td>28.5</td>
<td>18.5</td>
<td>9.8</td>
</tr>
<tr>
<td>UK</td>
<td>1984</td>
<td>-3.0</td>
<td>16.6</td>
<td>13.7</td>
</tr>
<tr>
<td>1994</td>
<td>-5.6</td>
<td>19.1</td>
<td>14.8</td>
<td>-1.3</td>
</tr>
<tr>
<td>2004</td>
<td>-0.9</td>
<td>17.3</td>
<td>15.6</td>
<td>0.8</td>
</tr>
</tbody>
</table>

\( \hat{\eta}_t, \hat{\psi}_t, \hat{\phi}_t \) and \( X_t^{P+M} \) are public savings, private savings, investment and the current account as a percentage of GDP, respectively. Data used come from NIGEM, are yearly averages, and are historical for 1984, 1994 and forecasts for 2004.

### Table 2: Parameter estimates single-equation regressions

<table>
<thead>
<tr>
<th></th>
<th>( \hat{\beta}_1 )</th>
<th>( R^2 )</th>
<th>( \hat{\beta}_2 )</th>
<th>( R^2 )</th>
<th>( \hat{\beta}_3 )</th>
<th>( R^2 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>US</td>
<td>0.87 *</td>
<td>0.29</td>
<td>1.00 *</td>
<td>0.74</td>
<td>0.30</td>
<td>-0.51 *</td>
</tr>
<tr>
<td></td>
<td>(0.20)</td>
<td>(0.23)</td>
<td>(0.23)</td>
<td>(0.08)</td>
<td>(0.08)</td>
<td>(0.08)</td>
</tr>
<tr>
<td>Japan</td>
<td>1.37 *</td>
<td>0.76</td>
<td>1.39 *</td>
<td>0.28</td>
<td>0.87</td>
<td>-0.95 *</td>
</tr>
<tr>
<td></td>
<td>(0.12)</td>
<td>(0.09)</td>
<td>(0.21)</td>
<td>(0.09)</td>
<td>(0.09)</td>
<td>(0.09)</td>
</tr>
<tr>
<td>Germany</td>
<td>0.57 *</td>
<td>0.51</td>
<td>0.69 *</td>
<td>0.59</td>
<td>0.51</td>
<td>-0.66 *</td>
</tr>
<tr>
<td></td>
<td>(0.09)</td>
<td>(0.15)</td>
<td>(0.09)</td>
<td>(0.15)</td>
<td>(0.15)</td>
<td>(0.11)</td>
</tr>
<tr>
<td>UK</td>
<td>0.68 *</td>
<td>0.25</td>
<td>0.44 *</td>
<td>0.10</td>
<td>0.47</td>
<td>-0.79 *</td>
</tr>
<tr>
<td></td>
<td>(0.17)</td>
<td>(0.16)</td>
<td>(0.20)</td>
<td>(0.15)</td>
<td>(0.15)</td>
<td>(0.06)</td>
</tr>
</tbody>
</table>

Figures in brackets are standard errors. * are significant coefficients. \( R^2 \) is the adjusted \( R^2 \).
Except for the estimate for $\beta_{se}$ for Japan, the results corroborate the main findings in the literature. First, $\beta_e$ is highly significant in all countries. This in particular holds for the US and Japan, being large countries that are said to have a highly integrated financial market within the country. Second, $\beta_{sp}$ and $\beta_{pe}$ are both highly significant and do not differ very much from each other in the US, Germany and the UK. So deficits indeed seem to depress investment. Third, for all four countries $\beta_i$ is highly significant and negative suggesting that investment boom do seem to depress the current account balance. Finally, the estimate for $\beta_{se}$ is not significant for the US, Germany and the UK. This confirms that government deficits do not seem to depress the current account in this (recent) period, as the literature suggests.

To conclude, apart from one parameter estimate for Japan, the results here are similar to those obtained in previous studies. They will be compared with the NIGEM simulation results in the short and long run since some authors interpret the equations of section 2.1 as long-run relationships (see Feldstein (1983)) whereas others interpret them as short-run relationships and estimate the equations in first differences (see Obstfeld (1986)). As the four models (3)-(6) are static and the variables stationary, though, the difference between estimating in levels or first differences does not change much. Exceptions are the estimate for $\beta_{sp}$ and $\beta_{pe}$ for Japan, which are 0.31 (standard error 0.15) and 0.68 (standard error 0.20), and the estimate for $\beta_{sp}$ for the UK, which is 0.88 (standard error 0.19), in case of estimation in first differences.

4 Simulation Results

In this section the results from four NIGEM simulations are presented. The aim of these simulations is to analyze the effect of (public and private) savings on investment, and investment as well as public savings on the current account balance.

Shocks carried out are (i) a negative shock to government consumption or government investment (ii) a negative shock to private consumption (iii) a positive shock to business investment and (iv) a positive shock to 'world trade' (i.e. the variable with the trade weights called USS that directly increases US exports in NIGEM for the US, etc.). So shock (i) concerns fiscal policy, shock (ii) a change in consumers' behaviour, shock (iii) a change in producers' behaviour and shock (iv) an external shock. All are permanent shocks, beginning in 1994Q1. The reason for choosing the four shocks mentioned above is that they are basically shocks in public savings $S^p$ (shock (i)), private savings $S^e$ (shock (ii)), investment $I$ (shock (iii)) and the current account $X - M$ (shock (iv)).

In carrying out the simulations, realistic expectations are assumed for wages, exchange rates and long-term interest rates. The interest rate targets real GDP and inflation with a weight allocated to inflation 5 times greater than that for output (see NIGEM (1991)). A European union with Germany as leader is adopted. For all simulations a one percentage change is given but the results presented are normalized. As the model is basically log-linear this normalization does not influence the main conclusions; for instance, the reaction of investment to a one percent increase in consumption is about twice its reaction to a two percent increase in consumption.

Table 3 presents the instantaneous responses (in 1994Q1) of $S^p$, $S^e$, $I$ and $X - M$ to the different shocks, as deviations from base. Graphs 1-4 present the simulation results for the whole period, i.e. 1994Q1-2012Q4. The short-run responses of Table 3 are discussed first.

**Shock (i): A decrease in government consumption or government investment**

A decrease in government consumption, ceteris paribus, is an increase in public savings. The shock decreases GDP (see (1)). This decrease in GDP depresses private savings. Private consumption depends positively and significantly on (disposable) income but private savings (see (8)), being income minus consumption, is more affected by the income decrease than the consumption decrease. Gross investment depends positively on GDP and consequently decreases. But the shock leads to nominal effects that affect savings and investment also. Prices as well as interest rates decrease due to the fall in demand, and this, in contrast to the real effects, influences private savings and investment positively. The price and interest changes are rather sluggish, however. In addition to this, private savings and investment depend in most countries significantly on less weakly on these nominal factors than on GDP. For these reasons the real effects can be expected to be stronger than the nominal effects.

The response of $S^p$ to the government shock turns out to be negative in the short run (i.e. 1994Q1), see the first panel in Table 3. This holds for all countries and most strongly for the US. For this country the private savings decrease is -0.85%, thus largely offsetting the public savings increase. The increase in investment in this period could thus have been 0.15%, at most, but turns out to be about zero. It is the current account that increases by 0.15% (remember that $S^e + S^p - I = X - M$ always holds). The response of investment turns out to be -0.14% in Germany and positive in the other countries. In Germany the effect of the decrease in the interest rate on investment is stronger than the effect of the decrease in $Y$. The current account response is positive in the US, Japan and Germany, ranging from 0.03% to 0.47%, mainly because the demand for imports decreases.

A decrease in government investment basically leads to the same responses as a decrease in government consumption in NIGEM. This results from the fact that government consumption and government investment are modelled in a similar way; they are both explained by their past and are not influenced by other variables. Unfortunately, therefore, the model does not allow a distinction between the effects of productive purchases, like investment in infrastructure etc., that lead to growth in the long term, and consumption purchases that have only temporary effects 1.

---

1 For example, Lee (1995), considers the particular case of the US and argues that the reallocation of government
Table 3  Simulation results 1994.1

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shock (i): A negative shock to government consumption</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>US</td>
<td>1.00</td>
<td>-0.85</td>
<td>0.00</td>
<td>0.15</td>
</tr>
<tr>
<td>Japan</td>
<td>1.00</td>
<td>-0.73</td>
<td>0.24</td>
<td>0.63</td>
</tr>
<tr>
<td>Germany</td>
<td>1.00</td>
<td>-0.67</td>
<td>-0.14</td>
<td>0.47</td>
</tr>
<tr>
<td>UK</td>
<td>1.00</td>
<td>-0.51</td>
<td>0.10</td>
<td>0.39</td>
</tr>
</tbody>
</table>

| Shock (ii): A negative shock to private consumption |  |  |  |   |
| US                   | -0.80 | 1.00 | 0.00 | 0.19 |
| Japan                | -0.40 | 1.00 | 0.45 | 0.06 |
| Germany              | -0.58 | 1.00 | -0.15 | 0.57 |
| UK                   | -0.45 | 1.00 | 0.11 | 0.44 |

| Shock (iii): A positive shock to business investment |  |  |  |   |
| US                   | 0.25 | 0.83 | 1.00 | -0.11 |
| Japan                | 0.00 | 0.93 | 1.00 | -0.06 |
| Germany              | -0.01 | 0.54 | 1.00 | -0.47 |
| UK                   | 0.08 | 0.52 | 1.00 | -0.40 |

| Shock (iv): A positive shock to trade in the exports markets |  |  |  |   |
| US                   | 0.60 | 0.40 | -0.00 | 1.00 |
| Japan                | 0.00 | 0.75 | -0.24 | 1.08 |
| Germany              | -0.04 | 1.45 | 0.40 | 1.00 |
| UK                   | 0.11 | 0.74 | -0.14 | 1.00 |

The figures are simulated responses in 1994.1 to shocks that take place in the same period. The values are deviations from base, normalised by the responses in $S^I/Y$, $S^P/Y$, $I/Y$ and $(X - M)/Y$ for the four shocks, respectively.

Spending from productive to consumption purchases in the 1980s has been a main cause of, among other things, the deterioration of the trade balance.

Shock (ii): A decrease in private consumption

A decrease in private consumption, ceteris paribus, is an increase in private savings. Also this shock decreases GDP. As taxes depend on GDP, public savings decrease. Basically the same mechanism is then at work as under the previous shock. The results in the second panel of Table 3 show that the responses of investment and the current account to the two savings shocks are very similar; investment decreases in Germany and the current account increases in all four countries.

Shock (iii): An increase in business investment

An increase in business investment, ceteris paribus, increases GDP. In most countries public savings increase because of increasing taxes. As shown in the third panel of Table 3, an exception is Germany. In all countries private savings seem to benefit most: increases are between 0.52% and 0.93%. The increase in current GDP obviously exceeds the increase in current consumption. The current account shows a deficit because of increasing imports.

Shock (iv): An increase in trade on the export markets

An increase in world trade, ceteris paribus, leads to a current account surplus because exports increase instantaneously. An increase in exports increases directly GDP. The increase in GDP increases private savings.

These short-run results presented in Table 3 differ a lot from the long-run results, as it is clear from an inspection of graphs 1-4. As the long-run results are more affected by the fiscal solvency run imposed than the short-run results, only the relations between (public and private) savings, investment and the current account to each shock will be considered in the next section.

5 A Comparison of the Estimation and Simulation Results

In this section the estimation results of the partial models (see Table 2) are compared with the simulation results of NIGEM (graphs 1-4). In order to do this, the ratios $\frac{\delta_1}{\delta_2}$, $\frac{\delta_3}{\delta_4}$, $\frac{(X-M)}{Y}$, $\frac{(X-M)}{Y}$ are calculated from the simulation results in 1994.1 and 2004.1 and presented in Table 4. The ratios for 1994.1 will be interpreted as short-run and the ratios for 2004.1 as long-run relations. These ratios can be compared with the estimation results of Table 2. The investment-savings relations of the models (3)-(4) are discussed first, the investment-current-account (5) and savings-current-account (6) next, and finally some possible limitations of NIGEM are considered.
Graph 1: Negative shock to government consumption

Graph 2: Negative shock to private consumption
Graph 1: Positive shock to trade on the export markets

Graph 2: Positive shock to business investment
Table 4. Ratios of the simulation results 1994 I and 2004 I

<table>
<thead>
<tr>
<th></th>
<th>1994 I</th>
<th></th>
<th></th>
<th></th>
<th>2004 I</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
</tr>
</tbody>
</table>
|        | $\frac{\Delta}{\Delta}$ | $\Delta$ | $\frac{\Delta}{\Delta}$ | $X-M$ | $X-M$ | $\frac{\Delta}{\Delta}$ | $\Delta$ | $\frac{\Delta}{\Delta}$ | $X-M$ | $X-M$
| US     | 0.06   | 0.08 | -0.01 | .  | 0.14   | 1.23 | .  | 1.13 | -0.18 | 2.68 |
| Japan  | 0.91   | 0.24 | -0.33 | 0.10 | 0.03   | 0.97 | 0.91 | -5.12 | 0.04 | 0.03 |
| WG     | -0.42  | -0.14 | 0.21 | -3.37 | 0.47   | 0.99 | 4.82 | 1.25 | 0.01 | 0.05 |
| UK     | 0.20   | 0.10 | -0.19 | 2.98 | 0.30   | -0.87 | 2.66 | -0.66 | -2.14 | -5.71 |

Shock (i): A positive shock to public savings

<table>
<thead>
<tr>
<th></th>
<th>1994 I</th>
<th></th>
<th></th>
<th></th>
<th>2004 I</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
</tr>
</tbody>
</table>
|        | $\frac{\Delta}{\Delta}$ | $\Delta$ | $\frac{\Delta}{\Delta}$ | $X-M$ | $X-M$ | $\frac{\Delta}{\Delta}$ | $\Delta$ | $\frac{\Delta}{\Delta}$ | $X-M$ | $X-M$
| US     | 0.04   | -0.01 | 0.00 | .  | -2.23  | 0.56 | -0.70 | 0.31 | 0.79 | -0.56 |
| Japan  | 0.89   | -0.91 | 0.45 | 0.13 | -0.12  | 0.81 | 0.76 | 0.23 | 6.98 |
| WG     | -3.34  | 0.25  | 0.15 | -3.92 | -0.99  | 0.16 | 0.16 | 5.13 |
| UK     | 0.20   | -0.25 | 0.11 | 3.95 | -0.98  | 0.15 | 5.43 | 0.15 | 6.05 |

Shock (ii): A positive shock to private savings

5.1 The public-private savings mirror

In model (1) the effect of national savings on domestic investment, $\beta$, depends, according to the theory, on the extent of savings that flows abroad. The estimate for $\beta$, as given in Table 1, is 0.87 for the US, 1.37 for Japan, 0.57 for Germany and 0.65 for the UK. These estimation results suggest that national savings are mainly invested domestically. According to the simulation results obtained with NIGEM in column (1) in Table 4, the instantaneous response to an impulse in savings (see shock (i)-(ii)) is smaller than these results suggest. For the US, for instance, the investment response is 0.06 to a 1% shock in public savings and 0.04 to a 1% shock in private savings. For Germany the response is even negative: -0.02 and -0.03 to both savings shocks. The long-run NIGEM responses are more in line with the estimates. From column (6) in Table 4 it follows that they range from -0.87 to 1.23 for both savings shocks.

In model (4) the effect of public savings and private savings on investment is represented by $\beta_{p}$ and $\beta_{q}$, respectively. The estimates for these parameters, as given in Table 2, are positive and each close to one for most countries. Like the responses of national investment to aggregate savings, the columns (2)-(3) in Table 4 show that these estimates are not corroborated by the NIGEM simulation results. The most remarkable finding here is that the public response is always close to a mirror image of the private savings response. Also in the long run, see columns (7)-(8) in Table 4, negative responses appear.

Increasing savings by increasing public savings and/or private savings thus does not instantaneously lead to economic growth, according to NIGEM. This follows clearly from graphs 1 and 2 where investment is negative in the short run for the US and Germany. From these graphs it follows that the major impact of a shock to public savings is reflected in private savings, and vice versa. This holds for the public savings shock in graph 1 for at least four years, i.e. from 1994-1998, and for the private savings shock in graph 2 for an even longer period for most countries. As a consequence of these public-private mirrors, the response of investment cannot be large since $S^p + S^q - I = X - M$ must hold. As the mirror is not perfect but a bit smaller than the impulse, i.e. $X - M < S^p + S^q$ in case of the public and private savings shock, respectively, aggregate savings increase in all countries for both savings shocks. In the short run the current account seems to benefit from the total savings impulse, whereas in the long run investment growth. But also in the long run, the investment increase in most countries does not match the whole savings shock. Thus the parameters $\beta_{p}$, $\beta_{q}$ and $\beta_{st}$ seem to be overestimated in the partial models in comparison with the NIGEM results.

The left and right part present the ratios of simulated values of 1994 I and 2004 I, respectively, to shocks that begin in 1994 I. The ratios for 1994 I can be derived from Table 3. //

"*" indicates that the denominator of the ratio is very small.
5.2 Effects on the current account

In model (5) the effect of investment on the current account is represented by $\beta$. The estimates for this parameter, as given in Table 2, are negative, ranging from -0.51 to -0.68, and highly significant. The NIGEM simulation results presented in columns (4) and (9) in Table 4 show that the negative effects are confirmed for the investment shock in both the short and long run, in 1994. They range from -0.06 to -0.47 and in 2004.1 from -0.12 to -0.55. Graph 3 shows that the current account is even more negative for the whole simulation period. For each country, though, the simulation results are less negative than the estimation results.

In model (6) the effect of public savings on the current account is $\beta_{es}$. This parameter is only estimated significantly for Japan and for this country, in contrast to expectations, negative. In column (3) in Table 4 the public savings shock (shock (i)) is relevant here. The results show positive effects ranging from 0.03 for Japan to 0.47 for Germany in 1994.1 and 0.03 for Japan and 2.08 in the US 2004.1. As discussed in the previous subsection, the current account increases in particular in the short run in response to the public savings shock. According to NIGEM, the current account thus clearly benefits from government surpluses (see graph 1). These simulation results are thus in line with the theory put forward, by Obstfeld and Rogoff (1995) among others, that government deficits depress current account balances. An exception is the UK in the long run, see graph 1, but the current account responses are very small.

5.3 Characteristics of NIGEM

NIGEM thus renders rather different results than the partial models in the literature; the effect of savings on investment is lower because of the public-private savings mirror, the effect of investment on the current account is weaker and the effect of government savings on the current account is stronger (for most countries). Although NIGEM is a more complete modelling approach because of the behavioural equations of different economic agents and interdependence between countries, it is appropriate at this stage to raise the question as to what extent the results depend on specific characteristics of the model.

Simulation results obtained with NIGEM are influenced by the fiscal solvency rule that forces public savings to return to base in 2013.1. Public savings, investment and the current account are thus also affected by the rule in the long run as follows from identity (2). This can be seen from the graphs, in particular graph 1, where public savings as well as the other three variables, go back to base rather quickly. Experiments with NIGEM show that there is no difference between imposing the rule and not imposing the rule (in which case government debt could explode) in the short run, i.e. about two years. Thus the short-run responses do not seem to be affected by the rule whereas the long-run responses are clearly affected. But because of the fact that public savings, private savings, investment and the current account are tied together, there does not seem to be a reason for the relations between these variables to be affected, neither in the short run, nor in the long run. For this reason the results in Table 4 uphold, irrespective of the solvency rule.

Another criticism of the use of NIGEM could be that the model is new Keynesian, with sluggish adjustment of prices and interest rates. How would the results differ with a more neo-classical model? In the case of the public savings shock, for instance, it still holds that if government consumption decreases, GDP decreases by which private consumption and investment fall. If prices and interest adjust immediately and because of the decrease, consumption and investment could increase indeed. The decrease in private savings in the short run, though, will remain since GDP falls and consumption falls less than the fall in GDP. Because of the price and interest adjustments, investment will start increasing at an earlier stage than under the NIGEM as shown in graph 1. Following these reasoning the savings mirror seems not to disappear, though, may exist over a shorter period than the NIGEM results show 6.

6 Further Considerations

In this section some attention is paid to causality issues.

6.1 Arrows of causality

The models (3)-(6) suggest that the causality between current savings, current investment and the current account only runs from savings to investment and savings as well as investment to the current account.

It follows from the specification of NIGEM, however, and is illustrated by the simulation results that public and private savings affect each other instantaneously. For this reason savings should not be treated as exogenous for investment. The OLS results of model (4) have a positive bias in comparison with the NIGEM results (see section 5.1). Moreover, from both the definition of savings and it follows that current investment affects current private savings; investment increases GDP and private savings equals GDP minus consumption. In graph 3 private savings is therefore visibly affected by changes in business investment.

The relationships (3) and (4) seem thus not appropriate. To model the relationship between savings and investment correctly, all factors influencing the economic system are to be involved and their relationship is to run in both directions. As investigated in Elsner (1994) and also argued

6Simulation results with the world model WSG, see McKibbin and Sachs (1991), see Table 8-1 to 8-3, p. 272-277, where a fiscal expansion of 1 leads to a private consumption increase of about 0.20, as well as the original data also show the public-private savings mirror. See also Marrinan and Wiseman (1993) who mention the mirror between the private savings gap and public savings in original data.
in Elsner (1995), the effect of current investment (for instance government expenditure) on future savings and thus potential economic growth should not be neglected. To take these aspects into account dynamic instead of static models are needed.

The current account is often seen as the outcome of forward-looking dynamic savings and investment decisions (Ghosh and Rogoff (1995) in the "intertemporal approach" to the current account). Although this might be true, changes in the current account, like changes in world trade (see graph 4), influence domestic savings and investment in turn. The criticism of the models (3)-(4) could then, strictly speaking, also be applied to the models (5)-(6).

6.2 Twin deficits

Finally we focus on the issue of countries that have both a government deficit and a current account deficit. We recall the equality \( S_y + S_t - I = X - M \), where in case of twin deficits \( S_y < 0 \) and \( X - M < 0 \). In order to reduce (at least one of) the twin deficits, it is often suggested that either public or private savings should be increased. Reducing investment is not desirable and reducing the current account is not fully within a government’s reach.

Let us first consider a change in the behaviour of private savers, in the sense that they save more. According to the simulation results in Table 2 this seems not appropriate since, although it increases the value of the current account, it further increases the government deficit. After all, it will always go at the cost of current consumption, and thus be a loss of economic growth. If instead of increasing private savings, public savings are increased by decreasing government expenditures, the current account is increased, as follows from graph 5. According to the NIGEM simulation results the twin deficits are thus decreased simultaneously. A drawback for the US and Germany is, though, that investment decreases in the short run.

As Elsner (1995) argues, this negative effect of investment and thus on (future) growth and savings can be as important as the fall in deficit(s). His model is

\[
S_t = \alpha_0 + \alpha_1 S_{t-1} + \xi S_{t-1} + \gamma_1 \Delta M_{t-1} + \gamma_2 \Delta M_{t-2} + \gamma_3 \varepsilon_{t-2}
\]

where \( S_t \) represents aggregate savings at time \( t \), \( S_{t-1} \) public savings one period lagged, \( \varepsilon_t \) the exchange rate and \( \Delta M_t \) the (once differenced) money supply. Elsner estimates \( \xi < 0 \) for the US, by which current government deficits have the positive effect that they lead to future savings and, consequently, probably to future growth. A government deficit in this light is thus not a hindrance.

As the US is the only one of our four countries with twin deficits over the whole sample period, we look at it in more depth. For the US sample period in NIGEM replicating the results of...
Elster (1995) yields the impulse response graph 5. As in Elster (1995) the response of current public savings to future savings is negative, though insignificant. According to this partial (dynamic) model, reducing the public deficit in the US affects future savings thus negatively indeed. Consequently future investment and future economic growth will certainly not increase because of this fall in savings.

This result is however not confirmed by NIGEM since there is no negative effect on aggregate savings. This follows from the fact that the mirror image of private savings is smaller than the shock in public savings in NIGEM. This is shown for NIGEM in graph 6 that is similar to graph 1 but for aggregate savings, investment and the current account. Aggregate savings is here positive over the whole period. In Elster’s model the (mirror) image of private savings to public savings is to be larger, otherwise ξ would not be negative⁶.

Although reducing the government deficit thus leads to a fall of investment in the short run, it does not confirm Elster’s result that aggregate savings (also) fall. The graphs 5-6 demonstrate this important difference in results that, once again, is only due to the different models that are used.

7 Conclusions

Simulations with the global macroeconomic model NIGEM show that rather different results are obtained from those given by the much simpler, partial models on savings-investment-current account that are often adopted in the literature. The simulation results are very similar for the four countries investigated.

In the short and long run the simulation effects of savings on investment are lower than the effects estimated by a simple investment-savings model. Also the effect of investment on the current account is weaker. The effect of public savings on the current account seems much stronger. The results of a dynamic partial model concerning the public savings effect on aggregate savings are also not in line with the NIGEM results.

These comparisons thus show that there are important differences between using a full macroeconomic model in which all relevant variables are modelled and models that only relate the variables of interest. Except for the inclusion of relevant variables, the differences come from included dynamics, multivariate causal relationships and, among others, the structural modelling of capital flows.

Most striking is the result that changes in public (private) savings tend to be largely offset by responses in private (public) savings. This in particular holds for the US, a country where a

⁶ Elster (1994) experiment with different measurements of national savings. The effect ξ⁵ (in the long run) can be interpreted as Keynesian if ξ < 0. Ricardoian equivalence if ξ = 0 and non-classical (crowding out) if ξ > 1, see footnote 4 and 5 in Elster (1996). The NIGEM results here thus tend to be non-classical rather than Keynesian.

solution needs to be found for the persistence of the twin deficits. Because of the almost perfect public-private savings mirror in the short run, an increase in private savings as often proposed as a solution would almost fully be translated in an increase of the government deficit. According to NIGEM decreasing the government deficit by fiscal policy is a better approach since it also decreases the current account deficit. It is, however, at the cost of investment in the short run. In the longer run both deficits decrease, and investment recovers.

References


