

"Twin Deficits" and Balances in QUEST and LIFT

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Introduction

There has been much debate among economists and policy makers alike on the asserted stylized fact called the "Twin Deficits" relationship. The weak form of this assertion is that countries that tend to have high government deficits also tend to have high trade deficits. In other words, a positive cross-sectional relationship between government deficits and trade deficits across countries is suggested. This weaker version appears to have some empirical validity.¹ A stronger form of this assertion is that the relationship also tends to hold over time, within the same country. Although this relationship is not as close empirically, it has strong intuitive appeal to some economists, who suggest that cutting budget deficits will not lead to a long-run decrease in GDP, since the adjustment of the trade balance should eventually make up the difference in government expenditures.

This issue continues to have relevance today, as Congress wrestles with the passage of a balanced budget amendment to the Constitution.² Simulations recently performed with the INFORUM QUEST model indicate that GDP in a deficit reduction scenario will be reduced below the base growth path (no deficit reduction).³ These simulations suggest that the high short-term costs of deficit cutting will only result in distant and uncertain benefits, and that GDP in a zero deficit world may take as long as 2005 to recover to the base growth path. In this pair of simulations, by the year 2000, although the federal deficit has been reduced by almost \$160 billion (from \$165 to \$7 billion), the nominal trade balance is just about the same as in the base, yielding a net reduction in GDP.

¹ See *Global Linkages*, McKibbin & Sachs.

² Some commentators believe that the failure to pass this amendment precipitated the recent sharp decline of the dollar with respect to the yen and the mark.

³ Simulations presented at INFORUM seminar, 3/15/95, as "Contract with America Redux".

How can one judge if these results are believable in light of recent historical experience? Can we have confidence that the QUEST model is treating the effects of the deficit correctly? Furthermore, it should be interesting to compare the behavior of QUEST with the INFORUM LIFT model, and see how reasonable the response of trade to federal deficits behaves in that model.

Some authors have simplistically treated the relationship between government deficits and trade deficits in a single-equation regression framework, regressing trade deficits directly on government deficits and other variables. However, the bulk of the literature has attempted to model the effect of the deficit and other variables on the real exchange rate, and then modeled the link between the exchange rate and trade. This is roughly what we try to do in the QUEST or LIFT models, although QUEST works through a terms-of-trade equation, and LIFT uses the exchange rate as a factor in determining foreign prices for the industry level trade equations. Although the crucial behavioral determinants to be studied include relative prices, interest rates and the exchange rate, *ex post* there are a few identities that must be satisfied. Broadly speaking these identities relate the savings and investment behavior in the domestic economy to what must be borrowed from abroad. The foreign borrowing required by the economy is closely related to the trade balance, as the full set of foreign accounts must balance. A simple way to look at the identities is that if we consume more than we produce, we must import the difference, and borrow the money to pay for it. Ultimately we may pay back the loan with interest, and then must run a trade surplus to generate the necessary foreign exchange.

In this short paper I subject first the QUEST model and then the LIFT model to two tests. The first test is simple: Do the models satisfy national income accounting identities which relate to important balances? These balances are: 1) the product-income GNP balance; 2) the government balance; 3) the savings-investment balance; and 4) the foreign balance. The second test is more intuitive, and leaves room for differences in opinion between honest, well-informed individuals: Do key components of these identities appear reasonable in the simulations in light of recent historical data?

In the first section of the paper, I review the identities relating to the balances and provide summaries of recent history. In the second section of the paper, I review the degree of enforcement of these identities in the QUEST model and make some minor proposals for improvement. In the third section, I discuss the behavior of the QUEST simulations in terms of these identities, hoping to provoke discussion on the model's behavior. In the final section, I review the status of the identities in LIFT, and make some proposals for improvement.

The Important Balances

This section reviews the important balances that should hold in an econometric model, based on national income accounting identities. The product-income GNP identity shows how the well-known circular flow results in the equality of GNP calculated either as expenditures or as income. The government balance is used to define the combined (federal plus state and local) government deficit. The savings-investment balance is used to define net foreign investment, and the foreign balance, which includes the trade balance, can be shown to follow by algebraic identity.⁴ Tables 1 to 4 summarize the algebraic identities which must hold, showing the variables both in terms of QUEST variable names and NIPA concept titles.⁵ It can be shown that if any three of these identities hold in a model, then the fourth identity will hold as well. For example, assume that the first three identities hold. We can derive an expression for v (investment) using the savings-investment balance, and an expression for g (government purchases) from the government balance. These can then be substituted into the left-hand side of the product-income identity. Canceling and rearranging terms yields the foreign balance. Table 5 provides an annual summary of these data for selected historical years from the QUEST historical databank. Note that in QUEST the variable $nbtrpf$ (Business transfer payments to foreigners) is not available. In table 5 this

⁴ These balances are displayed in *The Craft of Economic Modeling*, 2nd ed., p 188. The tables in this paper revise the balance identities slightly to be consistent with changes in the national accounts in effect since December, 1992.

⁵ The product-income side identity can be obtained from NIPA Tables 1.1, 1.9 and 2.1. The government balance can be seen in NIPA Table 3.1, the investment-savings balance in Table 5.1, and the foreign balance in Table 4.1. (See the July, 1994 issue of the *Survey of Current Business*.)

Table 1 The Product-Income GNP Identity

QUEST	NIPA concept	QUEST	NIPA concept
+ c	Personal consumption expenditures	+ c	Personal consumption expenditures
+ v	Gross private domestic investment	+ piptff	Personal transfers to foreigners
+ g	Government purchases	+ pisav	Personal savings
+ fe	Exports of goods and services	+ pitax	Personal tax and nontax payments
+ fefaci	Receipts of factor income	+ nwald	Wage accruals less disbursements
- fi	Imports of goods and services	- genip	Net interest paid by government
- fifaci	Payments of factor income	- ngtpp	Government transfers to persons
		+ nconsi	Social insurance tax
		- npdivi	Personal dividend income
		+ niprf	Corporate profits
		- nsub	Subsidies less surplus of government enterprise
		+ nsd	Statistical discrepancy
		+ nbtrpf	Business transfer payments to foreigners
		+ nibtax	Indirect business taxes
		+ ncca	Capital consumption allowance

Table 2. The Government Balance

QUEST	NIPA concept	QUEST	NIPA concept
+ g	Government purchases of goods and services	+ pitax	Personal tax and nontax payments
+ ngtpp	Government transfer payments to persons	+ nictax	Corporate profits tax
+ gfetpf	Government transfer payments to foreigners	+ nconsi	Contributions for social insurance
+ nsub	Subsidies less current surpluses	+ nibtax	Indirect business tax and nontax liabilities
+ genip	Net interest paid by government	+ defcit	Combined deficit of governments
- gsediv	Dividends received by state and local governments		

Table 3. The Investment-Savings Balance

QUEST	NIPA concept	QUEST	NIPA concept
+ v	Gross private investment	+ pisav	Personal savings
+ nfinv	Net foreign investment	+ nwald	Wage accruals less disbursements
		+ nprf	Corporate profits with inventory valuation adjustment and capital consumption adjustment
		- nictax	Corporate profits tax
		- npdivi	Dividends paid to persons
		- gsediv	Dividends paid to state and local governments
		+ ncca	Capital consumption allowance with capital consumption adjustment
		- defcit	Combined deficit of governments
		+ capgrt	Capital grants to the U.S.
		+ nsd	Statistical discrepancy

Table 4. The Foreign Balance

QUEST	NIPA concept	QUEST	NIPA concept
+ fe	Exports of goods and services	+ fi	Imports of goods and services
+ fefaci	Receipts of factor income	+ fifaci	Payments of factor income
+ capgrt	Capital grants to U.S.	+ pipttf	Personal transfers to foreigners
		+ gfetpf	Government transfer payments to foreigners
		+ nbtrpf	Business transfer payments to foreigners
		+ nfinv	Net foreign investment

variable was derived for both the product-income identity and the foreign balance as a residual.

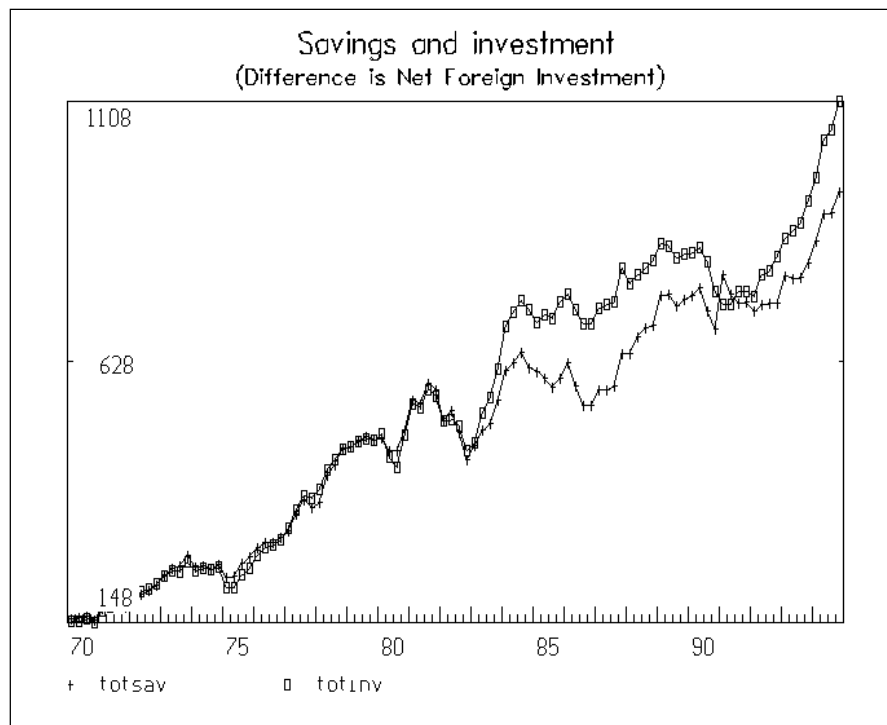
Now I will review some of the salient relationships embodied in these identities. Let's start with the investment-savings balance. Figure 1 shows a graph of total investment and total savings over the period 1970 to 1994. Total investment includes residential and non-residential structures investment, equipment investment and inventory change. Total savings includes personal savings, business savings (profits and depreciation less dividends and corporate profits tax) and government savings (negative when there is a deficit).

Table 5. Historical Relationships (continued)

	The Foreign Balance									
	1970	1975	1980	1982	1985	1987	1990	1992	1993	1994
Receipts from Rest of World	70.9	164.4	361.0	379.9	399.3	469.0	725.7	771.6	795.6	883.7
Exports of Goods & Services	57.0	136.3	279.2	282.6	302.0	364.0	557.1	638.1	659.0	718.5
Receipts of Factor Income	13.0	28.2	80.6	97.3	97.3	105.1	168.6	133.5	136.6	165.2
Capital Grants to U.S.	0.9	0.0	1.2	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
Payments to Rest of World	70.9	164.4	361.0	379.9	399.3	469.0	725.7	771.6	795.6	883.7
Imports of Goods & Services	55.8	122.7	293.9	303.2	417.6	507.1	628.5	668.4	724.3	818.2
Payments of Factor Income	6.6	14.9	46.5	67.1	82.4	100.5	146.9	127.9	132.1	173.3
Net Foreign Transfers from Persons	1.2	1.2	1.6	2.1	2.7	3.0	10.1	9.6	9.8	10.5
Business Transfer Payments to Foreign	0.4	0.8	2.5	3.6	3.2	3.2	5.5	5.9	5.9	11.6
Net Foreign Transfers from Govt.	2.0	3.5	5.0	6.4	11.4	10.4	13.2	16.5	15.7	13.6
Net Foreign Investment	4.9	21.4	11.5	-2.5	-118.1	-155.1	-78.5	-56.6	-92.3	-143.4

Note that from 1970 (and before) to early 1982, investment and savings moved almost in lockstep. This is closely related to the fact that net foreign investment, which by definition is the difference between the two, was insignificant during this period. It is easy to blame the emerging savings-investment gap starting in 1982 on the Reagan budget deficits. However, strong investment expenditures and secularly declining personal and corporate savings rates also contributed to this gap. Note also that between 1991 and early 1992, the gap closed

Figure 1



somewhat. This was partly due to an upward movement in the savings rates, but also to a sharp decline in investment expenditures.

Figure 2 compares the government deficit in this historical period to the net foreign investment. Although one could argue that they "tend" to move together, the value of R^2 in a regression of net foreign investment (squares) on the combined government deficit (+'s) for this period is only .22. A clue to the difference of these two numbers can be gained by noting that the combined deficit always climbs above the net foreign investment during or shortly after a recession. The periods 1975 to 1977, 1981 to 1984 and late 1990 to 1992 stand out.

We can understand the gap between these two numbers by analyzing Table 3. We can take out the government deficit on the right hand side of the table, and take out net foreign investment on the left. What remains shows us that the difference between the deficit and net foreign investment is almost equal to the difference between private savings and investment, as shown in Figure 3. In this graph, in terms of QUEST variables, the '+'s are calculated as:

$$\text{nfdif} = \text{defcit} + \text{nfinv} \text{ (where defcit is positive and nfinv is negative)}$$

Figure 2

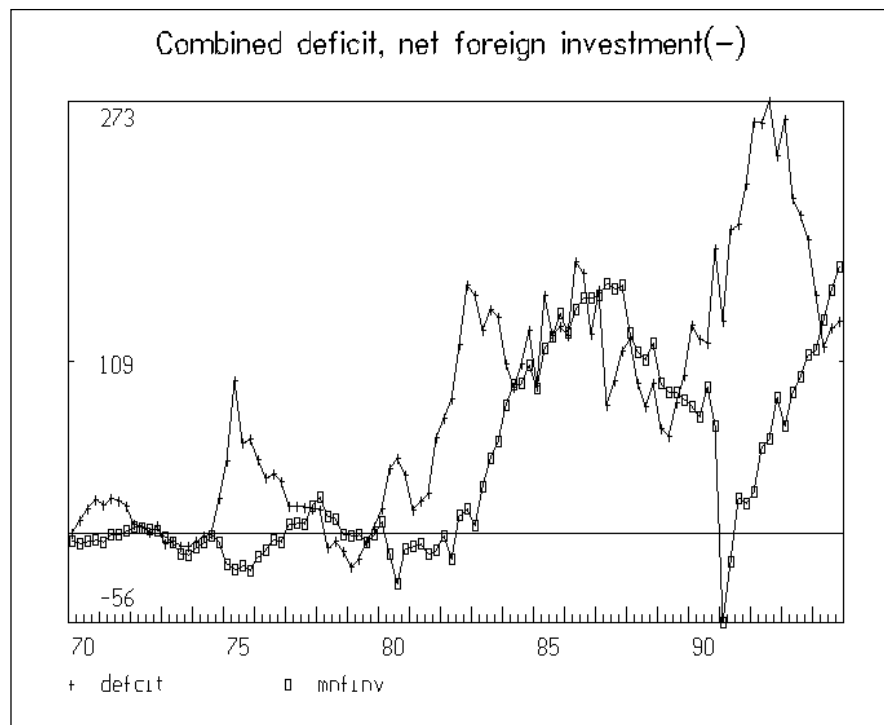
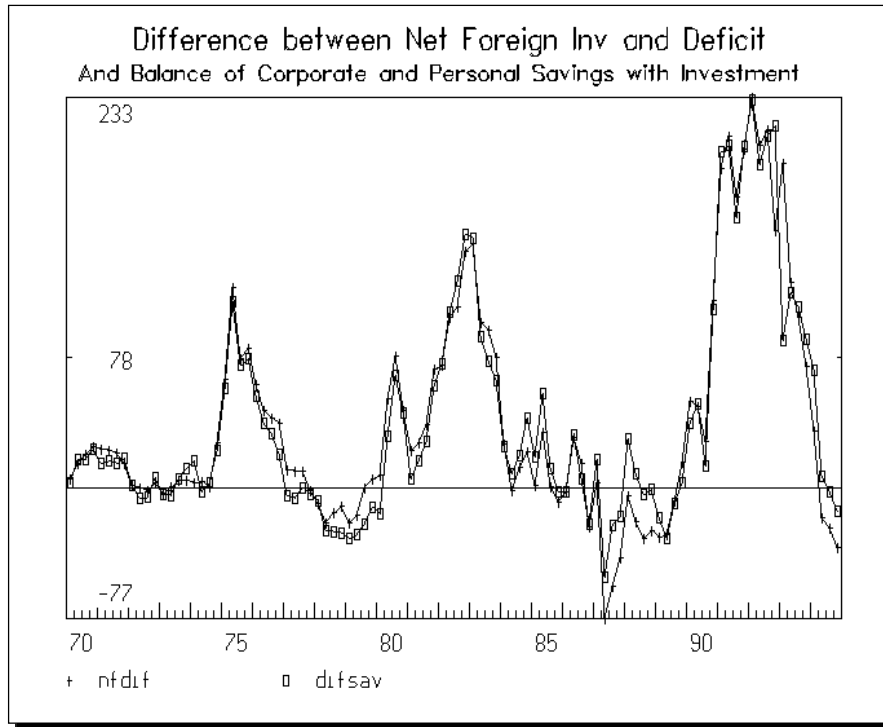


Figure 3



The squares are calculated as:

$$\text{difsav} = v - (\text{pisav} + \text{niprf} + \text{ncca} - \text{nictax} - \text{npdivi} - \text{gsediv})$$

The only remaining difference between these two quantities are Capital grants to the U.S. (*capgrt*), Wage accruals less disbursements (*nwald*), and the Statistical discrepancy (*nsd*), which are all small, and generally will be forecast to be zero.

The concept roughly measured by either of the lines in Figure 3 can be referred to as *the private savings-investment gap*. This measure can rise either when investment expenditures fall, or when savings rise. It will be helpful to have a look at each of the components of this measure separately. However, since savings and investment are both trended, it is easier to observe savings and investment behavior by looking at these variables as a percentage of GDP.

Figure 4 shows the investment/GDP ratio. As mentioned before, this includes all forms of investment, including housing construction. Figures 5 and 6 show Personal savings and

Business savings as a ratio to GDP. It is notable that the very periods when the savings-investment gap has been large tend to be just those periods when total investment takes a sharp drop.

Figure 4

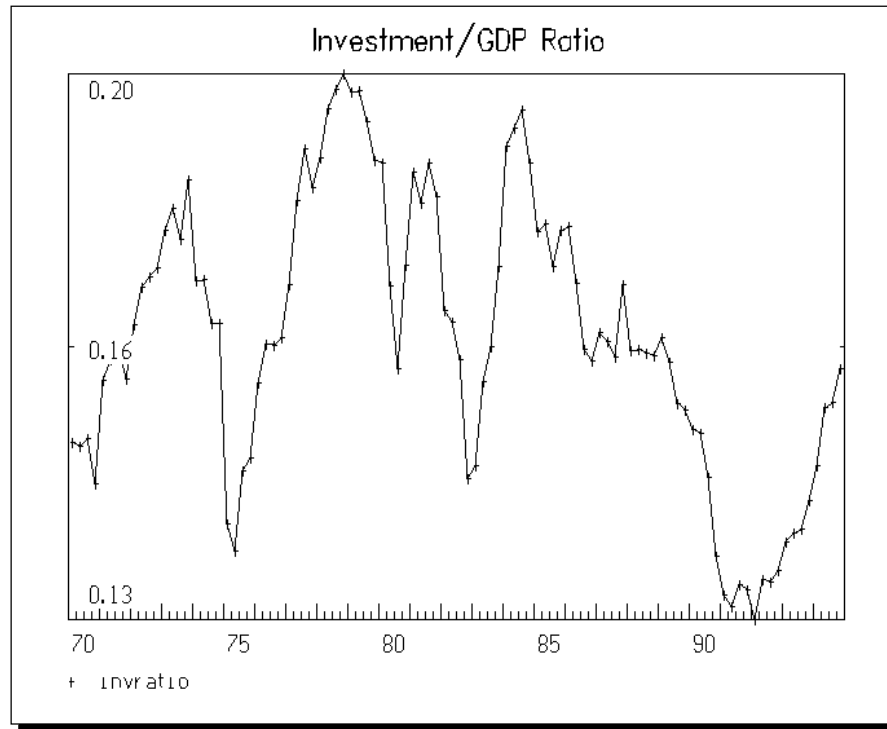


Figure 5

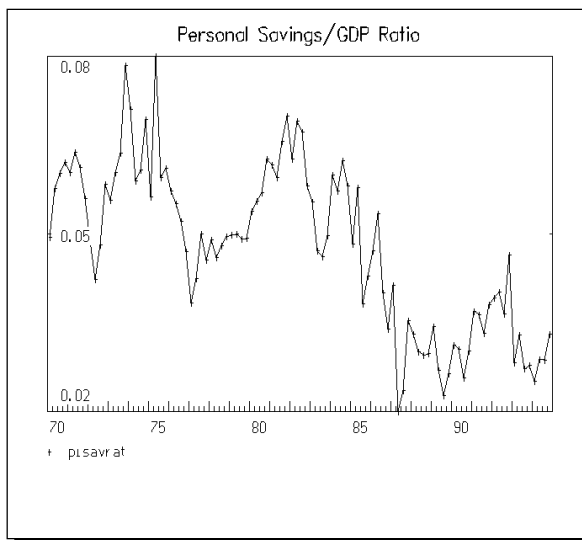
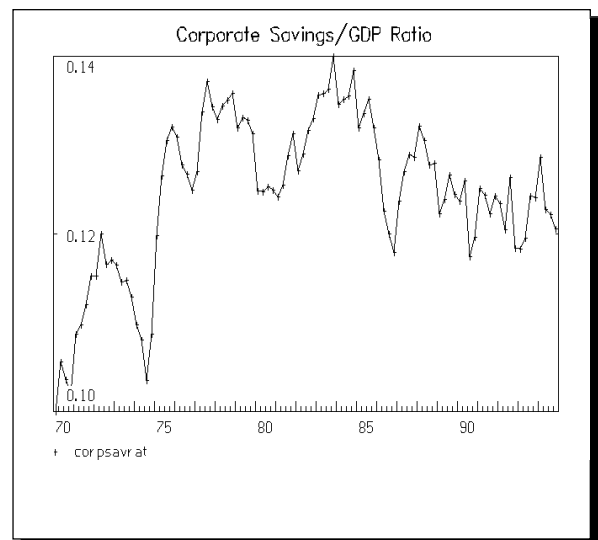


Figure 6



Personal savings rates were moving up and down between 4 and 8 percent of GDP until about 1981, when they started a slow decline that flattened only by 1990 at 2 to 3 percent. Corporate savings vary between 12 and 14 percent of GDP, but the share showed a declining trend from 1983 to the present. However, the movement in the savings rates is small compared to that of investment in a recession, and it is investment which explains the larger part of the gap.

This exercise demonstrates another useful way of looking at the identities: the difference in movement between the combined government deficit and the net foreign investment is the private savings-investment gap, which tends to become larger in recessions, when private investment is slack. Unless we can project other than flat or slightly declining savings rates, it should be mostly the cyclical behavior of investment that determines this gap. And if the past 25 years are any guide, a stable equilibrium growth path of investment would yield a constant gap which is slightly positive (refer to Figure 3).

With trend projections of savings and investment rates, the twin-deficits relationship would almost certainly hold. Roughly constant rates of private savings and investment would mean that the government deficit and net foreign investment are directly related, with perhaps only a small but constant gap between them. However, there is the rub. Rates of savings and investment will certainly not remain constant in response to changes in the government deficit. It is ultimately the response of savings and investment to these deficits that we must judge.

Figure 7 shows how the net foreign investment has tended to closely correspond to the trade balance. The only difference between them consists of net factor income, which moves slowly and is gently trended, and transfers to foreigners, which are small, but also growing. Both of these items will be discussed again in the next section.

Since we have observed that in the QUEST forecasts the government deficits and the trade balance *do not* move together, what is allowing this loose association? It must be that the private savings-investment gap changes in response to the changes in the deficit. Once we have observed how the components of the savings-investment are forecast to change, we can decide if we believe the changes. The next section will compare two QUEST forecasts.

The first is the March 1995 base, and the second is a simulation in which the deficit is sharply reduced.

Two QUEST Forecasts

Annualized forecast values for the March 1995 QUEST base case and the deficit reduction case are compared in Table 6. Here are a few highlights to note up front. By 2000, the combined deficit is \$158 billion lower in the alternate case. Net foreign investment, however, is only \$14 billion lower. Turning to the second part of Table 6 on the following page, we can observe that although Net exports improve in the middle years of the simulation, by 2000 they are at the same level as the base case, with imports and exports both reduced by about \$125 billion.

Before examining the more exciting issues such as savings and investment, we should first check our humble identities. Here, we find that the current QUEST model fails two identities Although the government balance is satisfied in the historical period, there is a

Figure 7

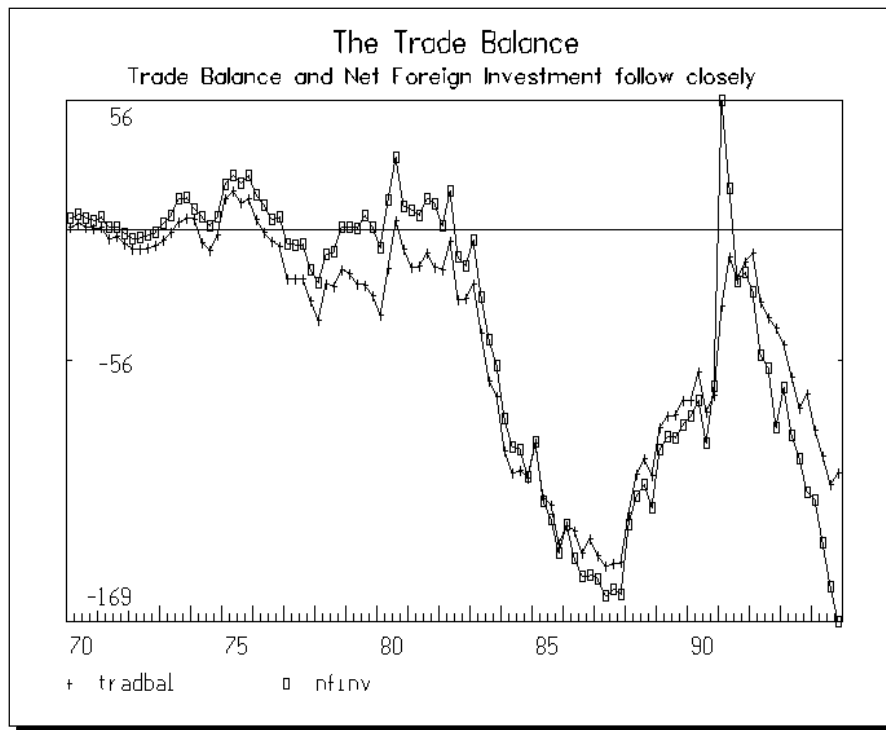


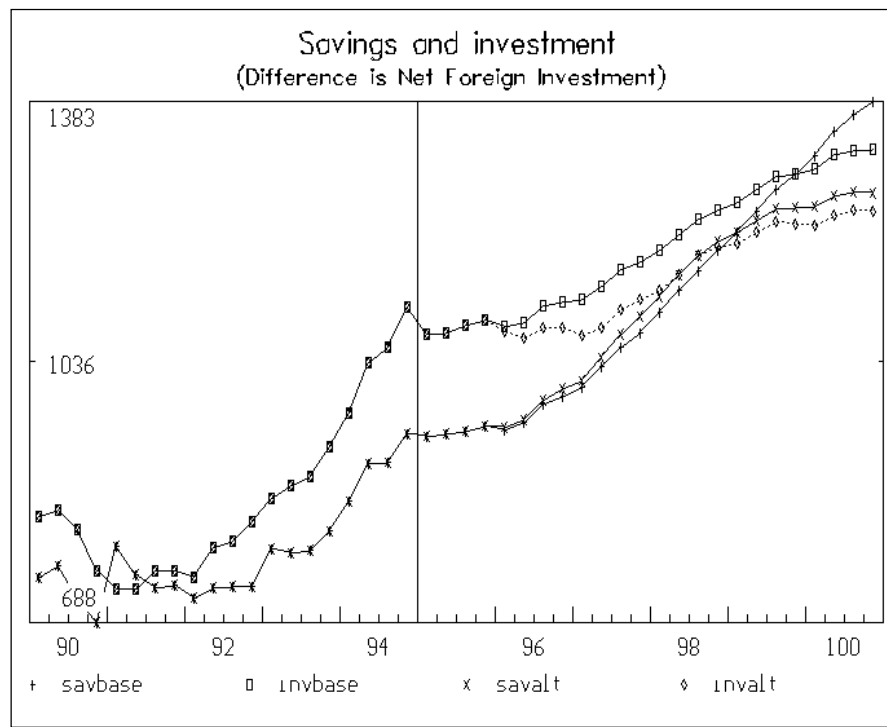
Table 6. Balances in the QUEST Forecasts

Forecast Values of QUEST Identities									
	Line 1: INFORUM BASE								
	Line 2: INFORUM balanced budget simulation								
Alternatives are shown in deviations from base values.									
	The Government Balance								
	1992	1993	1994	1995	1996	1997	1998	1999	2000
Government Payments	2106.8	2185.6	2262.1	2418.3	2572.9	2722.3	2882.9	3040.8	3182.7
	0.0	0.0	0.0	0.0	-64.0	-147.2	-233.3	-321.9	-422.7
Govt Purchases of Goods & Serv	1125.3	1148.4	1179.7	1243.9	1300.5	1366.1	1438.0	1511.7	1584.6
	0.0	0.0	0.0	0.0	-8.4	-23.1	-47.7	-81.5	-123.9
Govt Transfers to Persons	837.8	892.6	942.0	1019.2	1111.8	1186.4	1260.1	1326.7	1383.5
	0.0	0.0	0.0	0.0	-50.1	-100.8	-137.9	-162.8	-185.1
Govt Transfers to Foreigners	16.5	15.7	13.6	16.4	17.8	18.9	20.0	21.0	21.9
	0.0	0.0	0.0	0.0	-0.8	-1.5	-2.1	-2.4	-2.6
Subs. Less Curr. Surplus	3.6	9.0	1.0	1.7	1.8	1.9	1.9	2.0	2.1
	0.0	0.0	0.0	0.0	-0.0	-0.0	-0.0	-0.1	-0.1
Net Interest Paid by Govt.	133.7	130.2	136.8	149.4	154.5	163.2	177.9	195.2	207.4
	0.0	0.0	0.0	0.0	-4.7	-21.8	-45.6	-75.1	-111.0
- Dividends received by S&L Govts	10.1	10.4	10.9	12.4	13.5	14.3	15.1	15.9	16.7
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Government Receipts	2106.9	2185.6	2260.1	2400.2	2548.1	2688.8	2840.2	2991.9	3131.4
	0.0	0.0	0.0	0.0	-63.2	-143.4	-224.1	-305.7	-401.3
Personal Tax & Nontax Payments	648.6	686.4	743.3	782.0	826.0	874.9	925.9	975.8	1019.9
	0.0	0.0	0.0	0.0	-7.2	-24.3	-43.8	-66.9	-96.6
Profits Tax Liability	139.7	173.2	201.4	206.3	206.5	215.9	228.9	238.8	245.8
	0.0	0.0	0.0	0.0	-9.3	-12.0	-11.1	-15.3	-20.7
Contributions for Soc. Ins	556.4	585.6	627.7	672.6	716.8	761.4	810.3	859.8	906.1
	0.0	0.0	0.0	0.0	-5.9	-17.0	-28.2	-42.3	-61.0
Indirect Bus Tax & Nontax Liab.	504.4	525.3	554.5	586.5	622.9	662.1	705.6	750.7	794.4
	0.0	0.0	0.0	0.0	-5.8	-15.1	-27.2	-43.7	-65.1
Combined Deficit of Govts.	257.8	215.0	133.2	152.9	175.9	174.5	169.6	166.7	165.2
	0.0	0.0	0.0	0.0	-34.9	-75.0	-113.8	-137.5	-157.9
Discrepancy in Balance	-0.1	-0.0	2.0	18.1	24.8	33.5	42.6	48.9	51.2
	0.0	0.0	0.0	0.0	-0.8	-3.8	-9.2	-16.3	-21.4
	The Investment-Savings Balance								
	1992	1993	1994	1995	1996	1997	1998	1999	2000
Investment	731.7	789.8	897.6	941.7	966.2	1039.6	1142.7	1248.5	1349.6
	0.0	0.0	0.0	0.0	5.8	14.9	18.8	-21.5	-94.4
Gross Private Investment	788.3	882.0	1041.0	1079.9	1098.0	1144.8	1212.8	1269.8	1309.6
	0.0	0.0	0.0	0.0	-22.7	-51.1	-51.6	-59.7	-79.9
Net Foreign Investment	-56.6	-92.3	-143.4	-138.2	-131.8	-105.2	-70.2	-21.2	40.0
	0.0	0.0	0.0	0.0	28.4	66.0	70.4	38.2	-14.5
Savings	731.7	789.8	897.7	941.7	966.2	1039.6	1142.7	1248.5	1349.6
	0.0	0.0	0.0	0.0	5.8	14.9	18.8	-21.5	-94.4
Personal Savings	247.9	192.6	204.2	241.1	240.8	237.4	240.3	239.4	228.6
	0.0	0.0	0.0	0.0	-13.0	-30.0	-38.7	-50.1	-68.2
Wage Accruals Less Disb.	-20.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Corporate Prof. with IVA, CCadj	405.1	485.8	543.3	548.0	545.4	567.0	597.9	620.3	634.8
	0.0	0.0	0.0	0.0	-24.6	-31.6	-29.0	-39.7	-53.5
- Corporate Profits Tax	139.7	173.2	201.4	206.3	206.5	215.9	228.9	238.8	245.8
	0.0	0.0	0.0	0.0	-9.3	-12.0	-11.1	-15.3	-20.7
- Dividends Paid to Persons	161.0	181.3	194.2	214.1	225.6	233.0	241.5	251.6	261.2
	0.0	0.0	0.0	0.0	-0.6	-4.7	-8.1	-10.2	-13.6
- Dividends Paid to S&L Gov	10.1	10.4	10.9	12.4	13.5	14.3	15.1	15.9	16.7
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Capital Consumption Allowance, with C	658.5	669.0	715.5	757.0	816.8	884.8	968.0	1066.6	1176.4
	0.0	0.0	0.0	0.0	-1.5	-15.3	-46.5	-94.7	-164.8
- Combined Govt. Deficit	257.8	215.0	133.2	152.9	175.9	174.5	169.6	166.7	165.2
	0.0	0.0	0.0	0.0	-34.9	-75.0	-113.8	-137.5	-157.9
Capital Grants to U.S.	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Statistical Discrepancy	8.8	2.3	-25.6	-18.9	-15.4	-11.9	-8.3	-4.8	-1.3
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Discrepancy in Investment-Savings	0.0	-0.0	-0.1	-0.0	0.0	0.0	-0.0	-0.0	-0.0
	0.0	0.0	0.0	0.0	-0.0	-0.0	0.0	0.0	0.0

The other identity which is not enforced in QUEST is the foreign trade balance. On the payments side the old NIPA included three items: Personal transfers to foreigners (pipttf), Government transfers to foreigners (gftpf), and Government interest paid to foreigners (gfeif). The new NIPA includes instead of gfeif the variable I have called nbtrpf (Business transfer payments to foreigners), which is not currently in QUEST. However, as in the historical data, this variable can be derived as a residual from the foreign balance and the product-income identity. From the second part of Table 6, we see that the value as derived from the foreign balance reaches a value of -\$32.5 by 2000 in the base case, whereas the value derived from the product-income identity reaches \$18.8. This would be consistent with an improvement of \$50 billion dollars in the trade surplus in both the base and the alternate case. It is not clear how this variable should respond to the deficit, if at all. At any rate, the value as derived from the foreign balance goes up by \$17.8 in the deficit reduction case, but down by \$3.6 as derived from the product-income identity.

Let's look at some of the other familiar identities in the two QUEST forecasts. Figure 8 compares the overall savings-investment balance (including government) in the two simulations. Total investment in the alternate stays below total investment in the base, which

Figure 8



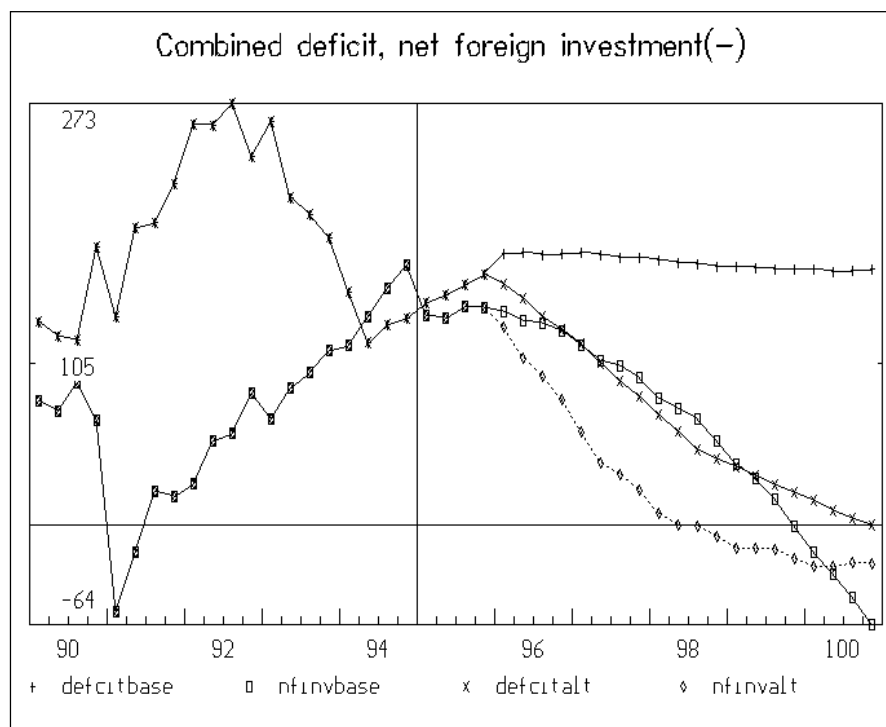
is not surprising, given the GDP difference. Total savings in the alternate case remain *above* total savings in the base, until early 1999, when they turn flat.

Figure 9 compares the implication of the previous graph (net foreign investment) with the government deficit. Net foreign investment falls in the base, even as the deficit remains at about \$200 billion. In the alternate case, with the lower deficit, it is at first below the base, it turns up to become *higher* than in the base case by the end of the year 2000.

Another way to look at this projection, shown in Figure 10, is that the *private savings-investment gap* in the base rises to \$233 billion, close to its value in 1992. In the alternate simulation, it remains in the neighborhood of \$50 billion. This represents an extra \$180 billion less domestic savings surplus than in the base by 2000. If it weren't for this difference, the trade balance would have had to be about \$180 billion more in surplus, to satisfy the foreign balance identity. (Of course, if the trade balance were higher, this would also increase GDP, which would then make both savings and investment higher.)

Figure 10 contains a clue as to why the QUEST model does not display the property of "twin deficits". Savings and investment behavior changes enough in the reduced budget

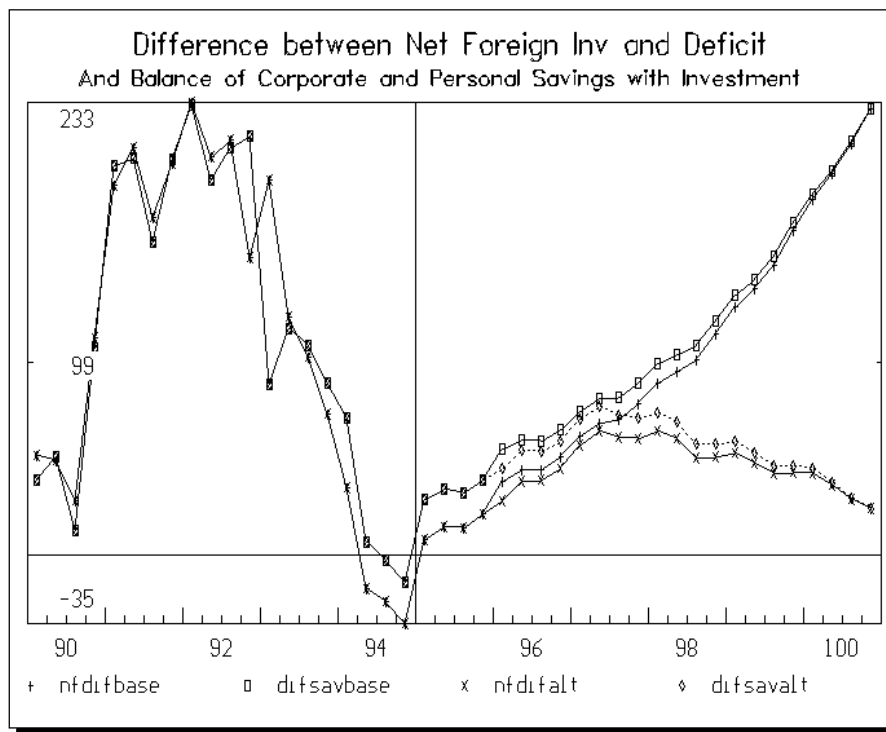
Figure 9



deficit simulation so as to keep the savings-investment gap high.. Before we can judge the reasonableness of this behavior, we should take a look at the investment and savings rates in isolation, and study how they respond to lower deficits in QUEST.

Figures 11 to 13 show these variables, again as a ratio of GDP. Investment in the alternate case first falls below the base as a percentage of GDP, but then rises slightly higher. However, in both simulations the investment/GDP ratio remains around .14. Both personal and business savings rates, however, are reduced significantly relative to the base. The business savings ratio is climbing steadily in the base⁶ but not climbing nearly so rapidly in the deficit reduction case. By 2000, this difference alone amounts to almost an entire percentage point of GDP, or about \$90 billion. The personal savings rate also falls relative to the base, reaching a historical low of .17 by 2000. This is about half a percent below the

Figure 10



⁶ To me, this looked suspicious. Examining the components of business savings in more detail indicates that the ratio of capital consumption allowance to GDP climbs rapidly in the base,

Figure 11

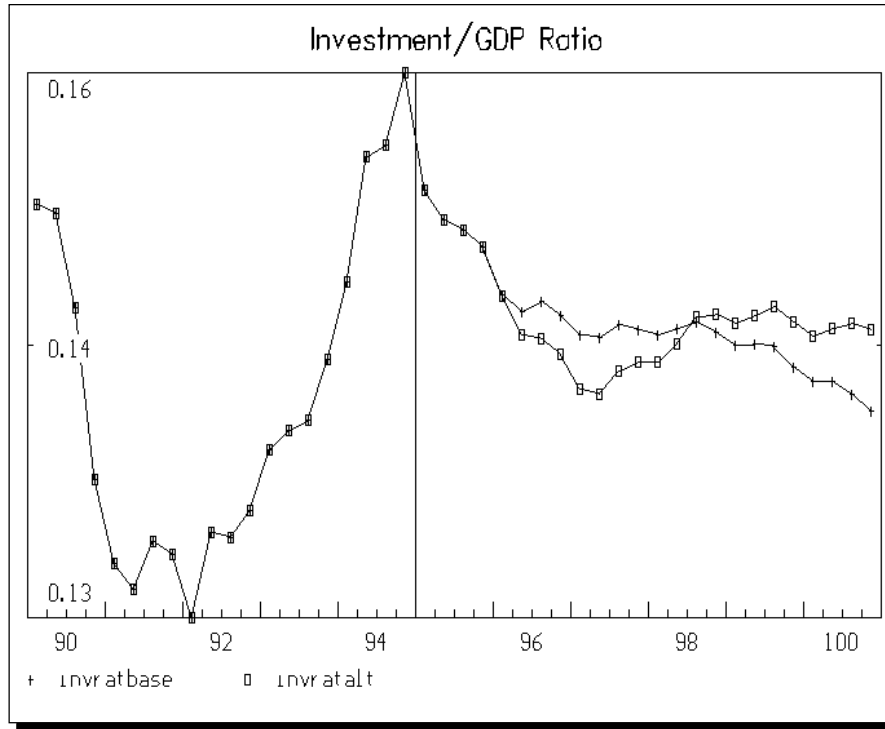


Figure 12

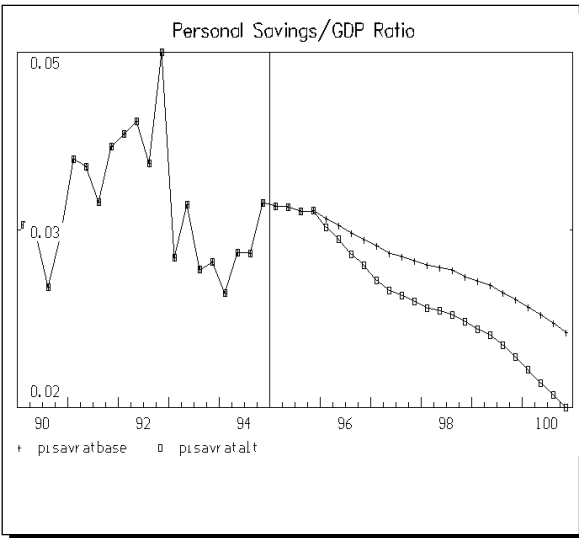
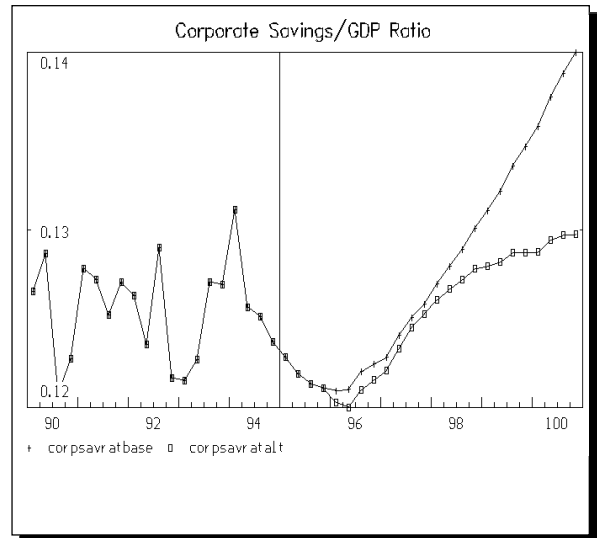


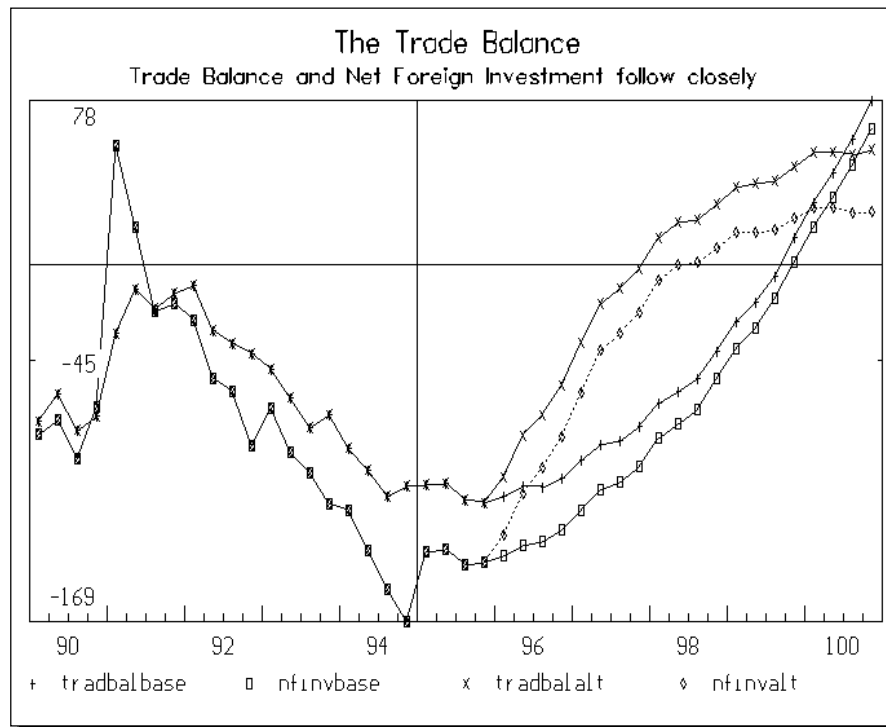
Figure 13



value in the base case, or about \$45 billion.⁷ In other words, if the savings rates had been constant, then over \$100 billion in extra private savings would have been available, precluding the need for an equivalent amount of net foreign investment.

Figure 14 shows a comparison of the trade balance and net foreign investment in both

Figure 14



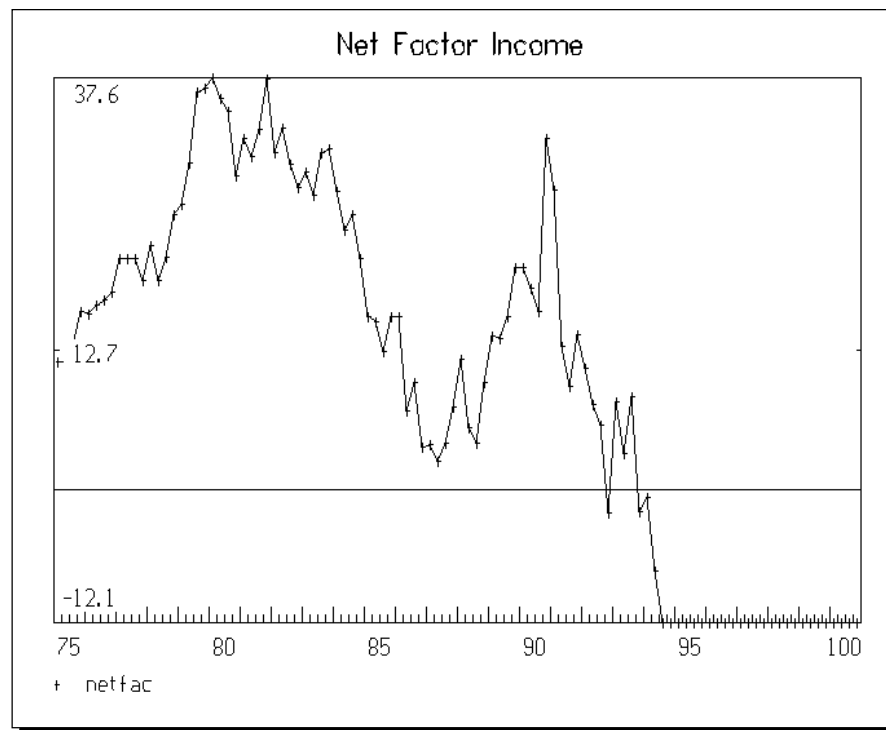
simulations. This shows that the close link between these two variables is still being preserved, although they are slightly closer in the base case, because of the trend in Transfer payments to the rest of the world (Table 6).

It is worthwhile to examine one more component of the foreign balance. This is the balance of factor income. Figure 15 shows that this variable had a "hump" shape in recent history, as net receipts of factor income grew until the mid-80's, only to start declining again as the U.S. became more in debt to foreigners. In 1992, for the first time in ages, the net

but much left rapidly in the deficit reduction alternative.

⁷ This is not the actual difference in savings, but rather what the difference would be multiplying the savings/GDP ratio on the base value of GDP.

Figure 15



balance became negative, meaning that foreigners were receiving more factor income (mostly interest from loans and investments) from the U.S. than the U.S. was receiving from abroad. Since the third quarter of 1993, the balance has remained negative. In the QUEST simulations, the values of both factor imports and factor exports are kept at the value of the last actual observation, at the end of 1994. How reasonable is this? Probably we should be forecasting the negative factor income balance to increase as long as foreign net investment is accumulating in the U.S. A more careful QUEST forecast would probably show this balance falling continuously, perhaps a little more slowly in the low deficit case (since the U.S. is not accumulating as much foreign debt). Although this is an important variable, its behavior in these simulations probably does not contribute much to the effects of the deficit on the trade balance.

We are left to question the behavior of investment, personal savings and business savings as an explanation for the lack of a link in the model between the combined deficit and the trade balance. It seems to be because the savings rates fall by so much in the alternate simulation, that the trade balance is not much better. What is to be said for this behavior?

The hyperrationality argument of Barro and others would suggest that a lower deficit results in a lesser need to save in order to pay off future government debt. Hyperrationality could be invoked in support of the lower savings rates in the alternate case, history does not provide evidence supporting this hypothesis (savings rates were falling in the 80s, as the deficit was rising). Furthermore, we should remember that in the historical data it was not the savings rates that were causing the big swings in the savings-investment gap, but rather the investment rates. In our forecast, the investment/GDP ratio does not change by much. Do we believe that this much change in the deficits relationship should be affected by the savings rates? I'll leave that for you to decide. On the one hand, a less robust economy brought about by large government spending cuts will tend to have lower savings rates, as well as lower investment. The key question is how much this investment-savings relationship will change in response to a government deficit. I think at least we should re-examine the forecast of the capital consumption allowance, and I am sceptical about how much lower the personal savings rate can fall. The QUEST model seems to suggest that at least in the mid-term forecast, savings will fall too much to stimulate the trade balance enough. This helps keep the economy continually below the base level of GDP, with corresponding impacts on employment and income.

The LIFT Model and the Balances

Although not readily available as one of the standard tables, a stub file for LIFT can be constructed that shows the same balances as shown in Table 5 for QUEST.⁸ Table 7 on the next page shows the historical data from the December 1994 Inforum Outlook for these variables. The government balance table can be derived essentially by adding up the federal government table (FED.STB) and the state and local government table (S&L.STB). Unlike QUEST, LIFT does include the Government transfers to foreigners (trffrn). LIFT models Dividends received by S&L governments (sldivr), but this variable is missing in S&L.STB. The government balance holds in the LIFT historical data, although some of the components

⁸ The stub file to create this table is H:\LIFT\DISPLAY\GBANK\STUBS\BALANCE.LFT. Appendix A shows the four balances defined in terms of LIFT macrovariables.

Table 7. Historical Relationships in the LIFT Data

Historical Values of LIFT Identities										
March 1995										
	The Product-Income GNP Balance									
	1977	1980	1982	1985	1987	1990	1991	1992	1993	1994
	----	----	----	----	----	----	----	----	----	----
Product Side GNP	2008.6	2751.5	3155.7	4016.1	4560.6	5623.8	5784.3	6119.9	6423.0	6729.8
Personal Consumption Expenditure	1271.5	1748.1	2059.2	2667.4	3052.2	3761.2	3906.3	4141.9	4356.0	4534.2
Gross Private Domestic Investmen	352.6	451.4	465.3	679.6	736.0	784.7	716.9	773.8	859.0	970.2
Government Purchases	367.9	506.0	607.2	771.9	879.6	1047.5	1098.2	1132.7	1163.9	1201.1
Exports of Goods and Services	191.7	351.7	366.3	375.5	471.0	734.4	744.1	782.8	817.8	884.8
Receipts of Factor Income	37.7	80.6	97.3	97.3	105.1	168.6	155.7	133.5	136.6	129.7
- Imports of Goods and Services	195.7	339.7	372.5	493.2	582.8	725.7	697.4	716.9	778.1	863.6
- Payments of Factor Income	17.2	46.5	67.1	82.4	100.5	146.9	139.7	127.9	132.1	126.6
Income Side GNP	1996.9	2744.9	3179.0	4055.6	4552.9	5563.6	5735.9	6027.7	6328.4	6609.6
Personal Consumption Expenditure	1271.5	1748.1	2059.2	2667.4	3052.2	3761.2	3906.3	4141.9	4356.0	4534.2
Personal Transfers to Foreigners	1.2	1.6	2.1	2.7	3.0	10.1	10.4	9.5	9.9	10.3
Personal Savings	87.9	153.8	199.9	189.3	142.0	170.0	211.5	247.6	192.2	187.9
Personal Tax and Nontax Payments	210.2	312.4	371.3	436.7	512.5	623.3	623.7	648.5	686.5	723.0
Wage Accruals - Disbursements	0.1	-0.0	-0.2	-0.2	-0.1	0.1	-0.1	-20.0	20.0	0.0
Social Insurance Tax	149.8	216.5	269.8	353.8	400.7	503.1	526.5	560.2	589.9	620.1
Corporate Profits	175.7	177.6	151.5	280.8	319.8	380.6	390.3	405.1	485.7	516.6
Statistical Discrepancy	10.9	13.6	-7.4	-13.9	-24.8	7.8	1.5	8.8	2.3	0.0
- Net Interest Paid by Governmen	24.4	33.4	55.5	88.3	95.3	125.1	135.4	133.7	130.3	134.6
- Government Transfers to Person	217.4	312.5	396.3	468.0	521.4	666.2	749.1	837.7	892.5	919.2
- Personal Dividend Income	40.7	59.0	70.0	92.4	106.2	153.5	160.0	171.1	191.7	203.6
Business Transfer Payments to Fo	1.4	2.4	3.6	3.2	3.2	5.5	5.5	5.8	5.9	5.8
Indirect Business Tax	165.5	212.0	256.4	329.9	365.0	444.0	478.3	504.4	525.3	553.2
Capital Consumption Allowance	205.2	311.9	394.6	454.6	502.2	602.7	626.5	658.4	669.1	716.0
Discrepancy in Product-Income GNP	11.7	6.6	-23.3	-39.4	7.7	60.2	48.3	92.1	94.7	120.2
	The Government Balance									
	1977	1980	1982	1985	1987	1990	1991	1992	1993	1994
	----	----	----	----	----	----	----	----	----	----
Government Payments	615.1	859.8	1068.7	1341.5	1515.0	1847.5	1945.3	2114.1	2201.0	2263.8
Govt Purchases of Goods & Serv	367.9	506.0	607.2	771.9	879.6	1047.5	1098.2	1132.7	1163.9	1201.1
Govt Transfers to Persons	217.4	312.5	396.3	468.0	521.4	666.2	749.1	837.7	892.5	919.2
Govt Transfers to Foreigners	3.4	5.0	6.4	11.4	10.4	13.2	-27.8	16.5	15.7	14.0
Subs. Less Curr. Surplus	3.3	4.8	6.2	6.4	14.2	4.5	-0.1	3.6	9.0	6.4
Net Interest Paid by Govt.	24.4	33.4	55.5	88.3	95.3	125.1	135.4	133.7	130.3	134.6
- Dividends received by S&L Govt	1.3	1.9	2.9	4.5	5.9	9.0	9.5	10.1	10.4	11.4
Government Receipts	615.4	859.9	1068.6	1341.3	1514.9	1847.6	1945.2	2114.1	2201.0	2263.8
Personal Tax & Nontax Payments	210.2	312.4	371.3	436.7	512.5	623.3	623.7	648.5	686.5	723.0
Profits Tax Liability	73.0	84.8	63.0	96.5	127.1	138.7	131.1	139.8	173.3	183.6
Contributions for Soc. Ins	149.8	216.5	269.8	353.8	400.7	503.1	526.5	560.2	589.9	620.1
Indirect Bus Tax & Nontax Liab.	165.5	212.0	256.4	329.9	365.0	444.0	478.3	504.4	525.3	553.2
Combined Deficit of Govts.	16.9	34.2	108.1	124.4	109.6	138.5	185.6	261.2	225.9	183.9
Discrepancy in Balance	-0.2	-0.1	0.1	0.2	0.1	-0.1	0.1	-0.0	0.0	0.0
	The Investment-Savings Balance									
	1977	1980	1982	1985	1987	1990	1991	1992	1993	1994
	----	----	----	----	----	----	----	----	----	----
Investment										
Gross Private Investment	352.6	451.4	465.3	679.6	736.0	784.7	716.9	773.8	859.0	970.2
Net Foreign Investment (resid)	-4.7	25.6	29.1	-86.9	-145.7	-63.2	26.5	-56.1	-91.0	-132.4
Savings										
Personal Savings	87.9	153.8	199.9	189.3	142.0	170.0	211.5	247.6	192.2	187.9
Wage Accruals Less Disb.	0.1	-0.0	-0.2	-0.2	-0.1	0.1	-0.1	-20.0	20.0	0.0
Corporate Prof. with IVA, CCadj	175.7	177.6	151.5	280.8	319.8	380.6	390.3	405.1	485.7	516.6
- Corporate Profits Tax	73.0	84.8	63.0	96.5	127.1	138.7	131.1	139.8	173.3	183.6
- Dividends Paid to Persons	40.7	59.0	70.0	92.4	106.2	153.5	160.0	171.1	191.7	203.6
- Dividends Paid to S&L Gov	1.3	1.9	2.9	4.5	5.9	9.0	9.5	10.1	10.4	11.4
Capital Consumption Allowance, w	205.2	311.9	394.6	454.6	502.2	602.7	626.5	658.4	669.1	716.0
- Combined Govt. Deficit	16.9	34.2	108.1	124.4	109.6	138.5	185.6	261.2	225.9	183.9
Capital Grants to U.S.										
Statistical Discrepancy	10.9	13.6	-7.4	-13.9	-24.8	7.8	1.5	8.8	2.3	0.0

Table 7. Historical Relationships in the LIFT Data (continued)

	The Foreign Balance									
	1977	1980	1982	1985	1987	1990	1991	1992	1993	1994
Receipts from Rest of World	191.7	351.7	366.3	375.5	471.0	734.4	744.1	782.8	817.8	884.8
Exports of Goods & Services	154.0	271.1	269.0	278.2	365.9	565.8	588.4	649.3	681.2	755.1
Capital Grants to U.S.										
Receipts of Factor Income	37.7	80.6	97.3	97.3	105.1	168.6	155.7	133.5	136.6	129.7
Payments to Rest of World	201.7	348.7	384.6	510.5	599.4	754.5	685.5	748.7	809.6	893.6
Imports of Goods & Services	178.5	293.2	305.4	410.8	482.3	578.8	557.7	589.0	646.0	737.0
Payments of Factor Income	17.2	46.5	67.1	82.4	100.5	146.9	139.7	127.9	132.1	126.6
Personal Transfers to Foreigners	1.2	1.6	2.1	2.7	3.0	10.1	10.4	9.5	9.9	10.3
Business Transfers to Foreigners	1.4	2.4	3.6	3.2	3.2	5.5	5.5	5.8	5.9	5.8
Government Transfers to Foreigners	3.4	5.0	6.4	11.4	10.4	13.2	-27.8	16.5	15.7	14.0
Net Foreign Investment (resid 2)	-10.0	2.9	-18.4	-135.0	-128.5	-20.1	58.7	34.0	8.2	-8.9

are slightly different from QUEST.

The other two balances (investment-savings and foreign) cannot be checked directly, since they are both missing the crucial component which they share: net foreign investment.⁹ However, we can determine net foreign investment in each of these tables as a residual, and compare the two versions. It will also be helpful to compare the data with the corresponding aggregates in QUEST.

The two versions of net foreign investment are highlighted in bold, line 2 of the investment-savings balance table, and the last line of the foreign balance table. Comparing with QUEST, it seems that the investment-savings balance table is only slightly different, but the foreign balance table is quite different from QUEST (and presumably, NIPA). Imports and exports of factor income and total foreign transfers are both quite close to QUEST through 1993. However, current dollar imports and exports of goods and services are quite different in LIFT. In 1993, for example, imports in LIFT were \$78 billion lower, and exports were \$22 billion higher, than in QUEST.

As mentioned in the first section, the four identities in Tables 1 to 4 are interrelated, and if any three of them hold, then the fourth must hold as well. The differences between the two versions of net foreign investment are directly related to the fact that the product-income GNP identity does not hold in LIFT. In fact, the discrepancy in the product-income identity by the year 2000 (\$120.2) is very close to the difference between the two versions of net

⁹ LIFT is also missing the variable Capital grants to the U.S., but this is usually zero.

Table 8. LIFT Forecast

Forecast Values of LIFT Identities									
March 1995									
	The Product-Income GNP Balance								
	1993	1994	1995	1996	1997	1998	2000	2005	2010
	----	----	----	----	----	----	----	----	----
Product Side GNP	6423.0	6729.8	7070.9	7422.8	7799.7	8153.4	8985.0	11729.2	15347.1
Personal Consumption Expenditures	4356.0	4534.2	4773.9	5026.8	5264.7	5498.2	6044.2	7856.2	10260.4
Gross Private Domestic Investment	859.0	970.2	1017.6	1031.2	1085.8	1129.6	1253.6	1649.3	2155.2
Government Purchases	1163.9	1201.1	1253.2	1307.2	1360.1	1412.9	1542.9	1945.0	2442.9
Exports of Goods and Services	817.8	884.8	941.3	996.9	1064.8	1125.1	1246.7	1696.8	2332.8
Receipts of Factor Income	136.6	129.7	130.0	132.0	134.0	136.0	140.0	150.0	160.0
- Imports of Goods and Services	778.1	863.6	916.0	939.5	975.0	1010.9	1099.4	1413.1	1834.2
- Payments of Factor Income	132.1	126.6	129.0	131.8	134.6	137.4	143.0	155.0	170.0
Income Side GNP	6328.4	6609.6	6982.7	7320.2	7686.4	8031.4	8845.2	11534.1	15119.9
Personal Consumption Expenditures	4356.0	4534.2	4773.9	5026.8	5264.7	5498.2	6044.2	7856.2	10260.4
Personal Transfers to Foreigners	9.9	10.3	10.7	10.7	10.7	10.7	10.7	10.7	10.7
Personal Savings	192.2	187.9	227.3	245.3	254.5	264.8	287.5	389.4	542.3
Personal Tax and Nontax Payments	686.5	723.0	764.7	803.7	845.9	881.4	971.9	1221.2	1467.4
Wage Accruals - Disbursements	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Social Insurance Tax	589.9	620.1	652.6	689.5	725.6	760.6	844.8	1115.0	1483.4
Corporate Profits	485.7	516.6	549.7	560.9	594.5	611.6	648.1	811.3	1091.8
Statistical Discrepancy	2.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
- Net Interest Paid by Government	130.3	134.6	163.1	176.5	173.2	166.5	158.7	183.4	163.1
- Government Transfers to Persons	892.5	919.2	955.9	1006.7	1053.8	1098.9	1204.1	1562.3	2052.0
- Personal Dividend Income	191.7	203.6	216.4	228.9	242.3	255.7	282.2	356.3	461.6
Business Transfer Payments to Foreign	5.9	5.8	6.2	6.4	7.2	7.4	7.9	10.3	13.3
Indirect Business Tax	525.3	553.2	586.9	619.0	654.4	688.6	767.6	1028.6	1369.4
Capital Consumption Allowance	669.1	716.0	746.3	770.0	798.2	829.3	907.5	1193.4	1557.9
Discrepancy in Product-Income GNP	94.7	120.2	88.2	102.5	113.3	122.0	139.7	195.2	227.3
	The Government Balance								
	1993	1994	1995	1996	1997	1998	2000	2005	2010
	----	----	----	----	----	----	----	----	----
Government Payments	2201.0	2263.8	2380.8	2498.7	2595.0	2685.9	2912.7	3697.8	4665.3
Govt Purchases of Goods & Serv	1163.9	1201.1	1253.2	1307.2	1360.1	1412.9	1542.9	1945.0	2442.9
Govt Transfers to Persons	892.5	919.2	955.9	1006.7	1053.8	1098.9	1204.1	1562.3	2052.0
Govt Transfers to Foreigners	15.7	14.0	15.0	16.0	17.0	18.0	20.0	26.7	33.3
Subs. Less Curr. Surplus	9.0	6.4	5.7	5.0	4.4	3.7	2.3	-1.0	-4.3
Net Interest Paid by Govt.	130.3	134.6	163.1	176.5	173.2	166.5	158.7	183.4	163.1
- Dividends received by S&L Govts	10.4	11.4	12.1	12.7	13.4	14.0	15.3	18.5	21.8
Government Receipts	2201.0	2263.8	2380.8	2498.7	2595.0	2685.9	2912.7	3697.8	4665.3
Personal Tax & Nontax Payments	686.5	723.0	764.7	803.7	845.9	881.4	971.9	1221.2	1467.4
Profits Tax Liability	173.3	183.6	195.2	199.4	211.2	216.6	230.1	294.7	404.1
Contributions for Soc. Ins	589.9	620.1	652.6	689.5	725.6	760.6	844.8	1115.0	1483.4
Indirect Bus Tax & Nontax Liab.	525.3	553.2	586.9	619.0	654.4	688.6	767.6	1028.6	1369.4
Combined Deficit of Govts.	225.9	183.9	181.3	187.1	157.9	138.7	98.3	38.3	-59.1
Discrepancy in Balance	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	The Investment-Savings Balance								
	1993	1994	1995	1996	1997	1998	2000	2005	2010
	----	----	----	----	----	----	----	----	----
Investment									
Gross Private Investment	859.0	970.2	1017.6	1031.2	1085.8	1129.6	1253.6	1649.3	2155.2
Net Foreign Investment (resid)	-91.0	-132.4	-99.4	-83.0	-63.4	-48.9	-36.4	37.0	208.5
Savings									
Personal Savings	192.2	187.9	227.3	245.3	254.5	264.8	287.5	389.4	542.3
Wage Accruals Less Disb.	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Corporate Prof. with IVA, CCadj	485.7	516.6	549.7	560.9	594.5	611.6	648.1	811.3	1091.8
- Corporate Profits Tax	173.3	183.6	195.2	199.4	211.2	216.6	230.1	294.7	404.1
- Dividends Paid to Persons	191.7	203.6	216.4	228.9	242.3	255.7	282.2	356.3	461.6
- Dividends Paid to S&L Gov	10.4	11.4	12.1	12.7	13.4	14.0	15.3	18.5	21.8
Capital Consumption Allowance, with C	669.1	716.0	746.3	770.0	798.2	829.3	907.5	1193.4	1557.9
- Combined Govt. Deficit	225.9	183.9	181.3	187.1	157.9	138.7	98.3	38.3	-59.1
Capital Grants to U.S.									
Statistical Discrepancy	2.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	The Foreign Balance								
	1993	1994	1995	1996	1997	1998	2000	2005	2010
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Table 8. LIFT Forecast (continued)

	1993	1994	The Foreign Balance						
			1995	1996	1997	1998	2000	2005	2010
Receipts from Rest of World	817.8	884.8	941.3	996.9	1064.8	1125.1	1246.7	1696.8	2332.8
Exports of Goods & Services	681.2	755.1	811.3	864.9	930.8	989.1	1106.7	1546.8	2172.8
Capital Grants to U.S.									
Receipts of Factor Income	136.6	129.7	130.0	132.0	134.0	136.0	140.0	150.0	160.0
Payments to Rest of World	809.6	893.6	947.8	972.5	1009.9	1046.9	1138.0	1460.6	1891.5
Imports of Goods & Services	646.0	737.0	787.0	807.7	840.4	873.5	956.4	1258.1	1664.2
Payments of Factor Income	132.1	126.6	129.0	131.8	134.6	137.4	143.0	155.0	170.0
Personal Transfers to Foreigners	9.9	10.3	10.7	10.7	10.7	10.7	10.7	10.7	10.7
Business Transfers to Foreigners	5.9	5.8	6.2	6.4	7.2	7.4	7.9	10.3	13.3
Government Transfers to Foreigners	15.7	14.0	15.0	16.0	17.0	18.0	20.0	26.7	33.3
Net Foreign Investment (resid 2)	8.2	-8.9	-6.5	24.3	54.9	78.2	108.7	236.2	441.4

foreign investment.

Selected years from the December 1994 Inforum Outlook are shown in Table 8. The two versions of net foreign investment are highlighted in bold. In 1994, net foreign investment as calculated from the foreign account is -\$9 billion, calculated from the investment-savings balance it is -\$132 billion, a difference of \$123 billion. By 2000, the difference is \$137 billion and by 2010 it is \$233 billion. Another way of looking at this is that the trade balance is more positive than would be suggested by savings and investment behavior. Furthermore, this gap gets wider in the forecast, so LIFT can get more Gross private investment and more exports at once, with no constraints on the foreign account. Again, we see that this inconsistency can be traced directly to the fact the in LIFT, the product-income identity for GNP is not satisfied.

Modeling Issues

Once the identities have been considered, they seem to be an integral part of the structure of the economy. An economy cannot consume and invest more than it earns without borrowing from foreigners. This borrowing directly implies a corresponding amount of imports. However, we normally model investment, saving, profits, retained earnings and

capital consumption in isolation from imports, exports (including factor income) and foreign transfers.

In QUEST, net foreign investment is computed as a residual of the savings-investment balance, but the foreign balance is not enforced to be consistent with this net foreign investment. This is due to the fact that QUEST is not explicitly tracking Business transfer payments to foreigners. Adding this variable, and fixing the government payments and receipts should be all that is required to bring QUEST back into consistency. There remains in QUEST the problem of the forecast of the capital consumption allowance.

In LIFT, the problems are more serious, since the basic product-income GNP identity does not hold. The most important source of problems seems to be the expenditure side, since current dollar exports, imports and investment are not consistent with the NIPA historically, and there seems to be a gap in the identity which relates current dollar GNP on the expenditure side with GNP on the income side. If the product-income identity did hold, then the net foreign investment variable would be the same, calculated either from the investment-savings balance, or from the foreign balance.

Do these inconsistencies create problems for forecasting? Although they are aesthetically unappealing, how much do they affect our results? The discrepancy in the product-income identity by 2010 is \$227.3, which is only 1.5% of GNP. Isn't this too small to worry about? In the base forecast shown in the table, income is too small for the expenditures that make up GNP. Another way of looking at this is that exports are too large, or imports are too small, compared to the amount of savings implied. From the income perspective, it means that prices are probably too low, but also business savings (retained earnings and capital consumption allowances) are probably too low. From the trade perspective, it means that the current dollar trade balance should probably be worse.

Since we started by discussing the twin deficits debate, perhaps we should use the size of these deficits as a measuring rod for the size of our discrepancy. In this LIFT base run, in the year 2010, the combined government *surplus* is projected to be \$59.1 billion. The trade *surplus* by 2010 is projected to be a whopping \$508.6 billion. Although the discrepancy in the product-income identity is small in comparison to GNP, it is almost half the size of the

trade surplus, and almost four times the size of the government surplus. To be more confident of the relationships between the two surpluses (or deficits!) we should make sure our numbers add up.

Appendix A - Identities in LIFT

Table A-1. The Product-Income GNP Identity

LIFT	NIPA concept	LIFT	NIPA concept
+ pcexz	Personal consumption expenditures	+ pcexz	Personal consumption expenditures
+ ihz + strucz + ipez + cbiz	Gross private domestic investment	+ trpfrn	Personal transfers to foreigners
+ wdef + wnd + gfdpz + gfndpz + wsle + wslo + wslhl + gsloez + gsloh + gslooz	Government purchases	+ savz	Personal savings
+ exz - facexp	Exports of goods and services	+ tp	Personal tax and nontax payments
+ facexp	Receipts of factor income	+ wld	Wage accruals less disbursements
- (imz - facimp)	Imports of goods and services	- (gfint + gslint)	Net interest paid by government
- facimp	Payments of factor income	- (trgp + trgsl)	Government transfers to persons
		+ socf + socsl	Social insurance tax
		- ydv	Personal dividend income
		+ privaz	Corporate profits
		- (gfsls + gslsls)	Subsidies less surplus of government enterprise
		+ sdxz	Statistical discrepancy
		+ trbw	Business transfer payments to foreigners
		+ tbf + tbsl	Indirect business taxes
		+ ccadj	Capital consumption allowance

Table A-2. The Government Balance

LIFT	NIPA concept	LIFT	NIPA concept
+ gfz + gslz	Government purchases of goods and services	+ tpf + tpsl	Personal tax and nontax payments
+ trgp + trgs	Government transfer payments to persons	+ tcf + tcsl	Corporate profits tax
+ trffrn	Government transfer payments to foreigners	+ socf + socsl	Contributions for social insurance
+ gfsls + gslsls	Subsidies less current surpluses	+ tbf + tbsl	Indirect business tax and nontax liabilities
+ gfint + gslint	Net interest paid by government	- gfdef - gsldef	Combined deficit of governments
- sldivr	Dividends received by state and local governments		

Table A-3. The Investment-Savings Balance

LIFT	NIPA concept	LIFT	NIPA concept
+ ihz + strucz + ipez + cbiz	Gross private investment	+ savz	Personal savings
NA	Net foreign investment	+ wld	Wage accruals less disbursements
		+ privaz	Corporate profits with inventory valuation adjustment and capital consumption adjustment
		- (tcf + tcsl)	Corporate profits tax
		- ydv	Dividends paid to persons
		- sldivr	Dividends paid to state and local governments
		+ ccadj	Capital consumption allowance with capital consumption adjustment
		- gfdef - gsldef	Combined deficit of governments
		NA	Capital grants to the U.S.
		+ sdxz	Statistical discrepancy

Table A-4. The Foreign Balance

LIFT	NIPA concept	LIFT	NIPA concept
+ exz - facexp	Exports of goods and services	+ imz - facimp	Imports of goods and services
+ facexp	Receipts of factor income	+ facimp	Payments of factor income
NA	Capital grants to U.S.	+ trpfrn	Personal transfers to foreigners
		+ trffrn	Government transfer payments to foreigners
		+ trbw	Business transfer payments to foreigners
		NA	Net foreign investment

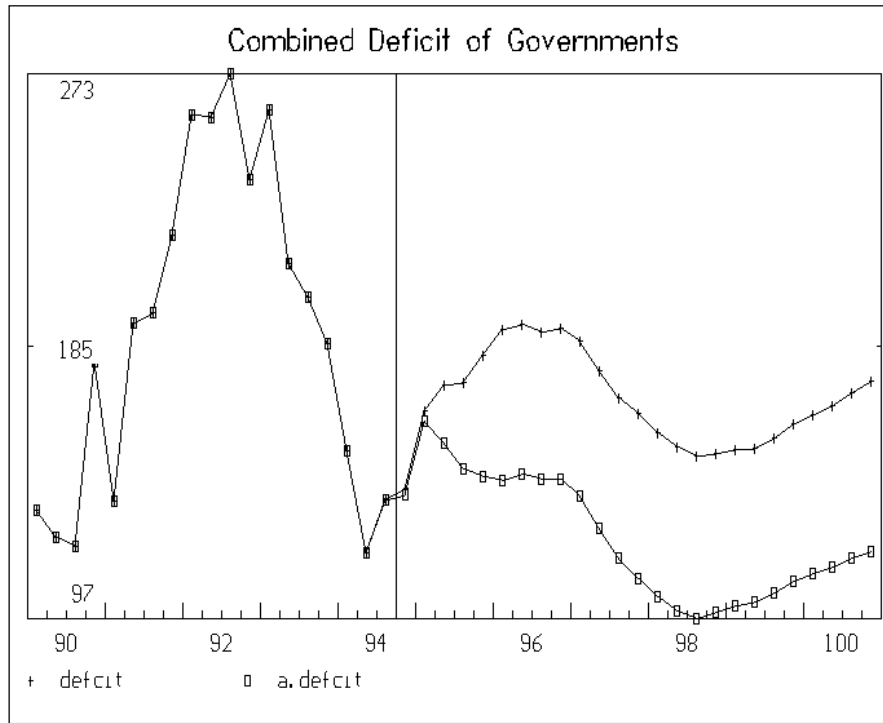
Appendix B - What's Wrong With QUEST?

At first glance, it looked like the problems with QUEST were simple. Fix some mysterious problem with the government balance, add the Business transfer payments to foreigners variables, and voilà! However, once we more closely trace the logic of QUEST, we realize that the problem is due to a special scaling procedure used to ensure the consistency of the product-income identity. In the 2nd edition of the *Craft*, this is explained on page 217. This identity is based on the fact that:

$$\mathbf{v} + \mathbf{fe} + \mathbf{g} = \mathbf{gnp} + \mathbf{fi} - \mathbf{c}$$

In the forecast, to the extent that these two sides of the equation don't agree, the left hand side is scaled to force equality, where **gnp** is calculated from the income side identity. In the recent version of QUEST, **g**, **dgf** and **dgs** were being scaled, but not **gf** and **gs**, the federal and state & local components of government purchases. Since **gf** goes into the calculation of **feddef** (federal deficit) and **gs** goes into the calculation of **stsurp** (state and local surplus), and the combined deficit is the sum of the two, the scaling was not showing up in the

Figure B-1



calculation of the deficit, so the deficit was wrong. Furthermore, since **nfinv** (net foreign

Figure B-2

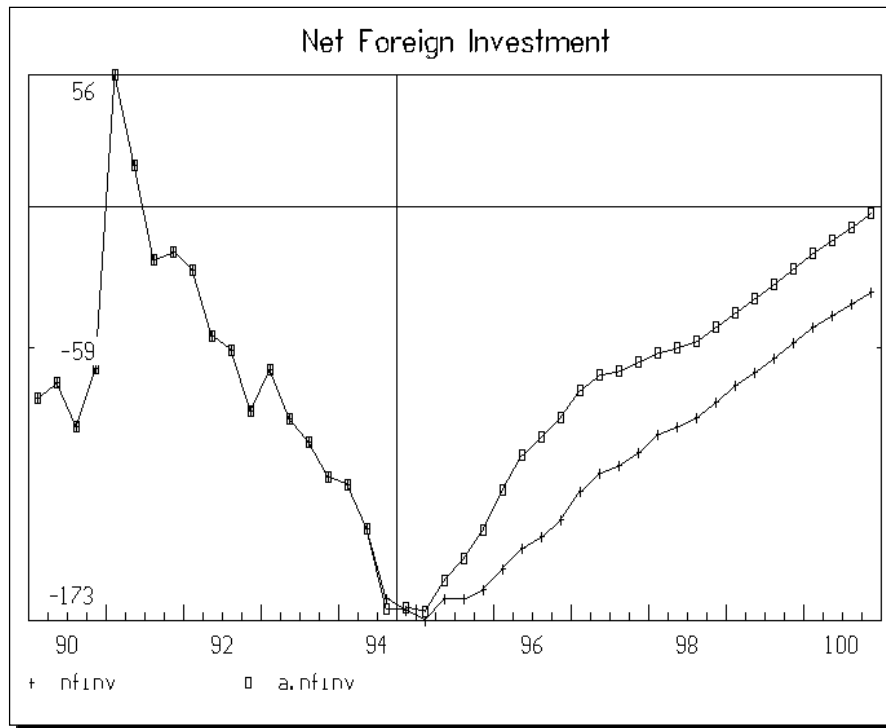
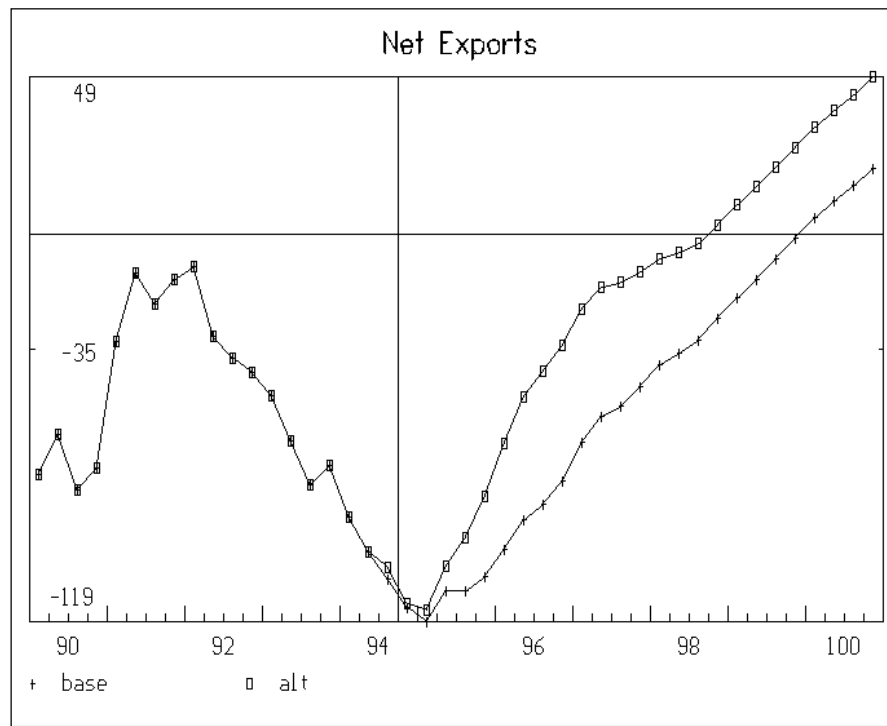


Figure B-3



investment) is determined by an identity that uses deficit, it was also wrong! This causes the government balance and the foreign balance to be wrong. The investment-savings balance still holds, because **nfinv** is on the left, and **deficit** is on the right. The product-income identity holds because we have forced it to hold!

To fix the problem, extra C-language "pass-through" statements were added to the MASTER file that also scaled **gf** and **gs** to be consistent with **g**. Now all four balances are satisfied.

It is helpful to emphasize that the scaling step is absolutely necessary in QUEST to ensure that the balances hold. This may give us some pause when we contemplate enforcing the balances in LIFT. With some hard work, we can get the historical exports, imports and investment data to agree with NIPA current dollar controls. However, there is nothing in the logic of LIFT that will force the import, export and investment prices to yield current dollar magnitudes consistent with GNP calculated on the income side. Do we want to insert a scaling step analogous to what is done in QUEST? If so, investment deflators, export deflators and government deflators would need to be scaled by an equal amount. Since investment depends on investment prices, and exports depend on export prices, wouldn't we then have to recalculate investment and exports from their behavioral equations, and then rescale? This process could be continued until the model converges, but our experience with QUEST suggests that even as the model converges on its usual criteria, the final scaling factor could still be relatively large. In fact, the scaling factor may demonstrate its own family of behavioral "properties".

For example, let's say we want to do a run where we change the exchange rate, lowering the dollar so as to stimulate exports, and restrict imports. After the trade effects have filtered through the expenditure and income sides of the model, the scaling must be performed. Perhaps the positive trade effect now makes expenditure side GNP larger than income side GNP. So we scale investment, exports and government to agree. But wait a minute! Some of the original export stimulus we find in the export equations has now been removed. In addition, investment and government expenditures are "crowded out" by the extra trade stimulus. For large changes, these effects may be difficult to rationalize, particularly the

government purchases changes. If we take government out of the items to be scaled, we have only investment left to bear the full brunt of the scaling. This would result in a model with direct crowding out of investment by trade. This behavior would force the identities to be consistent, but is it the kind of property we would want our model to have?

I remarked in the main body of the paper that I thought that the behavior of **ncca** in QUEST in response to deficit changes appeared unreasonable. The **ncca** equation is calculated in constant dollar terms (**ncca**\$) and then multiplied by the deflator **dncca** to obtain the current dollar component of GNP. If we examine the constant dollar number and the price in the two simulations, we can find that almost all of the change is due to a change in the price. But what exactly is the "price" of the capital consumption allowance? In the old QUEST (2nd ed.) the investment deflator was used to deflate **ncca**. In the new model, a separate regression exists for **dncca**, which is forecast based on various investment deflators. But it seems to me that for forecasting purposes, reflating the value of **ncca**\$ as calculated by the equation is giving too much weight to current price changes in investment. We should sit down and think more carefully on how to deflate and reflate **ncca**.

At any rate, being a good "tax and spend Democrat", I decided to do an experiment where I reduced the deficit by raising the federal personal income tax rate. Figure B-1 shows the results on the combined deficit of my tax rate increase. QUEST does not generate quite as much revenue as I had hoped (I raised the tax rate by a whole point from the base!). It seems that QUEST displays a bit of a Laffer curve. Experiments with raising the tax rate higher led to *less* tax revenues by the end of the forecast, since GNP was so much lower.

Figure B-2 on the next page shows the corresponding extent of the change in net foreign investment. In the fourth quarter of 2000, the deficit is \$55 billion lower, net foreign investment is \$33 billion higher, and the current dollar trade balance (Figure B-3) is better by \$28 billion in the alternate case. However, it is curious that current dollar GDP is way down, by roughly \$700 billion in the year 2000, whereas tax receipts were raised by much less than that amount.