

Real Effects of a Fall in the Stock Market

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1. Introduction

In the four and a half years between the beginning of 1995 and mid 1999, the real value of the stock market in the United States rose by 160 percent, nearly twice its increased over the previous thirty-five years. At the same time, the American economy experienced unprecedented prosperity. Growth exceeded expectations year after year. Is there a causal connection? More specifically, was an exogenous rise of the stock market a major cause of the prosperity? If so, could a reversal in the stock market wreak havoc with the real economy?

This paper uses a structural quarterly econometric model, QUEST, to study both questions. And the answer to both appears to be Yes. On the other hand, the prosperity does not seem to be a major cause of the rise in the stock market. Its causes must be sought elsewhere, perhaps in the flight of capital from troubled markets abroad.

Section 2 gives describes QUEST with an emphasis on equations in which the stock market variable plays a role. To establish the general credibility of QUEST, Section 3 shows its performance in an eighteen-year historical simulation with the value of the stock market variable exogenous. To ask to what extent exogenous upward pressure on the stock market has influenced the real economy since 1995, Section 4 compares two simulations of these years, one with the market variable at its historical value and the other with it following an equation based on data prior to 1995. Section 5 then compares four simulations of future courses of the market with names that suggest their nature: Bull, Sheep, Bear, and Wolf. One interested mainly in these simulations and prepared to trust the general credibility of the model can jump to them directly.

2. The QUEST Model

QUEST, a Quarterly Economic Structure Model, is intended to embody and test an understanding of how the economy works. It is concerned with how aggregate demand affects employment and unemployment, how unemployment affects prices, how prices and money supply affect interest rates and incomes, and how incomes, interest rates, and prices affect investment, consumption, imports, and exports, which make up aggregate demand. The model embodies a view of how each link in this closed-loop chain works. Satisfactory performance is not to judged by how well it works in forecasting a few quarters ahead, but by how well it holds up over a much longer period. Can it keep employment within a few percent of the labor force over decades? Can it keep inflation in line with the increase in money supply though it does not use money

supply in the inflation equation? Can it right itself if thrown off course for a few quarters? We will test it in an eighteen-year historical simulation, time enough for it to go seriously astray if it is inclined to do so.

In this respect, QUEST is quite different from most quarterly models of my acquaintance. They are usually aimed at short-term forecasting, usually of not more than eight quarters. They can therefore make extensive use of lagged values of dependent variables in the regression equations. The use of these lagged dependent variables gives close fits but leaves little variability for identifying the parameters of the underlying structural equations, which are often rather weak in such models. Our interest centers in the structural equations. In estimating the equations of QUEST, therefore, we have avoided lagged values of dependent variables in the regression equations. When used for short-term forecasting, QUEST uses the rho-adjustment method of error correction.

The foundations for QUEST are developed in my *Craft of Economic Modeling*, Part 1. It is built with the G software. The definitions of many of the variables and the statements of many of the identities will be given here as they appear in the commands to the software. Four commands do most of the work. They are:

f <variable> = <expression>

Example: f ypc = y/pop

Put the variable on the left into the model; calculate the expression on the right and store its value in this variable. Include the equation in the model.

fex <variable> = <expression>

Example: fex cBR = c/y

Put the variable on the left into the model; calculate the expression on the right and store its value in this variable. Do NOT include the equation in the model.

con <count> <constant> = <linear expression in regression coefficients>

Example: con 100 1 = a3+a4+a5

Softly constrain the regression coefficients to satisfy the constraint expressed by the equation. "Softly" means that a tradeoff is allowed between satisfying the constraint and fitting the data. The larger the <count> parameter, the harder the constraint.

sma <count> <first> <last> <degree>

Example: sma 100 a5 a12 1

Softly imposes the constraint that the regression coefficients between <first> and <last> lie on a polynomial of the specified degree. The higher the <count> parameter, the harder the constraint.

How to read the output of the regression will be explained following the first regression.

To keep QUEST reasonably simple and understandable, an alternative set of national accounts in real terms has been created. The official accounts in the United States use "Hedonic" deflators for computers and certain related items. Because these deflators were turning long-term growth measures using fixed weights into nonsense, chain weighting was introduced, with the consequence that real GDP is no longer the sum of real Consumption, Investment, Government,

and Net exports. Instead, complicated chain indexes have to be used. The Hedonic indexes for computers, however, while interesting, are by no means the only reasonable way to deflate them. In the alternative accounts used in QUEST, the computer component of an aggregate, say equipment investment, has been deflated by the deflator of the non-computer component of the same aggregate. The real variables created in this way have names ending in a capital R. The result is a real GDP, $gdpR$, a simple sum of its components, which grows ever so slightly slower than does the official measure with its Hedonic indexes and offsetting chain weights.

Personal consumption expenditures

We work up to the main equation for personal consumption expenditures with two supporting equations, one for expenditures on motor vehicles and one for Interest paid by consumers to business. The interest paid variable is particularly relevant because consumers must pay it out of their disposable income but it is not part of personal consumption. Thus, if interest payments rise relative to disposable income, they must come out of either savings or consumption. We will find out which choice consumers make. The expenditures on motor vehicles is important for total expenditures for two reasons. First, interest payments on car loans is a major component of the Interest paid by consumers to business. (Interest on home mortgages is *not* part of Interest paid by consumers to business, because home ownership is considered a *business* in the NIPA.) Second, the NIPA consider that an automobile is consumed in the quarter in which it is purchased. Consumers, however, think of the car as being consumed over its lifetime. Thus, if automobile purchases are particularly strong in a certain quarter, there is a sort of savings in the form of automobiles. It would not be surprising to see all or most of that saving appear as consumption in the NIPA series. Though the same reasoning applies to other durables, their purchases are much less volatile than those of automobiles, so there is not much to be gained by such treatment.

Since **Personal consumption expenditures on motor vehicles** is used in the other two, we start with it. It uses real disposable income accrued per capita, $ypcR$, lagged values of its first difference, $dypcR$, the Treasury bill rate, rtb , multiplied by $ypcR$ as an indicator of credit conditions, and an estimate of the wear-out of motor vehicles, $mvWear$. Disposable income accrued is in most quarters exactly the same as disposable income. In a few quarters, however, billions of dollars of bonuses that should normally have been paid in the fourth quarter of one year were, for tax reasons, paid in the first quarter of the next. Consumers definitely based their consumption on the accrued rather than the disbursed income. We will therefore almost always use Personal disposable income accrued, $pidisa$, not Personal disposable income, but we will call it simply “disposable income.” The interest rate, rtb , is multiplied by $ypcR$ so that the amplitude of its swings will grow at approximately the same rate as the growth in the dependent variable.

The full definitions are shown by the commands to the G regression program:

```

ti Motor Vehicles
# cdmvpc$ is per capita consumption of motor vehicles in constant dollars
fex cdmvpc$ = cdmv$/pop
# cR is Personal consumption in real terms; pop is population
fex cRpc = cR/pop
fex cD = c/cR

# Create ypcR, real disposable income per capita
fex pidi saR = pidi sa/cD
f ypcR = pidi saR/pop
f dypcR = ypcR - ypcR[1]

# Interest rate * ypcR to represent credit conditions
f rtbXypc = .01*rtb*ypcR

# Create Motor Vehicle wear out variable by accumulating
# the purchases of automobiles with a wear out rate of 8 percent per quarter.
# @cum(y, x, s) creates y by y(t) = (1-s)*y(t-1) + x(t)
f ub08 = @cum(ub08, 1, .08)
f mvWear = @cum(mvSt, cdmv$[4], .08)/(ub08*pop)

sma 50000 a4 a11 1

```

The results of the regression are:

```

:
                                Motor Vehicles
SEE = 54.20 RSQ = 0.8545 RHO = 0.64 Obser = 97 from 1975.100
SEE+1 = 41.83 RBSQ = 0.8337 DW = 0.72 DoFree = 84 to 1999.100
MAPE = 5.56

```

Variable name	Reg-Coeff	Mexval	Elas	NorRes	Mean	Beta
0 cdmvpc\$					784.98	
1 intercept	-109.16117	0.6	-0.14	6.80	1.00	
2 ypcR[1]	0.04117	4.0	0.88	1.93	16742.64	0.502
3 dypcR[1]	0.15373	5.1	0.01	1.86	63.75	0.141
4 dypcR[2]	0.19228	10.7	0.02	1.82	62.38	0.176
5 dypcR[3]	0.17071	15.5	0.01	1.72	59.56	0.159
6 dypcR[4]	0.15218	15.5	0.01	1.62	56.41	0.145
7 dypcR[5]	0.13854	14.4	0.01	1.56	57.04	0.133
8 dypcR[6]	0.13028	14.1	0.01	1.50	56.82	0.125
9 dypcR[7]	0.11721	12.3	0.01	1.44	57.51	0.113
10 dypcR[8]	0.09304	8.7	0.01	1.39	57.61	0.089
11 dypcR[9]	0.05366	5.0	0.00	1.32	61.33	0.054
12 rtbXypc[1]	-0.07425	12.7	-0.11	1.02	1133.78	-0.211
13 mvWear	0.31085	1.1	0.28	1.00	700.67	0.269

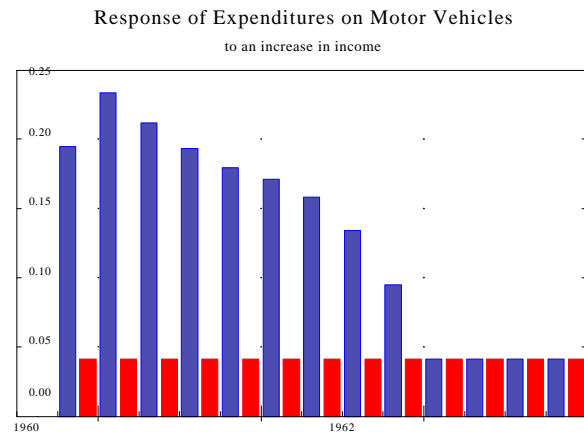
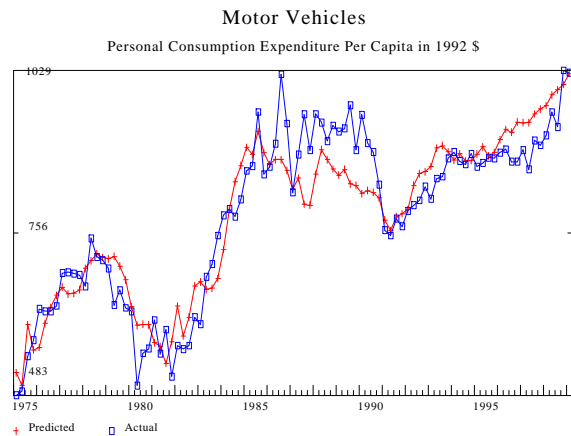
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id cdmv$ = cdmvpc$*pop
fex cdmvDBR = (cdmv/cdmv$)/cD
f cdmv = cdmv$*cdmvDBR*cD

```

SEE is the standard error of estimate; SEE+1 is the standard error of estimate forecasting one period ahead with error correction using rho, the auto correlation coefficient of the residuals. MAPE is the mean absolute percentage error. For each variable: Reg-Coeff is the regression coefficient; Mexval is the marginal explanatory value of the variable, the percent by which the SEE would rise if the variable were omitted; Elas is the elasticity at the sample mean; Mean is the sample mean; beta is what the regression coefficient would be if both dependent and independent variables were normalized to have unit standard deviations; and NorRes, the normalized sum of squared residuals, is proportional to the sum of squared residuals after the introduction of the variable. (In the presence of *con* or *sma* commands, the Mexval and NorRes measures refer to the effects on the augmented objective function, not the SEE which is printed.) Printing of t-values and F-statistics has been suppressed because they are certainly invalid here for at least two reasons: (1) the rho, or autocorrelation coefficient, is so high that the assumption of independence on which t-tests rest is certainly not met; (2) the equation has been selected by a trial and error procedure that certainly qualifies as pre-testing which would invalidate the t-statistics even if rho were zero.

The fit is shown below in the graph on the left. The graph on the right is to help interpret the results. It shows how expenditures would respond if, after a long period of being constant, income were to rise by \$1.00 and then remain constant at that new value. During the period of constant income, expenditures on motor vehicles would have reached a constant, equilibrium level. Nothing would happen to expenditures on motor vehicles in the first quarter after the income rise. Then in the second quarter they would rise by \$.04117 (the coefficient on ypcR[1], which would have risen from its previous value by \$1.00) plus \$.15373 (the coefficient on dypcR[1], which would be 1.00 in that quarter). Similarly, in the second quarter, they would be \$.04117 + \$.19228 above their old equilibrium value, because in that quarter dypcR[2] would be 1.00 while all the other dypcR terms would be zero. The graph shows the total response in the cross-hatched rectangles; the permanent response (\$.04117) is shown by the low solid rectangles. The transient response is the part of the tall rectangles above the low solid ones.



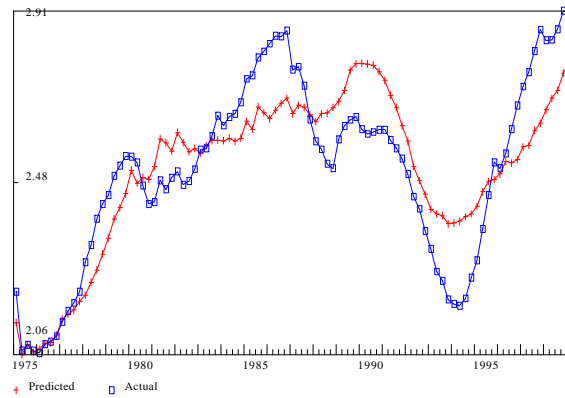
This sort of response will characterize many of our equations. We won't graph the others, but it is important for the reader to visualize these responses. This tendency of consumers to "go on a spree" of automobile buying after an increase in income is both very understandable — the increase in income allows them to borrow the money to buy the cars — and very much a generator of cycles in the economy. Actually, in this particular case, we have somewhat oversimplified the response, because, four quarters after the response of expenditures begins, the replacement response through the *mvWear* term begins, faintly at first, then producing a damped wave of expenditures as the initial purchases are replaced.

The fit of the automobile equation is surprisingly good, given the volatile nature of the series. Besides the strong and long transient response to increases in income and the damped replacement wave, the equation is noteworthy for its negative (theoretically correct) response to interest rates. Just how large a response is this? Perhaps the best answer here is given by the beta coefficient of $-.211$. That is to say, as the interest rate variable moves by 1.0 standard deviations, the dependent variable moves by $.211$ of its standard deviations. Another way to look at this question is to ask how much would a one point drop in the interest rate, say from 6 percent to 5 percent, increase expenditures on motor vehicles. At the mean value of *ypcR*, the answer is \$12.4 per person per year. The swing from the low point of the dependent variable in 1980 to its high point in 1986, was \$523, so the sensitivity to interest rates, while not negligible, is not very important.

For **Interest paid by consumers to business**, the dependent variable is expressed as a percent of disposable income. The most important explanatory variable tries to capture the interest payments on past automobile purchases. It is assumed that the loans are paid off at the rate of about 9 percent per quarter, so that about 35 percent is paid off in the first year. The outstanding amount, if all automobiles are bought with loans, is called *autfi* (automotive financing.) The interest on this amount at the Treasury bill rate (*rtb*) is called *autfir*. If the interest rate charged is $rtb+a$, then the payments should be $a*autfi + autfir$. If all automobiles and nothing else were financed, the coefficient on *autfir* should be 1.0. In the equation as estimated, both these variables are expressed as percent of disposable income, *autfin* and *autfis*, respectively. The coefficient on *autfis* comes out close to the expected 1.0, while the value of *a* emerges as $.0086$, so the financing rate appears to be less than one percentage point above the Treasury bill rate, less than I would have expected. Notice the large values of Beta for these two variables; the dependent variable is quite sensitive to them.

The other important variable is the exponentially-weighted average — created with the @cum function — of recent values of the savings rate. Its justification is that one way that people can save is by paying off debt on which they are paying interest. It should also be pointed out that interest payments on debt other than automotive, in so far as they are a constant fraction of disposable income, are absorbed into the intercept of the equation. The last variable, the rate of change of the money supply, was intended to indicate the ease of getting loans. It did not prove particularly successful.

piipcb - Interest Paid by Consumers to Business



```

title piipcb - Interest Paid by Consumers to Business
# shipcb is share of interest in disposable income less savings and transfers
fex shipcb = 100.*piipcb/pidisa
# autfi is a consumption of motor vehicles bucket with a spill of 0.09
f autfi = @cum(autfi , .25*cdmv, .09)
f autfin = 100.*autfi/pidisa
f autfir = @cum(autfir, .0025*rtb*cdmv, .09)
f autfis = 100.*autfir/pidisa
# savrat is the savings rate
f savrat = 100.*(pi sav/pidisa)
# blsr is a savings rate bucket with a spill rate of 0.12
f blsr = @cum(blsrc, savrat, .12)
f dml = (m1 - m1[1])/m1[1]

```

```

: piipcb - Interest Paid by Consumers to Business
SEE = 0.11 RSQ = 0.7487 RHO = 0.96 Obser = 97 from 1975.100
SEE+1 = 0.03 RBSQ = 0.7378 DW = 0.08 DoFree = 92 to 1999.100
MAPE = 3.74

```

Variable name	Reg-Coeff	Mexval	Elas	NorRes	Mean	Beta
0 shipcb	-	-	-	-	2.51	-
1 intercept	2.23803	50.7	0.89	3.98	1.00	
2 autfin	0.00863	0.2	0.04	3.75	12.01	0.030
3 autfis	1.05542	79.7	0.35	3.11	0.83	0.957
4 blsr	-0.01350	71.8	-0.29	1.01	53.62	-0.989
5 dml	1.01953	0.6	0.01	1.00	0.01	0.061

```
id piipcb = 0.01*shipcb*pidisa
```

At last we are ready for the equation with the largest dependent variable in the model, **Personal consumption expenditures**. It is estimated in per capita terms, and the most important explanatory variable is certainly disposable income per capita and its first differences. Notice that the signs on the first difference terms are all negative. Instead of the splurge effect which we saw

in the case of automobiles, there is a very gradual increase in spending to the level justified by an increase in income.

Textbooks of macroeconomics usually make the savings rate — and, therefore, implicitly the consumption rate — depend on the interest rate. Our equation uses the Treasury bill rate less the expected rate of inflation, which I have called the perceived real interest rate. (The actual rate of inflation is not known until after the end of a quarter, so the expected rate may be more relevant for behavior.) To make the amplitude of its fluctuations grow with the growth of the dependent variable, it has been multiplied by real disposable income per capita to make the variable $rtbexXdi$. It has the expected negative sign, but not much importance — as indicated by its mexval — relative to the other variables which never seem to get mentioned in the textbooks.

Savings in the form of automobiles, *sautos*, is the excess of spending on motor vehicles over an estimate of their wearout. Theoretically, its coefficient should be 1.0. It came out higher, and I have let it stand at because the same factors that influence purchases of automobiles may also influence the purchase of other durables. Its large mexval indicates its considerable importance.

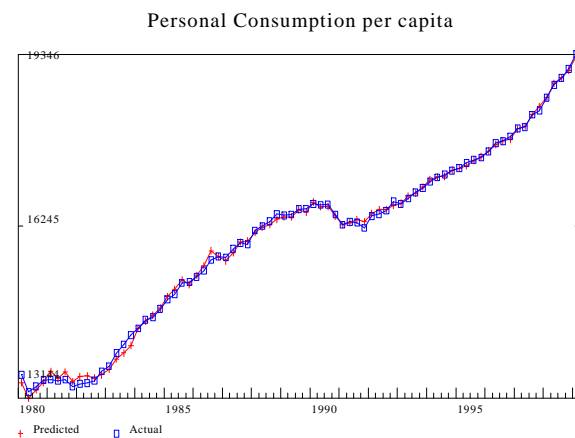
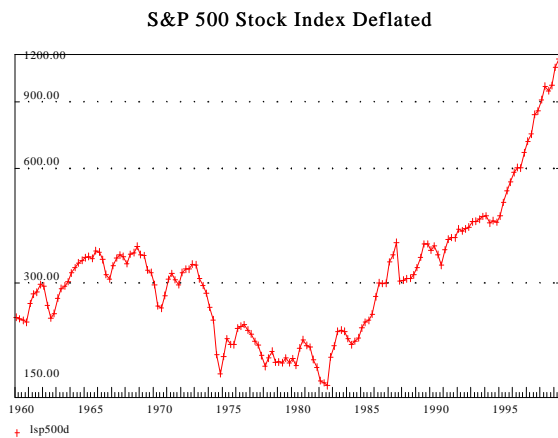
Interest paid by persons to business, called $piipcbprR$ after converting it to constant price, per capita terms, also came out with the expected negative sign but with a coefficient above 1.0 in absolute value. In the present equation, less than half of an increase in this variable will come out of consumption. Slight changes in other parts of the equation, however, have been known to make the coefficient less than -1.0 algebraically.

Inflation, as we know, influences interest rates and, therefore, interest income of persons. But a savvy investor will recognize that if he spends all his interest in times of rapid inflation, the real value of his interest-yielding assets will shrink. To keep up the value of his investment, he must save the fraction of his interest receipts due to inflation. The variable $intsavpcR$ is an attempt to measure this amount in real terms per capita. Theoretically, its coefficient should be -1; it comes out at about -.6. This variable has a profound influence on the macroeconomic properties of the model. For example, if money supply is increased and interest rates lowered, investment is stimulated, unemployment is reduced, and inflation picks up. But as soon as it does, this variable causes an increase in savings and a reduction in consumer spending, which offsets the rise in investment. Thus, monetary policy in a model with this effect is apt to prove a weak instrument. Since the effect is both intuitively evident and quantitatively important, it is surprising that it seems to have gone unnoticed in macroeconomic textbooks.

Contributions for social insurance, even the employee's half of social security, is deducted before reaching Personal income in the NIPA. It would not be irrational, however, for consumers to consider that these contributions are, in fact, a form of saving which substitutes for their private saving. We have included the $consipcR$ variable to allow for this possibility. It appears that consumers consider that about thirty percent of these contributions substitute for saving.

Last but certainly not least, we come to the real stock market value per capita, $SMVpcR$. The more fundamental variable here is $SMValueR$, which will appear in several equations. It is simply the Standard and Poor's index of 500 stocks, $sp500$, deflated by the GDP deflator. The graph on the left below shows that this value is not inherently and necessarily growing. The big growth is all in the four years 1995 - 1998, a period when trouble in foreign markets may well have driven investors into the American market. This sort of growth makes consumers with assets in the stock market feel wealthy. Do they spend accordingly? Indeed they do, as we see from the results, where this variable has a mexval of 18. In per capita terms, the variable variable increased by 2448 between 1995.1 and 1999.2, thus increasing consumption per capita by \$396 (= $2448 * .16217$). During the same period, real savings per capita fell by \$1013. Thus, about forty percent of this much-publicized decline is to be explained by spending based on the rise in the stock market. We will return later to the question of explaining the stock market variable itself.

The combination of all these variables gives a virtually perfect fit to personal consumption. Given the number of explanatory variables we have used, what is more remarkable is that there was enough variability in the data to identify reasonable effects for all the variables. When the equation was estimated over the period 1980.1 - 1994.1, however, no effect was found for the stock market variable. It becomes important only in the last four years.



```

ti Personal Consumption per capita
fex cRpc = cR/pop
fex cD = c/cR
#Disposable Income per Capita
fex pi di saR = pi di sa/cD
f ypcR = pi di saR/pop
f dypcR = ypcR - ypcR[1]
# Interest necessary to maintain real value of assets
# First get inflex, expected inflation
fex lgdpD = 100. *@log(gdpD)
fex infl = lgdpD - lgdpD[4]
f rtbReal = rtb - infl

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```
fex ub10 = @cum(ub10, 1.0, .10)
# inflex is expected inflation
f inflex = @cum(cinfl, infl[1], .10)/ub10
f intsavpcR = (inflex/(rtb+3.)) *npi ni/(cD*pop)
```

```
# Stock Market Value
fex SMValueR = sp500/gdpD
f SMVpcR = SMValueR/pop
# Perceived real interest rate
f rtbexXdi = (rtb - inflex)*ypcR
# Contributions for Social Insurance
f consipcR = nconsi/(cD*pop)
# savings in autos
# stock of autos
f autos = @cum(autos, cdmv$, .10)
f uba1 = @cum(uba1, 1., .10)
f sauto = (cdmv$ - (autos/uba1))/pop
```

```
# Interest paid by consumers to business
f piipcbpcR = piipcb/(cD*pop)
```

```
con 100000 -1 = a14
sma 2000 a3 a11 1
```

```
:
Personal Consumption per capita
SEE = 63.03 RSQ = 0.9985 RHO = 0.58 Obser = 77 from 1980.100
SEE+1 = 51.81 RBSQ = 0.9981 DW = 0.84 DoFree = 60 to 1999.100
MAPE = 0.32
```

Variable name	Reg-Coeff	Mexval	Elas	NorRes	Mean	Beta
0 cRpc	- - - - -	- - - - -	- - - - -	- - - - -	16022.83	- - -
1 intercept	139.67827	0.1	0.01	672.47	1.00	
2 ypcR	0.91258	128.8	0.99	33.04	17429.43	0.760
3 dypcR	-0.63033	38.7	-0.00	32.76	60.76	-0.047
4 dypcR[1]	-0.55733	39.1	-0.00	32.55	59.83	-0.042
5 dypcR[2]	-0.45244	28.3	-0.00	32.49	58.34	-0.034
6 dypcR[3]	-0.32565	19.1	-0.00	32.31	56.30	-0.025
7 dypcR[4]	-0.27935	15.7	-0.00	32.07	56.58	-0.021
8 dypcR[5]	-0.26475	12.8	-0.00	32.04	56.38	-0.020
9 dypcR[6]	-0.24799	10.7	-0.00	32.02	56.23	-0.019
10 dypcR[7]	-0.20398	8.1	-0.00	32.02	57.36	-0.015
11 dypcR[8]	-0.12265	3.3	-0.00	32.02	57.86	-0.009
12 consipcR	0.52523	2.0	0.07	31.88	2159.56	0.069
13 SMVpcR[1]	0.16217	18.3	0.02	28.29	1528.75	0.070
14 intsavpcR	-0.97833	414.0	-0.07	7.23	1220.04	-0.163
15 rtbexXdi	-0.00560	102.9	-0.01	2.03	38393.90	-0.093
16 sauto	1.82957	42.3	0.01	1.00	47.99	0.081
17 piipcbpcR	0.21286	0.2	0.01	1.00	450.08	0.007

$$i d cR = cR_{pc} * pop$$

$$i d c = cR * cD$$

Investment

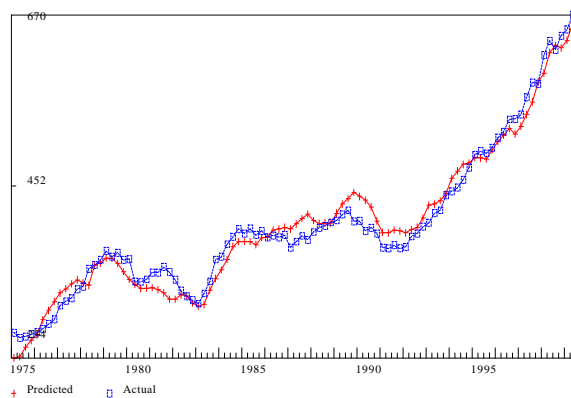
Gross private domestic investment in Quest is treated in the four major parts available in even the aggregated version of the NIPA: Producers' durable equipment, Non-residential construction, Residential construction, and Change in business inventories.

The first and largest is investment in **Producers' durable equipment**. The term for replacement is familiar from the equation for investment in AMI. Two small changes have been made in the variable whose first differences are used to indicate the need for expansion investment: (1) it is gross *private* product, since it is being used to explain *private* investment, and (2) it is the @peak function of this variable. The @peak function is the highest value which the variable has ever had up to and including the present. The use of the @peak function makes little difference in estimating the equation, but it makes the model more stable, since the first difference terms cannot go negative in a downturn. Notice the strong positive transient or "splurge" effect of an increase in output. This behavior makes equipment investment one of the primary generators of cycles in the economy.

The real interest rate used is the difference between the Treasury bill rate and the rate of inflation in the GDP deflator. Its mean value is about 2.0, and this mean has been subtracted so that the variable just shows the fluctuations about the mean. This variable is then multiplied by the replacement term divided by its mean, so the amplitude of the fluctuations in the variable will grow more or less in line with the growth of the dependent variable. A change of one percentage point will, when replacement is at its mean, change this variable by one unit. Thus, a reduction of the real interest rate by one percentage point, say from 3 to 2 — a big change -- will increase investment by about \$8 billion ($2.71 + 2.95 + 2.28 = 7.94$), or about 2 percent of its mean value over this period. For an effect that dominates macroeconomics books (via the IS curve), the quantitative importance is embarrassingly small.

The stock market variable is relevant to this equation because it affects the perceived cost of funds to firms. Firms can raise funds for capital investment by selling additional shares, but the profits must then be spread over a larger number of shares and, if a particular individual or group exercises control over the company through the number of shares it holds, it may well be reluctant to see that control weakened by issuing new shares to outsiders. These objections, however, may be overcome if the stock price is high so that a lot of capital is raised with little dilution of ownership. While this effect has long been recognized as possible, it has become practically important only since 1995. According to our equation, 1999.2 equipment investment, which was \$178 billion above its 1995.1 level, would have been \$81 billion lower had the stock market variable remained constant at its 1995.1 value. Without the use of this variable, the equation fits fine up through 1994, but then falls substantially short.

Equipment Investment



```

ti Equipment Investment
f gppR = gdpR - gdpG$
f pgppR = @peak(pgppR, gppR, .00)
f d = pgppR - pgppR[1]
f ub05 = @cum(ub05, 1.0, .05)
f repEq = @cum(stockEq, vfnreR[4], .05)/ub05
# Compute real interest rate
fex lgdpD = 100.*@log(gdpD)
fex infl = lgdpD - lgdpD[4]
fex ub10 = @cum(ub10, 1., .10)
# inflex is expected inflation
fex inflex = @cum(cinfl, infl[1], .10)/ub10
f rtbReal = rtb - infl
f rrXrepe = (rtbReal - 2.)*(repEq/335.)

fex cD = c/cR
fex SMValueR = sp500/gdpD
f lSMValueR = @log(SMValueR)
f dSMVR = SMValueR - .333*(SMValueR[3]+SMValueR[4]+SMValueR[5])

con 10000 1 = a2
sma 1000 a3 a13 1
sma 1 a14 a16 1
sma 400 a18 a22 1

```

:
Equipment Investment
 SEE = 16.85 RSQ = 0.9676 RHO = 0.83 Obser = 98 from 1975.100
 SEE+1 = 9.78 RBSQ = 0.9587 DW = 0.33 DoFree = 76 to 1999.200
 MAPE = 3.78

Variable name	Reg-Coef	Mexval	El as	NorRes	Mean	Beta
0 vfnreR					401.40	
1 intercept	-4.78043	0.2	-0.01	64.33	1.00	
2 repEq	0.98888	502.2	0.84	6.73	339.14	0.648
3 d[1]	0.20740	7.2	0.02	5.93	33.27	0.069
4 d[2]	0.20724	17.1	0.02	4.78	32.49	0.068
5 d[3]	0.20820	17.7	0.02	4.21	31.47	0.067
6 d[4]	0.19751	16.3	0.02	3.81	30.99	0.064
7 d[5]	0.16794	12.5	0.01	3.46	30.88	0.054
8 d[6]	0.12050	6.7	0.01	3.25	29.84	0.038
9 d[7]	0.08334	3.3	0.01	3.13	29.69	0.026
10 d[8]	0.06134	1.9	0.00	3.07	29.98	0.020
11 d[9]	0.05462	1.6	0.00	3.04	29.95	0.018
12 d[10]	0.05082	1.3	0.00	3.02	29.68	0.016
13 d[11]	0.03390	0.7	0.00	3.00	29.94	0.011
14 rrXrepe[7]	-2.82831	3.1	-0.00	2.60	0.08	-0.058
15 rrXrepe[8]	-3.07772	11.1	-0.00	2.45	0.07	-0.063
16 rrXrepe[9]	-2.38504	4.5	-0.00	2.37	0.05	-0.049
17 SMVal ueR[1]	0.05801	4.2	0.05	1.15	358.31	0.126
18 dSMVR[1]	0.13340	3.3	0.01	1.05	30.02	0.085
19 dSMVR[2]	0.06409	1.9	0.00	1.01	27.03	0.041
20 dSMVR[3]	0.02130	0.2	0.00	1.01	24.96	0.014
21 dSMVR[4]	0.01527	0.1	0.00	1.00	22.70	0.010
22 dSMVR[5]	0.02078	0.2	0.00	1.00	19.89	0.012

Investment in **Non-residential construction** — stores, office buildings, industrial plants, pipelines, churches, hospitals, airports, parking lots, and so on — is one of the hardest series to explain. Even the booming economy of the late 1990's did not bring it back to the levels it reached in the recession years of the early 1980's. Our equation is motivated by the idea that investment is proportional to the difference between the desired stock and the actual stock of structures, and that the desired stock is a linear function of the real Gross private product, *gppR*. Thus, the basic idea is that

$$vfnrsR = \lambda(a + b * gppR - StockSt)$$

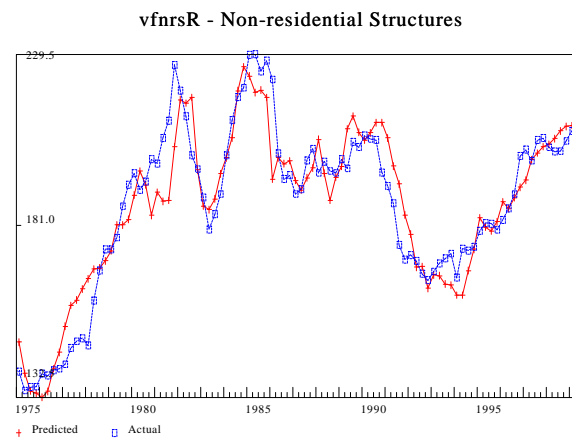
where *vfnrsR* is real investment in non-residential construction, and *StockSt* is the stock of those structures. Several depreciation rates have been tried for calculating the stock of structures without much effect on the fit of the equation. One percent per quarter was chosen. By introducing lagged values of the first difference of *gppR*, the desired level of the stock is allowed to rise gradually following an increase in *gppR*.

The natural variable to add next is some sort of interest rate. These all had positive — wrong — signs with lags of three years or less. The real rate with a lag of 16 quarters has been left more or less as a reminder of the perverse results with shorter lags. This strong positive relation with

interest rates suggested using interest income, which, indeed proved somewhat helpful. The reasoning is that persons with significant amounts of interest income might be likely to investment in real estates.

The rates of change of the stock market value variable — but not its level — also proved helpful. This variable may be measuring optimism about the future of the economy.

Finally, a special dummy variable was introduced for the period between the 1981 and the 1986 tax acts. The 1981 act allowed passive partners in real estate development (as well as active partners) to count paper depreciation at double declining balance rates against their ordinary income. Investors looking for tax shelters poured billions of dollars into non-residential construction. The 1986 act repealed this provision for non-residential construction. It did not even “grandfather” in the buildings that had been built while the 1981 act was in force. Thus, many investors who had bought tax shelters found themselves with more or less worthless holdings. Though the 1986 act was not passed until the middle of the year, its passage was anticipated, and investment was cut back for the beginning of the year.

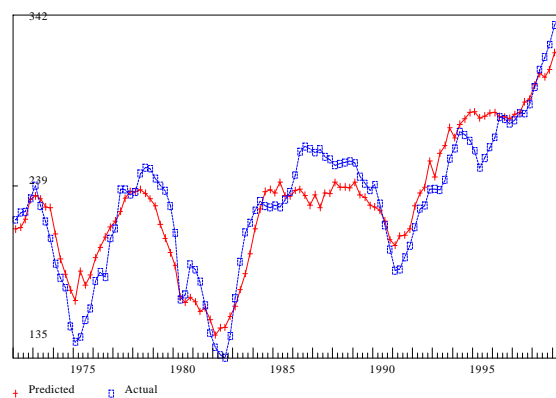


```

ti vfnsR - Non-residential Structures
fex gppR = gdpR - gdp$
fex pgppR = @peak(pgppR, gppR, .00)
fex d = pgppR - pgppR[1]
f ub01 = @cum(ub01, 1, .01)
f StockSt = 100. * @cum(cumSt, 0.25*vfnsR[4], .01)/ub01
# Compute real interest rate
fex lgdpD = 100. * @log(gdpD)
fex infl = lgdpD - lgdpD[4]
fex ub10 = @cum(ub10, 1, .10)
# inflex is expected inflation
fex inflex = @cum(cinfl, infl[1], .10)/ub10

```


Residential Construction



ti Residential Construction

fex SValueR = sp500/gdpD

fex lgdpD = 100. *@log(gdpD)

fex infl = lgdpD - lgdpD[4]

fex ub10 = @cum(ub10, 1.0, .10)

freq ub10 4

inflex is expected inflation

fex inflex = @cum(cinfl, infl[1], .10)/ub10

fex rtbex = rtb - inflex

f ub01 = @cum(ub01, 1., .01)

f StockHouse = 100. *@cum(cvfrR, 0.25*vfrR[2], .01)/ub01

fex cD = c/cR

f pidi sR = pidi s/cD

sma 50 a5 a14 2

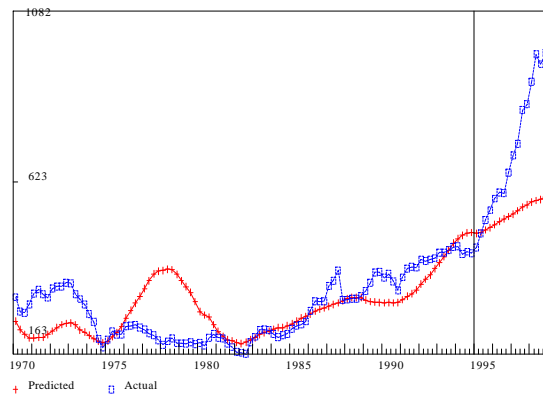
		Residential Construction											
SEE	=	15.83	RSQ	=	0.8642	RHO	=	0.87	Obser	=	110	from	1972.100
SEE+1	=	7.73	RBSQ	=	0.8458	DW	=	0.25	DoFree	=	96	to	1999.200
MAPE	=	6.15											
Variable name		Reg-Coeff	Mexval	Elas	NorRes	Mean	Beta						
0	vfrR					228.51							
1	intercept	536.46989	38.4	2.35	7.35	1.00							
2	pidisR	0.14456	33.3	2.52	3.82	3982.79	2.596						
3	SMValueR	0.08780	22.7	0.14	2.90	360.21	0.422						
4	StockHouse	-0.19556	25.4	-3.92	2.11	4584.13	-2.195						
5	rtbex[3]	-0.92239	0.6	-0.01	2.09	1.67	-0.041						
6	rtbex[4]	-1.04197	4.1	-0.01	1.90	1.65	-0.047						
7	rtbex[5]	-1.13455	5.1	-0.01	1.68	1.65	-0.051						
8	rtbex[6]	-1.20508	4.5	-0.01	1.55	1.66	-0.054						
9	rtbex[7]	-1.26093	6.0	-0.01	1.44	1.67	-0.057						
10	rtbex[8]	-1.30352	9.8	-0.01	1.30	1.69	-0.059						
11	rtbex[9]	-1.31644	12.2	-0.01	1.19	1.71	-0.061						
12	rtbex[10]	-1.25479	7.9	-0.01	1.11	1.74	-0.059						
13	rtbex[11]	-1.05269	4.3	-0.01	1.05	1.76	-0.049						
14	rtbex[12]	-0.64667	2.5	-0.01	1.00	1.78	-0.031						

The Stock Market Value

Now we turn to trying to explain the **real stock market value** variable, *SMValueR*, with other variables in the model. Fundamentally, the value of a stock should be the present value of the stream of future profits discounted by the rate of interest. If we put the profits in real terms, then the interest rate used should be a real rate. Basically, our equation for *SMValueR* relates it to the present value of future profits by presuming that both profits in real terms and real interest rates are expected to remain at their present level. Both profits and interest rates have been exponentially smoothed to reduce variability that was not reflected in the stock market series. Profits are likely to be discounted at rates considerable above the Treasury bill rate. After trying several values, we settled on adding 5 percentage points to the “perceived” real Treasury bill rate. The regression coefficient on this variable was then constrained to give it an elasticity of 1. A time trend was also allowed on the grounds that there may be some systematic error in the calculation of *SMValueR* which can be left to the time trend to explain.

The results below show this equation estimated only through 1994.4, roughly the beginning of the present bull market. Notice that the 1987 “correction” brought the market back close to the value calculated by this equation. The part of the graph to the right of the vertical line compares the actual values of the stock market variable with the values which would be “justified” by the equation estimated over the previous fifteen years.

Stock Market Value



```

ti Stock Market Value
f ub100 = @cum(ub100, 1, ., 1)
f rtbexs = @cum(crtbex, 5, +rtbex, . 10) / ub100
f ni prfs = @cum(cni prf, ni prf, . 10) / ub100
fex SValueR = sp500 / gdpD
f DiscProfit = (ni prfs / rtbexs) / gdpD
con 1000 6. = a2
    
```

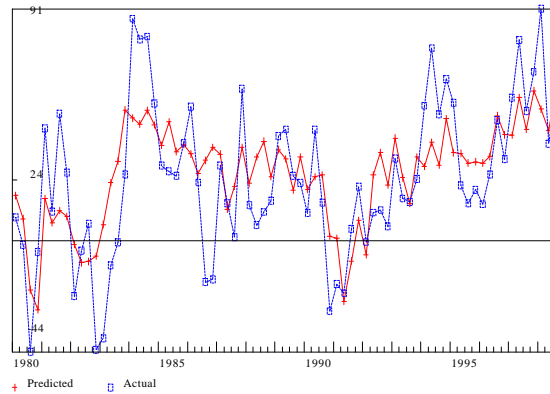
:

Stock Market Value						
SEE =	77.11	RSQ =	0.1445	RHO =	0.97	Obser = 100 from 1970.100
SEE+1 =	19.26	RBSQ =	0.1268	DW =	0.06	DoFree = 97 to 1994.400
MAPE =	22.46	Test period:	SEE 243.40	MAPE	22.90	end 1999.100
Variable name	Reg-Coeff	Mexval	El as	NorRes	Mean	Beta
0 SValueR	-	-	-	-	286.14	-
1 intercept	-132.11801	7.9	-0.46	7.02	1.00	
2 DiscProfit	5.58250	158.5	1.00	1.20	51.08	0.731
3 time	4.81920	9.4	0.47	1.00	27.62	0.417

These are the equations which are directly affected by the stock market variable. The reader interested mainly in the effects of a crash may skip the rest of this section, which develops all of the other equations of the model.

Investment in **Change in business inventories** is based on the change in real final sales, that is, all of GDP except inventory change itself.

viR Change in Inventory



```

title viR Change in Inventory
# fs stands for "final sales"
f fsR = cR + vR + feR + gR
f dfsR = fsR - fsR[1]

```

```

:
                                viR Change in Inventory
SEE =      20.87 RSQ = 0.5212 RHO = 0.47 Obser = 75 from 1980.100
SEE+1 =    18.47 RBSQ = 0.5009 DW = 1.07 DoFree = 71 to 1998.300
MAPE =    183.74

```

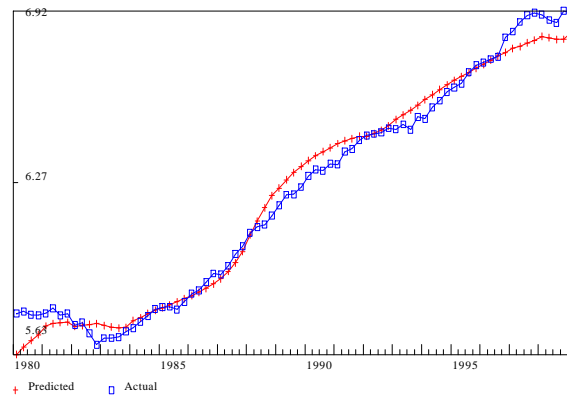
Variable name	Reg-Coeff	Mexval	El as	NorRes	Mean	Beta
0 viR					24.21	
1 dfsR[1]	0.20472	7.4	0.38	1.49	45.48	
2 dfsR[2]	0.25836	11.7	0.48	1.05	44.81	0.372
3 dfsR[3]	0.01397	0.0	0.03	1.04	43.39	0.020
4 dfsR[4]	0.10827	2.0	0.19	1.00	42.95	0.156

Exports, Imports, and the Terms of Trade

The primary variable in the explanation of **exports** is foreign demand, *fgndem*. This variable, a by-product of the Inforum International System of multisectoral models, is a combination of the real imports of the major trading partners of the United States, weighted together with their shares in U.S. exports in 1992. We estimate the equation in double logarithmic form, so the numbers in the "Reg-Coeff" column are elasticities. Thus, a one percent increase in foreign demand has led to a 0.82 percent increase in U.S. exports. Thus, the equation indicates a progressive loss of share in our export markets.

The other variable is the Terms of Trade, *tot*. It is the price of U.S. exports relative to the prices of imported goods, which are indicative of prices in other countries. This variable is better for our purposes than exchange rates, for exchange rates do not show what is happening to relative prices of goods, for they leave out the rate of inflation in the two countries. As is to be expected, this elasticity is substantial.

feR -- Exports



```
ti feR -- Exports
# Terms of Trade for Exports
fex tot = (fe/feR)/(fi/fiR)
fex lfeR = @log(feR)
f lfgndem = @log(fgndem)
f ltot = @log(tot)
f dltot = ltot - ltot[1]
```

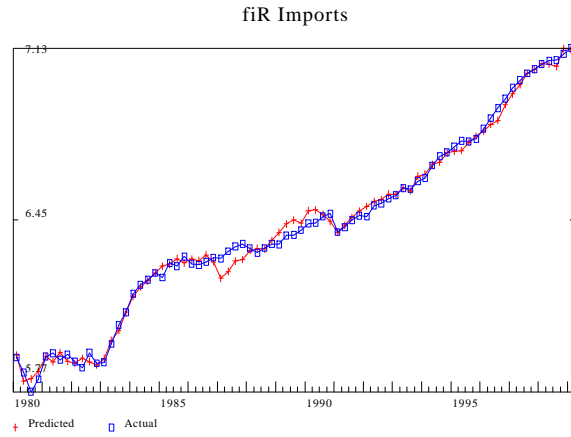
```
:
                                feR -- Exports
SEE =          0.06 RSQ = 0.9806 RHO = 0.81 Obser = 77 from 1980.100
SEE+1 =         0.04 RBSQ = 0.9780 DW = 0.38 DoFree = 67 to 1999.100
MAPE =          0.70
```

Variable name	Reg-Coeff	Mexval	Elas	NorRes	Mean	Beta
0 lfeR	-	-	-	-	6.23	-
1 intercept	1.81577	119.2	0.29	51.65	1.00	
2 lfgndem	0.81888	416.8	0.72	2.13	5.47	0.881
3 ltot[6]	-1.57700	39.5	-0.01	1.36	0.04	-0.197
4 dltot[7]	1.41934	5.5	0.00	1.21	0.00	0.048
5 dltot[8]	1.21191	3.9	-0.00	1.11	-0.00	0.042
6 dltot[9]	0.77275	1.6	-0.00	1.07	-0.00	0.027
7 dltot[10]	0.69442	1.3	-0.00	1.03	-0.00	0.024
8 dltot[11]	0.47099	0.6	-0.00	1.02	-0.00	0.017
9 dltot[12]	0.40869	0.5	-0.00	1.01	-0.00	0.014
10 dltot[13]	0.37447	0.4	-0.00	1.00	-0.00	0.013

```
id feR = @exp(lfeR)
```

The equation for **imports** is similar but uses components of aggregate demand, consumption, investment, and exports in place of the foreign demand variable. Exports is used because imports are used in making exports. Here we see that if all components of demand are increased by one percent, imports increase by over 1.8 percent. This disparity between the elasticities of exports and imports with respect to demand constitutes an enduring problem for the U.S..

The price elasticity is also strong, above 1.0. The positive sign is expected because the terms of trade variable is the prices of domestic goods relative to foreign.



```

ti fiR Imports
f lfiR = @log(fiR)
f lvR = @log(vR)
f lfeR = @log(feR)
f lcR = @log(cR)
# Terms of trade
fex tot = (fe/feR)/(fi/fiR)
f ltot = @log(tot)
f dltot = ltot - ltot[1]
sma .01 a6 a11 2

```

```

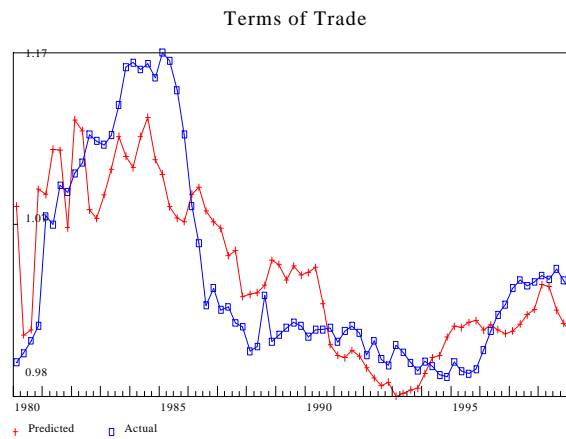
:
                                fiR Imports
SEE =          0.02 RSQ = 0.9953 RHO = 0.39 Obser = 77 from 1980.100
SEE+1 =         0.02 RBSQ = 0.9946 DW = 1.23 DoFree = 66 to 1999.100
MAPE =          0.31

```

Variable name	Reg-Coeff	Mexval	Elas	NorRes	Mean	Beta
0 lfiR	-	-	-	-	6.42	-
1 intercept	-7.77891	101.7	-1.21	212.55	1.00	
2 lfeR	0.43674	63.7	0.42	20.49	6.23	0.498
3 lvR	0.37945	56.1	0.40	6.65	6.76	0.169
4 lcR	1.06946	65.2	1.38	2.79	8.28	0.460
5 ltot	1.28215	59.0	0.01	1.35	0.04	0.182
6 dltot[1]	-0.73516	8.9	0.00	1.35	-0.00	-0.027
7 dltot[2]	-0.73384	15.6	-0.00	1.33	0.00	-0.028
8 dltot[3]	-0.68665	13.9	-0.00	1.28	0.00	-0.027
9 dltot[4]	-0.59343	10.2	-0.00	1.22	0.00	-0.023
10 dltot[5]	-0.45085	7.5	-0.00	1.12	0.00	-0.017
11 dltot[6]	-0.25381	5.8	-0.00	1.00	0.00	-0.010

```
id fiR = @exp(lfiR)
```

The **terms of trade** variable depends on upon the real rate of interest and the cumulative trade deficit, both classical variables for this purpose, but also upon the rate of change of the stock market value variable. Strictly speaking, it should depend upon the real rate of interest in this country relative to the same variable in other countries, but the rates in the other countries goes beyond the scope of Quest, so we implicitly assume that they are roughly constant. The cumulative deficit represents claims on dollars and should push down the dollar and lead to elimination of the trade deficit. In the last five years of the 1990's, however, its equilibrating action has been thwarted by the rise in the stock market in this country — and weakness in Asian markets. Money coming in to buy stocks has held up the dollar, promoted imports, and weakened exports. The percent change in the stock market value variable is therefore added to round out the equation.



ti Terms of Trade

fex tot = (fe/feR)/(fi/fiR)

Compute real interest rates

fex lgdpD = 100.*@log(gdpD)

fex infl = lgdpD - lgdpD[4]

f rtbReal = rtb - infl

Stock Market Value

fex SMValueR = sp500/gdpD

f lSMValueR = @log(SMValueR)

f pcSMVR = 2.*(lSMValueR - .333*(lSMValueR[7]+lSMValueR[8]+lSMValueR[9]))

f cumdef = @cum(cumdef, 0.001*(fi[1]-fe[1]), 0)

r tot = rtbReal, pcSMVR, cumdef

		Terms of Trade											
SEE	=	0.03	RSQ	=	0.6522	RHO	=	0.77	Obser	=	75	from	1980.100
SEE+1	=	0.02	RBSQ	=	0.6375	DW	=	0.46	DoFree	=	71	to	1998.300
MAPE	=	2.55											
Variable name		Reg- Coef	Mexval	El as	NorRes	Mean	Beta						
0 tot						1.05	- - -						
1 intercept		1.02464	769.7	0.98	2.88	1.00							
2 rtbReal		0.01806	22.9	0.05	1.37	2.95	0.498						
3 pcSMWR		0.02898	2.8	0.01	1.36	0.32	0.165						
4 cumdef		-0.01519	16.7	-0.04	1.00	2.71	-0.477						

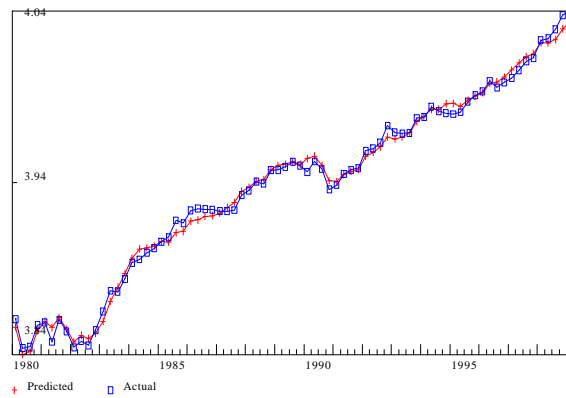
Productivity, Employment, and Unemployment

As an exercise in Chapter 3, we added to the original AMI model and equation for employment which simply regressed employment on real Gross domestic product. Implicitly, this made all the growth in productivity depend on the growth in real GDP. Here we need to examine that growth more closely. Our dependent variable will be gross labor productivity, real GDP divided by employment. Regressed simply on *time*, over the period 1980.1 - 1999.1, the coefficient on *time* is .0097, that is, 0.927 percent per year. Besides time, however, there are at least two other factors readily available to use which should be tried. From the investment equation, we have available the stock of equipment from which we can make up a capital-output ratio. This ratio was tried with no success at all. Another factor, however, is real GDP itself. It could influence productivity by economies of scale, by the opportunities which growth gives to eliminate inefficiencies without the painful process of laying off workers. When it was introduced into the equation, it was very successful; and the coefficient on *time* fell to only .001. There is, however, a problem with this variable, for it occurs in the numerator of the dependent variable. Thus, any random fluctuation in it will show up automatically as a similar fluctuation in productivity. Thus, if we are really looking for long-term relations, the *gdpR* variable may get too high a coefficient relative to the *time* variable. To control for this situation, the equation was run with *gdpR*[1] as the most recent variable. The coefficient on *time* rose to .00327. We then constrained the coefficient at that value, restored the use of the current value of *gdpR*, and re-estimated the equation.

Notice the big surge in productivity which follows an increase in real GDP. It is initially produced by existing employees simply working harder and longer and perhaps by some postponable work simply being postponed. Gradually, however, employment is brought up to the levels appropriate for the level of output.

With labor productivity known, **employment** is just computed by dividing real GDP by it; **unemployment** is computed by subtracting employment from the labor force.

Labor Productivity



```

ti Labor Productivity
fex empm = emp*.001
fex lLabProd = @log(gdpR/empm)
f lgdpR = @log(gdpR)
f pcGdpR = lgdpR - lgdpR[1]
# f CapOut = repEq/pgppR -- tried without success
sma .001 a4 a11 1
con 100 .0033 = a2

```

```

:
                                Labor Productivity
SEE =          0.00 RSQ = 0.9943 RHO = 0.72 Obser = 77 from 1980.100
SEE+1 =         0.00 RBSQ = 0.9934 DW = 0.56 DoFree = 66 to 1999.100
MAPE =          0.08

```

Variable name	Reg-Coeff	Mexval	Elas	NorRes	Mean	Beta
0 lLabProd					3.94	
1 intercept	1.83151	553.0	0.46	239.18	1.00	
2 time	0.00329	728.5	0.03	58.85	34.75	0.348
3 lgdpR	0.22893	588.3	0.50	2.52	8.68	0.621
4 pcGdpR	0.28806	33.9	0.00	2.47	0.01	0.041
5 pcGdpR[1]	0.23692	46.7	0.00	2.19	0.01	0.034
6 pcGdpR[2]	0.18999	44.8	0.00	1.77	0.01	0.027
7 pcGdpR[3]	0.15081	31.0	0.00	1.45	0.01	0.022
8 pcGdpR[4]	0.11889	19.5	0.00	1.27	0.01	0.017
9 pcGdpR[5]	0.09163	12.2	0.00	1.17	0.01	0.013
10 pcGdpR[6]	0.06607	8.0	0.00	1.10	0.01	0.009
11 pcGdpR[7]	0.03659	5.1	0.00	1.00	0.01	0.006

```

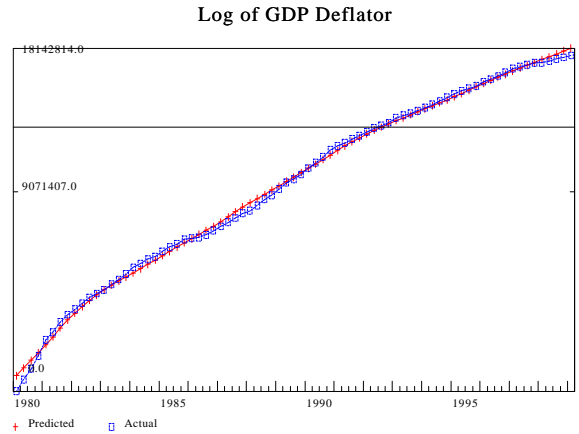
f LabProd = @exp(lLabProd)
f empm = gdpR/LabProd

```

Price level and inflation

The theory of inflation incorporated in the price level equation is straight out of standard macroeconomic textbooks, where it is called the “Philipps curve with acceleration.” The idea is simply that the rate of inflation depends upon the expected rate of inflation and the level of

unemployment. That means that price level depends on the cumulated rate of unemployment and the cumulated expected inflation. Since the level of prices matters as much in the model as its rate of change, the equation estimated is for the price level, and inflation is obtained by differencing the levels.



```

ti Log of GDP Deflator
# gdpD is the GDP deflator: gdpD = gdp/gdpR
f lgdpD = 100.*@log(gdpD)
f infl = lgdpD - lgdpD[4]
fex ub10 = @cum(ub10, 1.0, .10)
# inflex is expected inflation
f inflex = @cum(cinfl, infl[1], .10)/ub10
fex empm = .001*emp
f u = 100.0*(lfc - empm)/lfc
f cinfl = @cum(cinfl, 0.25*inflex, 0.)
f cu = @cum(cu, u, 0)
# Calculate imported inflation, inflimp
fex relpri = @log((fi/fiR)/(fe/feR))
f inflimp = 100.*(relpri - relpri[4])
f cinflimp = @cum(cinflimp, 0.25*inflimp, 0)
con 100 .8 = a3

```

```

:
                                Log of GDP Deflator
SEE   =      0.91  RSQ   = 0.9978  RHO   =  0.92  Obser  =  77 from 1980.100
SEE+1 =      0.51  RBSQ  = 0.9977  DW    =  0.16  DoFree  =  72 to 1999.100
MAPE  =      10.66

```

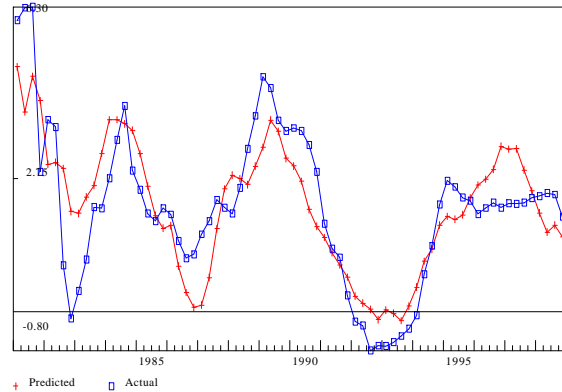
Variable name	Reg-Coeff	Mexval	El as	NorRes	Mean	Beta
0 lgdpD	-	-	-	-	-12.44	-
1 intercept	-127.33545	451.3	10.23	534.58	1.00	
2 cu[3]	-0.10942	48.4	6.16	81.85	700.74	-0.838
3 cinfl	0.80908	803.7	-7.39	3.71	113.62	1.024
4 cinflimp[4]	0.13028	13.2	-0.14	2.13	13.38	0.033
5 time	2.81706	46.0	-7.87	1.00	34.75	0.800

```
f gdpD = @exp(.01*lgdpD)
f infl = lgdpD - lgdpD[4]
```

Interest rates

The key to obtaining a somewhat satisfactory explanation of the interest rate was to use as the dependent variable the “expected” or “perceived” real interest rate — the nominal rate on new issues of Treasury 90-day bills minus the expected rate of inflation. The sole explanatory variable is the velocity of M1 together with lagged values of its first difference, and its product with time. The negative coefficient on the product of velocity and time indicates a gradual reduction in the requirements of for M1. The positive signs on the first differences indicate that the immediate impact on interest rates of a change in money supply relative to GDP is substantially greater than the long-term impact. Seemingly, the financial institutions adjust to the available money supply. During an earlier period, M2 would have been the appropriate measure of money; but during the period studied here, it has little value in explaining interest rates.

Treasury Bill Rate



```
ti Treasury Bill Rate
f lgdpD = 100. *@log(gdpD)
f infl = lgdpD - lgdpD[4]
fex ub10 = @cum(ub10, 1.0, .10)
# inflex is expected inflation
f inflex = @cum(cinfl, infl[1], .10)/ub10
# rtbex -- perceived or expected real rate
fex rtbex = rtb - inflex
# v1 -- the M1 velocity of money
f v1 = gdp/m1
f dv1 = v1 - v1[1]
sma .1 a3 a7 1
```

```

:
Treasury Bill Rate
SEE = 0.89 RSQ = 0.6791 RHO = 0.68 Obser = 73 from 1981.100
SEE+1 = 0.66 RBSQ = 0.6445 DW = 0.64 DoFree = 65 to 1999.100
MAPE = 79.04

```

Variable name	Reg-Coeff	Mexval	Elas	NorRes	Mean	Beta
0 rtbex					2.16	
1 intercept	0.01633	0.0	0.01	3.11	1.00	
2 v1	1.11727	12.9	3.55	2.47	6.88	0.367
3 dv1	4.35889	28.4	0.03	2.42	0.01	0.300
4 dv1[1]	3.56337	41.9	0.02	2.22	0.01	0.248
5 dv1[2]	2.76889	30.8	0.02	2.01	0.01	0.194
6 dv1[3]	1.89495	15.8	0.01	1.92	0.01	0.132
7 dv1[4]	0.96726	7.8	0.01	1.86	0.01	0.067
8 time*v1	-0.02355	36.4	-2.64	1.00	242.61	-0.642

```
id rtb = rtbex + inflex
```

The Income Side of the Accounts

To understand the connections and relevance of the remaining equations, one needs to recall the basic identities of the income side of the NIPA. In the following quick review, the items for which regression equations have been developed are shown in bold. All other items are either determined either by identities or by behavioral ratios or are left exogenous.

```

#gnp -- gross national product
# gnp = gdp + exports of factor income - imports of factor income

```

```

# Net National Product
id nnp = gnp - ncca

```

```

# ninc -- National income from the product side
# ninc = + nnp      Net national product
#         - nibtax  Indirect business taxes
#         - nbtrp   Business transfer payments
#         - nsd     Statistical discrepancy
#         + nsub    Subsidies less surplus of gov't enterprises
#

```

```

# The alternative, income-side definition of national income.
# ninc = + niceprop Compensation of employees and Proprietor income
#         + niren    Rental income
#         + ni prf   Corporate profits
#         + netint   Net interest

```

```

# pi -- Personal Income
#pi = + ninc National income
# - ni prf Corporate profits with IVA and CCA
# + npdivi Personal dividend income
# - netint Net interest
# + npini Personal interest income
# - nconsi Contributions for social insurance
# + ngtpg Government transfer payments to persons
# + nbtrpp Business transfer payments to persons
# - nwald Wage accruals less disbursements

# npini -- Personal interest income
# npini = + netint Net interest
# + gfenip Net interest paid by the Federal government
# + gsenip Net interest paid by state and local governments
# + piipcb Interest paid by consumers to business

```

Notice that we have two different definitions of National income, one derived from GDP and one from adding up the five types of factor income which compose it. We will compute it both ways but scale the components of the income definition to match the product definition.

In all, there are eight different items to be determined by regression: Capital consumption allowances, four components of National income, Personal dividend income, and two Net interest payments by government. One other item, Interest paid by consumers to business, has already been discussed.

Capital consumption allowances

```

ti ncca -- capital consumption allowance
# Wearout of Equipment
f ub05 = @cum(ub05, 1, ., . 05)
f repEq1R = @cum(c1vfnreR, vfnreR, . 05) / ub05
f repEq2R = @cum(c2vfnreR, repEq1R, . 05) / ub05
# Deflator for Equipment
fex vfnreDBR = (vfnre/vfnreR) / gdpD
f vfnreD = vfnreDBR * gdpD

# Equipment wearout in current prices
f repEq2 = repEq2R * vfnreD
f repEq1 = repEq1R * vfnreD

# Wearout of Structures
f ub01 = @cum(ub01, 1, ., . 01)
f vfsR = vfrR + vfnrsR
f repSt1R = @cum(c1vfsR, vfsR, . 01) / ub01

```

```

f repSt2R = @cum(c2vfsR, repSt1R, . 01) /ub01

# Deflator for Structures
f vfsR = vfnrsR + vfrR
f vfs = vfnrs + vfr
fex vfsDBR = ((vfnrs+vfr)/(vfnrsR+vfrR))/gdpD
f vfsD = vfsDBR*gdpD

# Structure wearout in current prices
f repSt1 = repSt1R*vfsD
f repSt2 = repSt2R*vfsD

fex disaster = 0
# disaster 92.3 = Hurricane Andrew; 94.1 = L. A. earthquake
update disaster
1992.3 1 0 0 0 0 0 .5;
con 500 1 = a2 + a3
con 500 1 = a4 + a5

:
ncca -- Capital consumption allowance
SEE = 7.33 RSQ = 0.9989 RHO = 0.47 Obser = 97 from 1975.100
SEE+1 = 6.50 RBSQ = 0.9988 DW = 1.05 DoFree = 91 to 1999.100
MAPE = 1.28

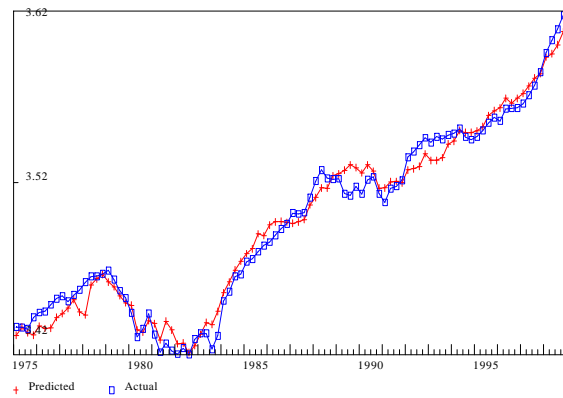
Variable name      Reg-Coeff  Mexval  El as  NorRes  Mean  Beta
0 ncca             - - - - - 543.95 - - -
1 intercept        -36.00992  69.6   -0.07  831.70   1.00
2 repEq1           0.16919   2.4    0.09   20.47   298.05  0.095
3 repEq2           0.93117   49.5   0.45   17.78   263.16  0.470
4 repSt1           0.37909   2.4    0.21   2.60    305.16  0.177
5 repSt2           0.64854   5.8    0.31   2.44    258.27  0.252
6 disaster         84.98287  56.3   0.00   1.00     0.02   0.044

```

Components of national income

Compensation of employees and **Proprietor income** are modeled together since our employment variable does not separate employees from proprietors. The ratio of the combination to total employment gives earnings per employed person, which, when put into real terms, is regressed on labor productivity and the unemployment rate. (The latter variable is a mild infraction of the rule against using a stationary variable to explain a trended one, but percentage-wise the growth in the dependent variable has not been great in recent years.) Both the dependent variable and labor productivity are in logarithmic terms, so the regression coefficient is an elasticity. This elasticity turns out to be slightly less than 1.0. Note that while the mexvals on the two lagged values of the unemployment rate are both very small, the combined effect, as seen in the NorRes column, is substantial.

Real Earnings per Employed Person



ti Real Earnings per Employed Person

fex empm = emp*.001

fex lwageR = @log(((nice+ni prop)/empm)/gdpD)

:

Real Earnings per Employed Person

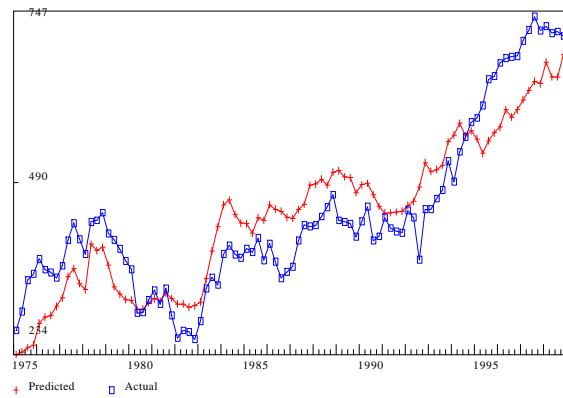
SEE = 0.01 RSQ = 0.9794 RHO = 0.83 Obser = 97 from 1975.100
 SEE+1 = 0.00 RBSQ = 0.9785 DW = 0.34 DoFree = 92 to 1999.100
 MAPE = 0.18

Variable name	Reg- Coef	Mexval	El as	NorRes	Mean	Beta
0 lwageR					3.49	
1 intercept	0.09855	0.8	0.03	48.64	1.00	
2 lLabProd	0.83976	16.5	0.94	1.55	3.92	0.874
3 lLabProd[1]	0.03437	0.0	0.04	1.49	3.92	0.035
4 u[2]	-0.00277	0.7	-0.01	1.01	6.73	-0.069
5 u[3]	-0.00247	0.6	-0.00	1.00	6.74	-0.061

f nicepro = @exp(lwageR)*empm*gdpD

Rental income is the smallest component of national income. It is the income of persons (not corporations) from renting a house, a room or two in a house, or a commercial property. In particular, it includes the net rental income imputed to owner-occupants of houses, that is, the imputed space rental value less mortgage interest, taxes, and upkeep expenses. In view of this content, it is not surprising that the stock of houses should be one of the explanatory variables. It is not, however, able to explain why rental income, after decades of virtual constancy, began to rise rapidly in 1994. The only variable at our disposal to explain this takeoff is the stock market value variable. Perhaps the rise in the stock market was accompanied by a parallel rise in the value of commercial real estate, which shows up in the rental income.

niprFR -- Corporate Profits with IVA and CCAdj



```

title niprFR -- Corporate Profits with IVA and CCAdj
fex gppR = gdpR - gdpG$
fex pgppR = @peak(pgppR, gppR, . 0)
fex d = pgppR - pgppR[1]
fex niprFR = ni prf/gdpD
sma 1000 a3 a6 1

```

```

:
      niprFR -- Corporate Profits with IVA and CCAdj
SEE   =      59.03 RSQ   = 0.7885 RHO = 0.93 Obser = 97 from 1975.100
SEE+1 =      21.73 RBSQ = 0.7769 DW  = 0.14 DoFree = 91 to 1999.100
MAPE  =      12.36

```

Variable name	Reg-Coeff	Mexval	El as	NorRes	Mean	Beta
0 niprFR	- - - - -	- - - - -	- - - - -	- - - - -	443.73	- - -
1 intercept	-125.54372	7.1	-0.28	4.73	1.00	
2 gppR	0.10753	81.7	1.19	1.21	4906.35	0.767
3 d	0.49874	4.3	0.04	1.15	33.62	0.120
4 d[1]	0.37460	6.4	0.03	1.05	32.82	0.090
5 d[2]	0.25986	2.7	0.02	1.02	31.79	0.061
6 d[3]	0.13968	0.9	0.01	1.00	31.31	0.033

```

id niprFR = niprFR*gdpD

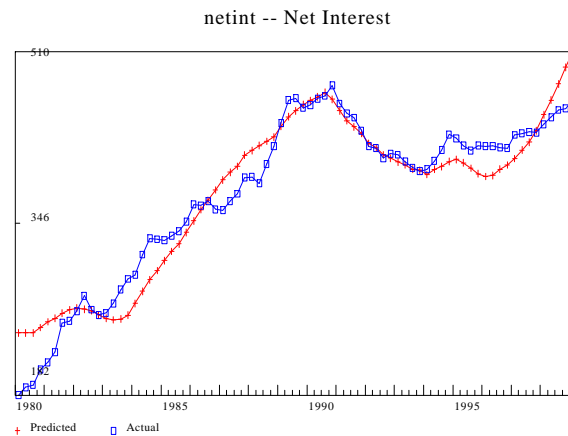
```

Net interest is all interest paid by business less interest received by business. It is modeled by estimating the debt of business and multiplying it by the interest rate. Business debt is taken to be its initial amount at the beginning of the estimation period, D_0 , plus accumulated external financing since then, $bdebt$. This need for external financing is investment minus internal sources of funds — profits and capital consumption allowances less profits taxes and dividends paid (which are equal to dividends received plus dividends paid abroad minus dividends received from abroad). The external financing can be accomplished either by borrowing or by issuing equities. We will derive the net interest equation as if all of the funding was by debt; we can then recognize that part of it will be financed by issuing stock. Not all debt is refinanced ever quarter, so we smooth the Treasury bill rate, producing $srtb$. Business does not necessarily pay the Treasury

rate, so we add to *srtb* a constant, *a*, to approximate the rate it does pay. Theoretically, then, we should have

$$\begin{aligned} \text{netint} &= D_0*(a + \text{srtb}) + \text{bdebt}*(a + \text{srtb}). \\ &= aD_0 + D_0*\text{srtb} + a*\text{bdebt} + \text{bdebt}*\text{srtb} \end{aligned}$$

The fit obtained with this regression is acceptable, but the regression coefficients were not entirely consistent with expectations. The coefficient on *srtb*bdebt*, which should have been 1.0, came out when unconstrained a bit above 1.0 and was constrained down to 1.0. The coefficient on business debt, which should surely be less than .1 by the theory, came out at 0.30. But the main discrepancy is that the coefficient on *srtb*, which should be the initial debt — and therefore positive — is decidedly negative. Perhaps high interest rates induce firms to switch away from debt financing and towards equities.



```

title netint -- Net Interest
f ub100 = @cum(ub10, 1, ., 1)
f srtb = 0.01*@cum(crtb, rtb[1], ., 1)/ub100
f bdef = v - (ncca + ni prf - nictax - npdivi - gsedi v + fefaci - fifaci)
# business deficit
fdates 1980.1 2005.4
f bdebt = @cum(bdebt, .25*bdef, 0.0)
f rXbdebt = srtb*bdebt
con 10000 1 = a4

```

```

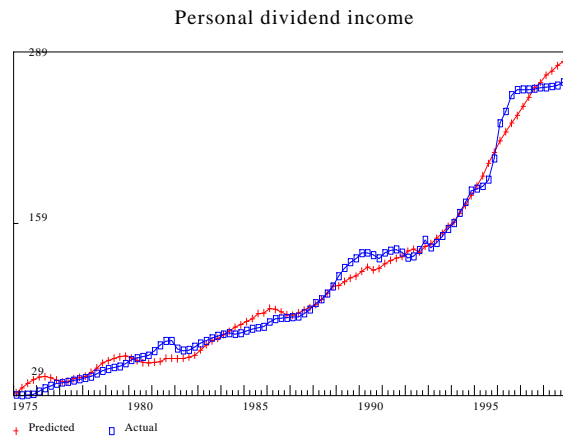
:
netint -- Net Interest
SEE = 22.23 RSQ = 0.9214 RHO = 0.93 Obser = 77 from 1980.100
SEE+1 = 10.48 RBSQ = 0.9182 DW = 0.14 DoFree = 73 to 1999.100
MAPE = 5.48

```

Variable name	Reg-Coeff	Mexval	El as	NorRes	Mean	Beta
0 netint					373.74	
1 intercept	286.48936	105.1	0.77	32.95	1.00	
2 srtb	-699.78230	10.3	-0.14	26.62	0.07	-0.179
3 bdebt	0.29861	107.9	0.30	21.25	379.06	0.707
4 rXbdebt	1.00013	361.0	0.07	1.00	24.94	0.145

Dividends

The most important determinant of **dividends**, not surprisingly, is profits; and most of our equation just amounts to a long distributed lag on past profits. Because appreciation of the value of stock can also substitute, in the eye of the investor, for dividends, we have also included changes in the value of the stock market, which gets the expected negative sign.



```

title Personal dividend income
# prfat -- Profits after tax
f prfat = ni prf - nictax
# prfat is economic profits after taxes
f ub1div = @cum(ub1div, 1, ., 10)
f sprf = @cum(cprf, prfat, ., 10) / ub1div
sma 1 a6 a12 1

```

```

:
Personal dividend income
SEE = 7.98 RSQ = 0.9874 RHO = 0.90 Obser = 97 from 1975.100
SEE+1 = 3.55 RBSQ = 0.9857 DW = 0.20 DoFree = 85 to 1999.100
MAPE = 7.28

```

Variable name	Reg-Coef	Mexval	Elas	NorRes	Mean	Beta
0 npdivi	-	-	-	-	114.64	-
1 intercept	-6.16669	6.0	-0.05	78.70	1.00	
2 prfat	0.10993	2.1	0.24	1.93	253.39	0.239
3 prfat[1]	0.06002	0.4	0.13	1.67	247.57	0.128
4 prfat[2]	0.06846	0.7	0.14	1.49	242.06	0.143
5 sprf[3]	0.32473	21.2	0.56	1.11	196.42	0.519
6 pcSMVR[2]	-3.79594	1.3	-0.00	1.10	0.12	-0.010
7 pcSMVR[3]	-3.77742	2.7	-0.00	1.10	0.11	-0.010
8 pcSMVR[4]	-3.71174	4.1	-0.00	1.08	0.11	-0.010
9 pcSMVR[5]	-3.51178	4.0	-0.00	1.06	0.10	-0.009
10 pcSMVR[6]	-3.07297	3.1	-0.00	1.04	0.10	-0.008
11 pcSMVR[7]	-2.32483	2.2	-0.00	1.03	0.09	-0.006
12 pcSMVR[8]	-1.26748	1.4	-0.00	1.00	0.09	-0.003

Government net interest payments

Both the federal government and the state and local governments both borrow and lend money. Consequently, they have both interest payments and receipts. The difference between the two levels of government, however, is profound; and the approach which works well for the federal government does not work at all for the state and local governments. For the **Net interest paid by the federal government**, which is a huge net borrower, we can calculate the overall deficit or surplus in each quarter and cumulate this amount to obtain a rough estimate of the net amount on which the government is earning or paying interest. By use of G's *fdates* command, we make the cumulation of the deficit or surplus begin at the same time that the regression begins. (The *fdates* command controls the dates over which the *f* commands work.) Because not all debt is refinanced instantly with the change in the interest rate, we use an exponentially weighted moved average of the rates, *frtb* or *srtb*, to multiply by the debt. We should then have

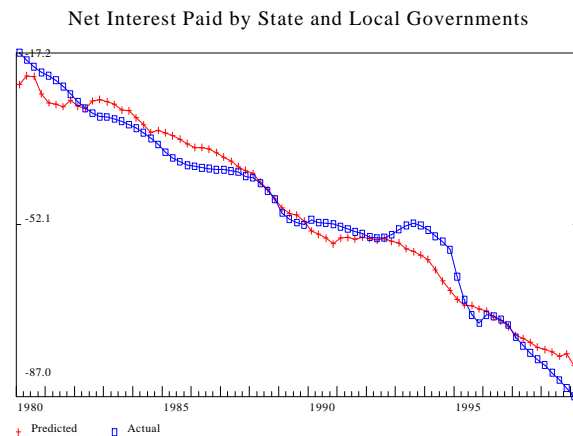
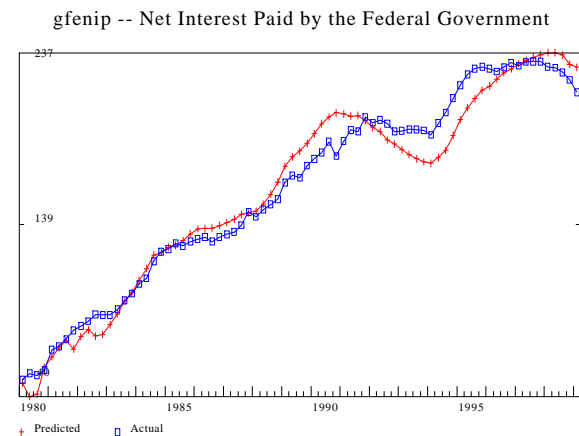
$$gfenip = \text{InitialDebt} * frtb + fcumdef * frtb$$

where *fcumdef* is the cumulated deficit of the federal government. The InitialDebt thus becomes a parameter in the regression equation. Notice that there is no constant term in this equation. We have therefore forced G to omit the constant term by placing a ! after the = sign in the *r* command. We have also included *rtb* as a separate variable in addition to *frtb* so that the regression can take an average of them to produce the best fit.

The same approach will not work at all for the **Net interest paid by state and local governments**, largely because these governments can borrow at low rates because the interest they pay is exempt from federal income tax. Thus, the rate they pay on their debt is far below the rate they receive on their assets, so the net indebtedness is not sufficient to make even a rough

guess of the interest payments. Indeed, over the last twenty years the net indebtedness has grown while the net interest paid has become more and more negative. (The increase in the indebtedness is not immediately apparent from the NIPA, which show a positive surplus, *gssurp* in our bank.. The problem is that this surplus is not reckoned with total purchases of goods and services, *gs*, but only with consumption expenditures, *gsece*. The difference is that *gs* includes capital outlays while *gsece* excludes capital outlays but includes imputed capital consumption allowances. The cumulated surplus relevant for our purposes would be calculated with total expenditures, *gs*, and that surplus is negative throughout most of the last twenty years.)

In this situation, we have had recourse to a simpler device and assumed that state and local governments have tried to maintain both financial assets and liabilities roughly proportional to total purchases of goods and services, *gs*. Under that assumption, net interest payments should depend on *gs* and on its product with the interest rate. The fit is satisfactory and the elasticity of interest receipts with respect to *gs* just a little above 1.



```

title gfenip -- Net Interest Paid by the Federal Government
f ub100 = @cum(ub100, 1, . 1)
f frtb = @cum(cfrtb, . 01*rtb, . 1)/ub100
" calculate federal government deficit
f feddef = gf+gfetp+gfegi a+gfeni p+gfesl s- gfrptx- gfrprf- gfri bt- gfrcsi
fdates 1979. 4 2005. 4
f fcumdef = @cum(fcumdef, . 25*feddef, 0. 0)
fdates 1960. 1 2005. 4
f frXfcumdef = frtb*fcumdef[1]
f rXfcumdef = rtb*fcumdef[1]
r gfenip = ! frtb, rtb, frXfcumdef, rXfcumdef

```

```

:          gfenip -- Net Interest Paid by the Federal Government
SEE   =    10.22 RSQ   = 0.9659 RHO =    0.91 Obser  =   77 from 1980.100
SEE+1 =     4.38 RBSQ = 0.9645 DW  =    0.19 DoFree =   73 to   1999.100
MAPE  =     5.43

```

Variable name	Reg-Coeff	Mexval	Elas	NorRes	Mean	Beta
0 gfenip	- - - - -	- - - - -	- - - - -	- - - - -	158.45	- - -
1 frtb	82.56389	0.5	0.04	85.00	0.07	
2 rtb	3.19454	8.2	0.14	78.88	6.92	0.168
3 frXfcumdef	1.21321	127.9	0.87	1.02	113.48	1.248
4 rXfcumdef	-0.00076	0.9	-0.05	1.00	10290.34	-0.081

```

title Net Interest Paid by State and Local Governments
f gsXrtb = gs*rtb

```

```

:          Net Interest Paid by State and Local Governments
SEE   =    3.46 RSQ   = 0.9620 RHO =    0.93 Obser  =   77 from 1980.100
SEE+1 =    1.44 RBSQ = 0.9610 DW  =    0.13 DoFree =   74 to   1999.100
MAPE  =    6.91

```

Variable name	Reg-Coeff	Mexval	Elas	NorRes	Mean	Beta
0 gsenip	- - - - -	- - - - -	- - - - -	- - - - -	-48.96	- - -
1 intercept	10.47731	16.0	-0.21	26.31	1.00	
2 gs	-0.08290	397.2	1.07	1.21	629.77	-0.962
3 gsXrtb	-0.00186	10.1	0.15	1.00	3893.45	-0.091

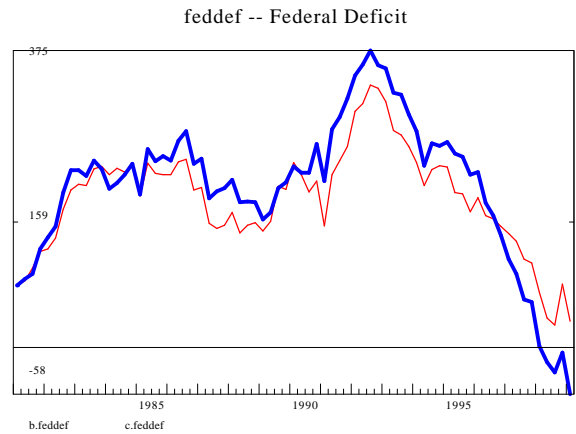
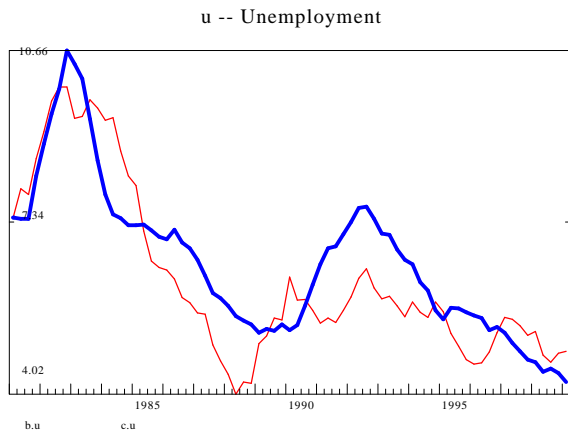
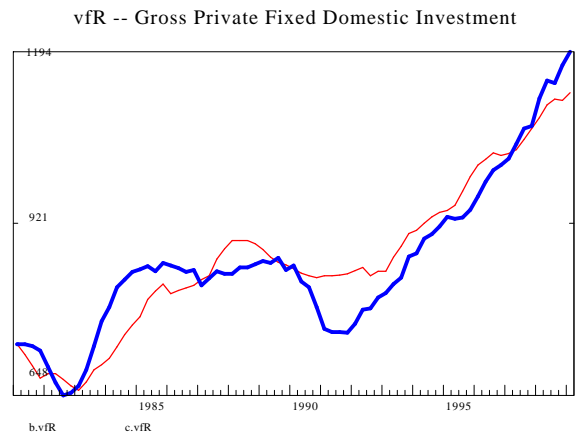
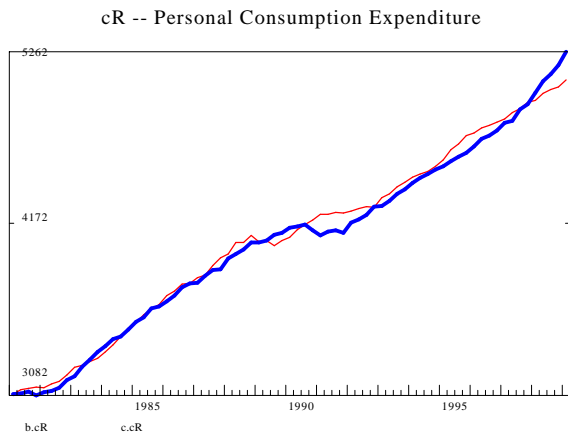
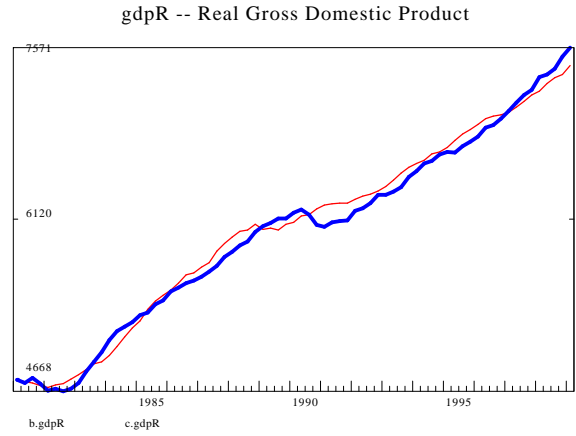
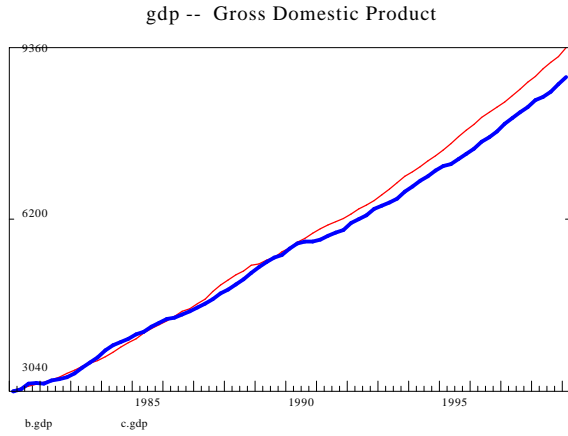
3. Historical Simulations

We will run two simulations over the historical period. In the first, we fix the value of the stock market variable at its correct value. In the second, we let it follow the equation estimated above. Since the two are very close up to 1996, we will begin this experiment in 1995.1.

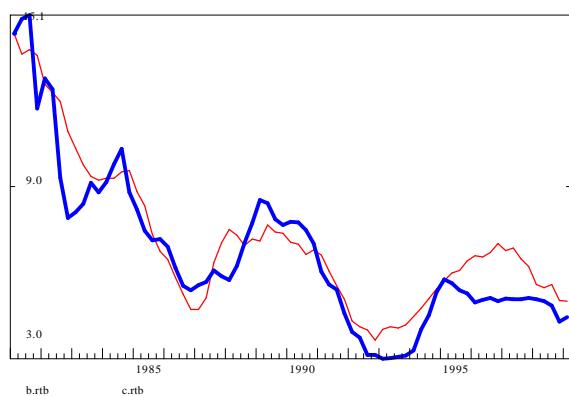
The comparison of the historical simulation with the stock market variable exogenous shows that the model can follow fairly closely the trends of the real variables. In the case of real GDP, the model generally slows down in 1989 - 1992, but does not reproduce the sharp drop of 1991. Correspondingly, unemployment rises in these years, but not to the peak which actually occurred in 1992. Because unemployment is a bit too low, inflation is slightly too high. This discrepancy shows up in nominal GDP and, in fact, in nearly all the nominal variables. This extra inflation is, by the end of the simulation, creating tight money, pushing up the interest rate, and beginning to slow down the growth in investment and real GDP. Despite the problem with this extra inflation, the decline in the federal deficit, which is in current prices, is fairly closely reproduced. While there is certainly room for improvement, the model seems to be able to reproduce the broad outlines of economic growth over the last two decades. As has been mentioned, using the equation for the Stock Market Value instead of its actual value would have made little difference up through 1995.

Comparison of Actual Values with Historical Simulation with Stock Market Exogenous

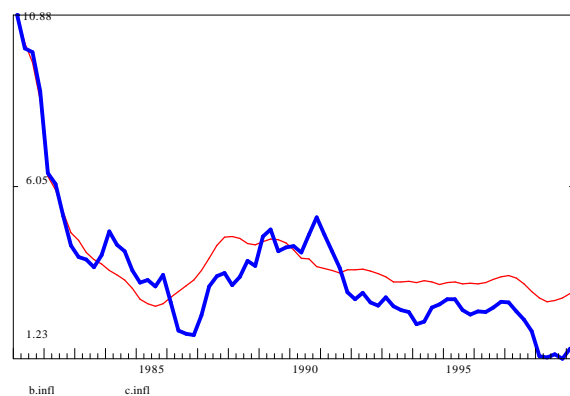
Heavy line is actual, light line is historical simulation.



rtb -- Rate on New 90-day Treasury Bills



infl -- Inflation Rate of GDP Deflator



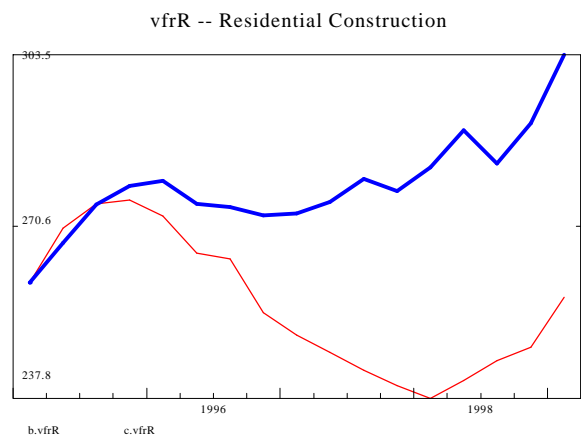
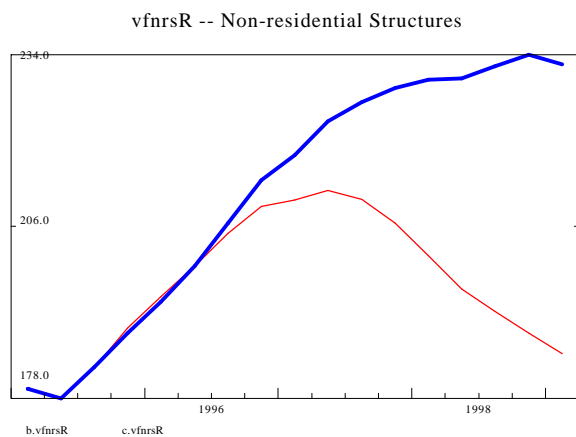
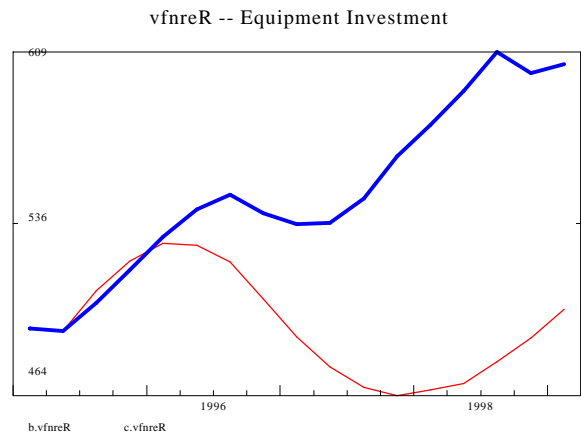
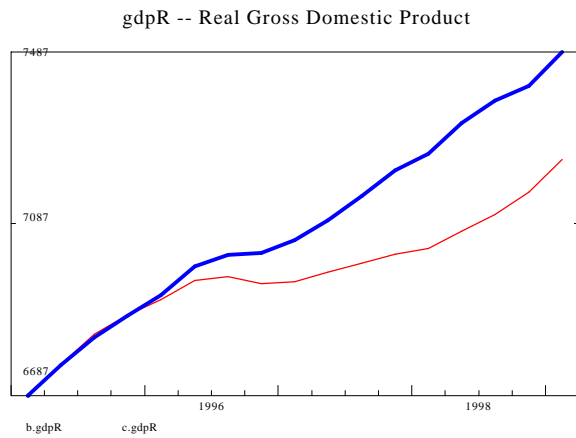
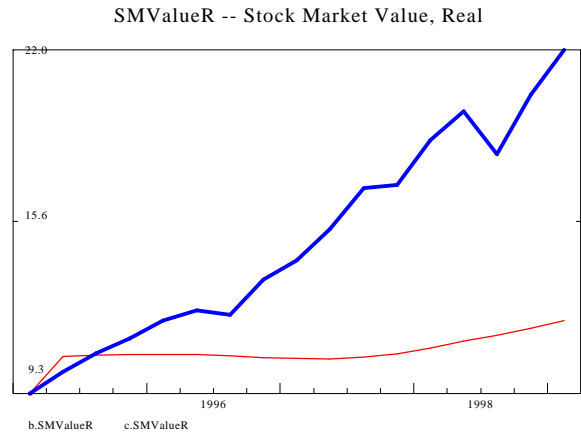
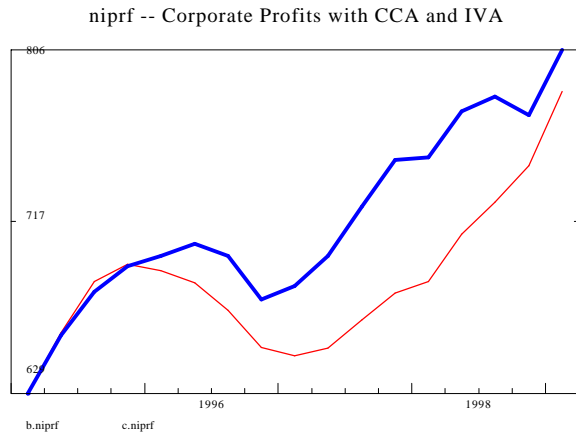
Beginning in 1996, weakness in Asian and other economies led to an influx of foreign investment into the U.S. stock market. This influx was not, I believe, predictable on the basis of developments in the U.S. economy alone. Thus, from the point of view of testing the model, we are justified in taking the value of the stock market to be exogenous. But from the point of view of asking how much of the prosperity of the period 1996 - 1999 is due to the effect on the stock market of this influx, we can very well run the model the stock market value determined internally by the equation we have described. That is what we do in the next simulation, which is compared with the first in the graphs below. In these graphs, the heavy line is a simulation beginning in 1995.1 and using actual values of the stock market variable. The light line is a simulation also beginning in 1995.1 but using the equation for the stock market variable. The difference is, therefore, the effect of the boom in the stock market over and above what the equation would have produced.

First, we note that corporate profits are down in this alternative, so the primary driver of the stock market is reduced below its actual levels. Consequently, the stock market itself shows almost no growth. All components of fixed investment slow their growth in 1996 and plunge down in 1997. Personal consumption expenditure slows after 1995 and loses about a quarter of its total growth over the four years. The savings rate is little affected because the slow growth of the stock market variable is offset by other factors. Real GDP shows a slight recession in 1996 and loses a quarter of its total growth over the four years. Unemployment rises sharply in 1996, passes six percent, and ends the four years some 2.5 percentage points higher than in the base. The inflation rate is reduced by over a percentage point, but there has not been time enough for this lower rate to produce significantly easier money. The federal deficit is still reduced but about one third less than in the base.

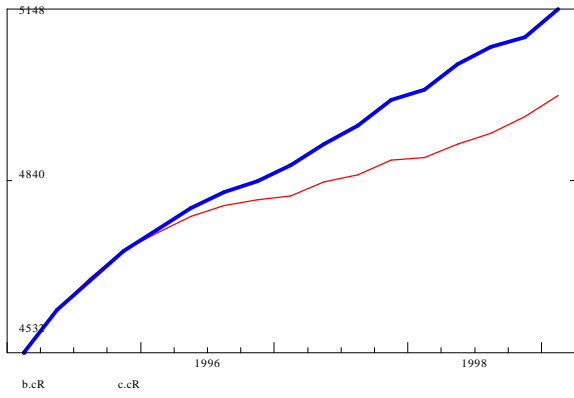
Without the externally driven rise in the stock market, the years 1996 - 1998 would have shown weak but positive growth. The exceptional prosperity of the period was the result of the bull market superimposed on a fundamentally stable but not especially dynamic economy.

Effects of the Bull Market: Comparison of Results with Stock Market Value at Historical Levels versus Equation-based Levels

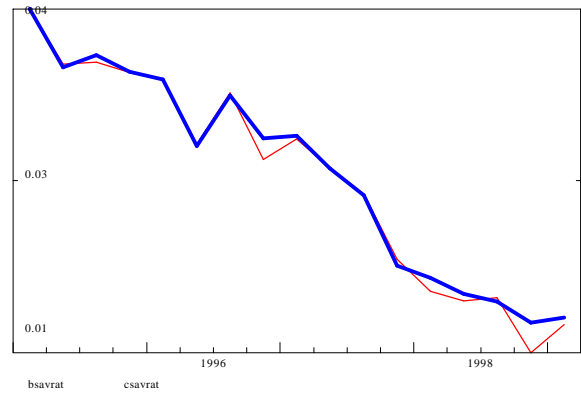
Heavy line is the historical simulation with actual values of the Stock Market variable.



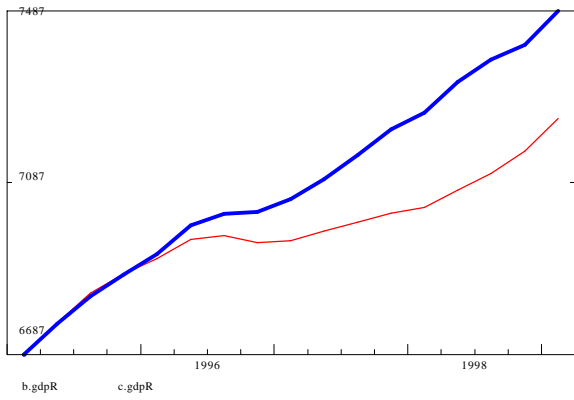
cR -- Personal Consumption Expenditure



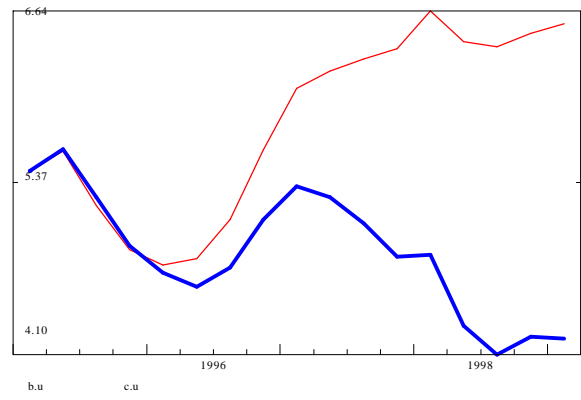
Savings Rate



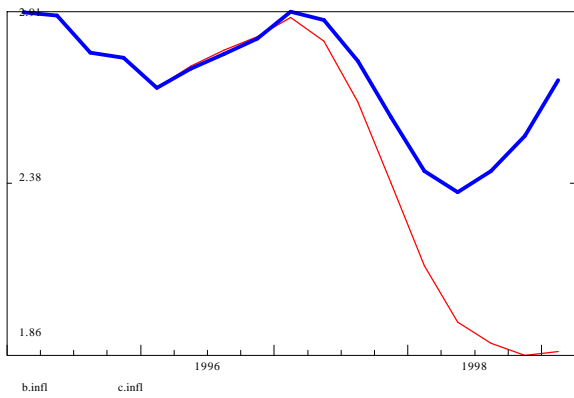
gdpR -- Real Gross Domestic Product



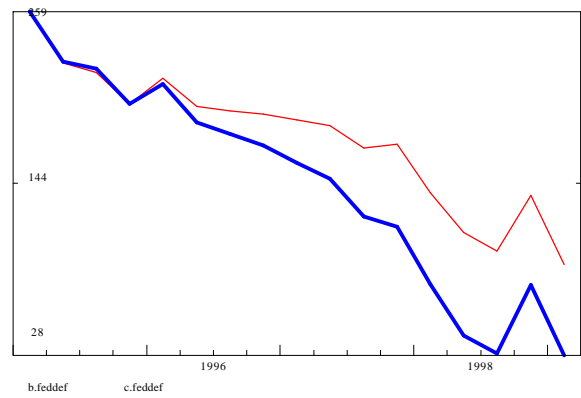
u -- Unemployment



infl -- Inflation Rate of GDP Deflator



feddef -- Federal Deficit



4. Forecasts with Alternative Stock Market Assumptions

To study the effect of the stock market on the cyclical evolution of the American economy in the coming years, we have formulated four alternative projections. They differ only in the constant term adjustment added to the equation for the stock market value variable, SMValueR. We first calculate the add factor which would have been necessary to be equivalent to fixing the stock market value variable at its historical value in the historical simulation. This factor fluctuates between small positive and negative number until 1996, when it begins a sharp growth. In naming the alternatives, we expand on the custom of distinguishing between “bulls” and “bears”. The alternatives are:

Name	Mark	Description
Bull	▲	The add factor will continue to grow at only a slightly reduced rate.
Sheep	□	The add factor stays where it was at the beginning of 1999.
Bear	▼	The add factor returns to 0 by 2002.4
Wolf	◆	The add factor returns to 0 by 2000.4, and is about as negative as it has been in two decades by 2002.4. It then returns to zero by 2005.4

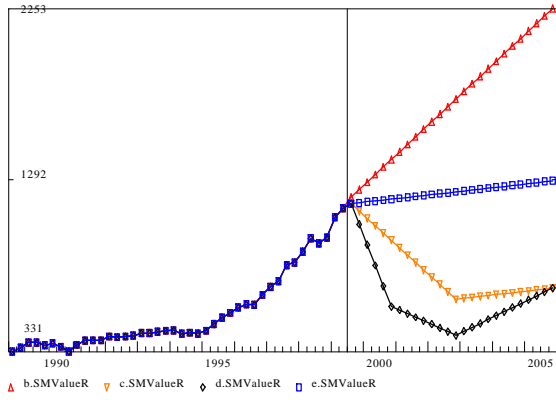
In all alternatives, the M1 money supply is assumed to grow at 2 percent per year, tax rates remain stable, and real government expenditures, labor force, population, and foreign demand follow trends.

The results are, to say the least, striking. Until undertaking this revision of the Quest model, I was of the opinion that the stock market had little effect on the real economy, with my principal piece of evidence being the 1987 “correction.” These results change that conclusion radically. The difference between Bull and Bear is the difference between continued growth at only slightly reduced rates and a recession comparable to that of 1990, when real GDP (in the measure used here) lost 2.3 percent in three quarters. The Wolf scenario produces a recession twice as deep and twice as long. In such a recession, the various automatic stabilizers come into play. Profits fall but interest rates fall so much that discounted profits, the base of the stock market value equation, are actually highest in the Wolf scenario.

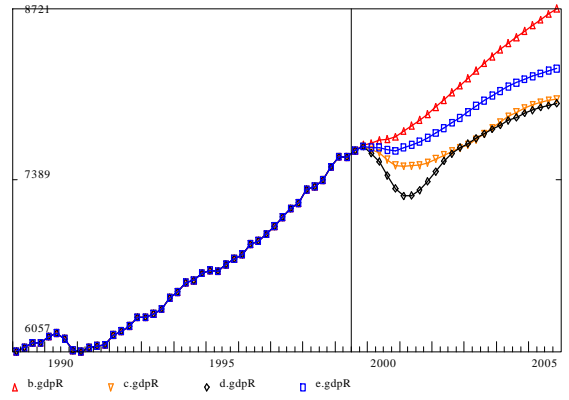
I must stress that I have no scientific grounds for saying which of these scenarios is the most likely. Nor do I believe that anyone else does.

There are, however, I believe, some policy implications of these results. The main one is that a major recession could be just ahead – or could be years away. Any tax cut should certainly be delayed until it is needed. When the recession happens and how deep it is will depend on the expectations of those who control portfolio capital that can quickly flow from one country to another. The dollar has, I believe, been held up by the inflow of such capital. A decline in that inflow could start the dollar’s fall, which would then signal that it was time to get out of the U.S. market, thus setting off something close to a Wolf scenario. How can that be avoided? This best prevention would certainly be to make dollar proof against flights. And the only way to do that is essentially to have a single currency with other major economies.

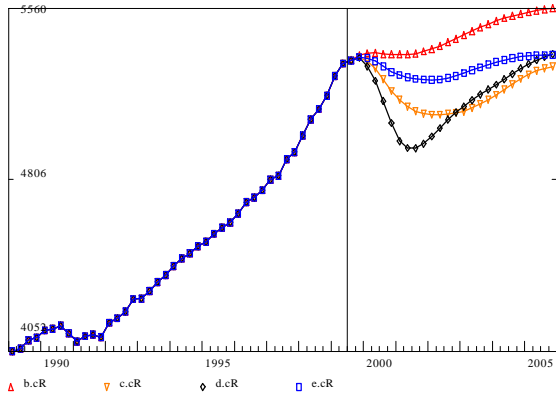
SMValueR -- Stock Market Value, Real



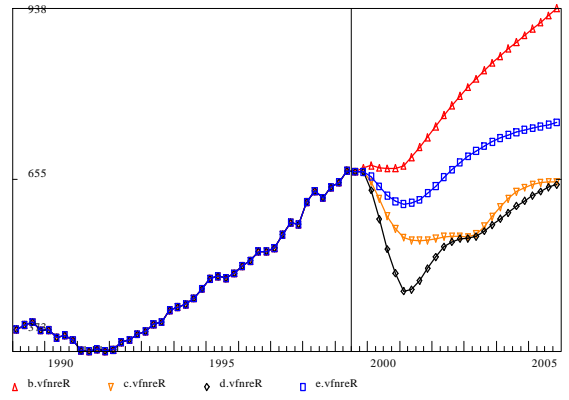
gdpR -- Real Gross Domestic Product



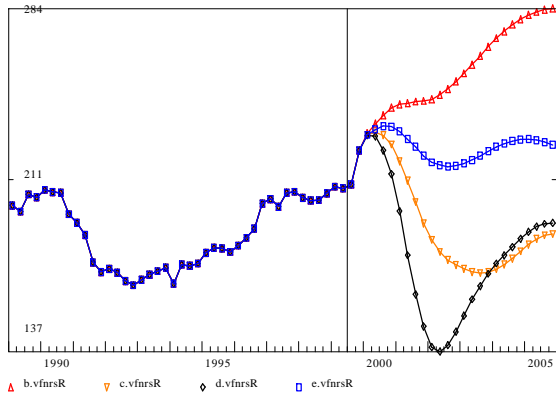
cR -- Personal Consumption Expenditure



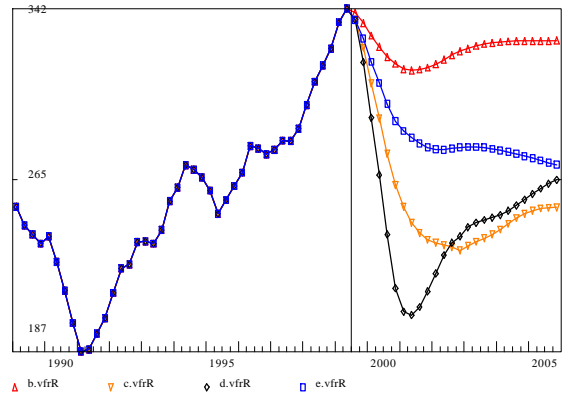
vfnreR -- Equipment Investment



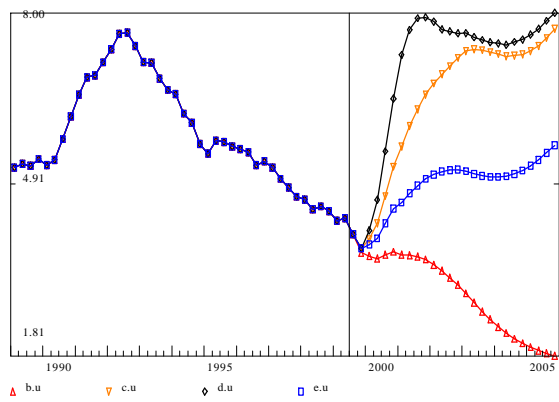
vfnsrR -- Non-residential Structures



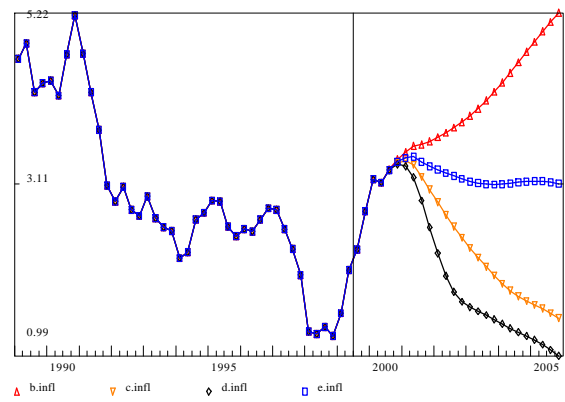
vfrR -- Residential Construction



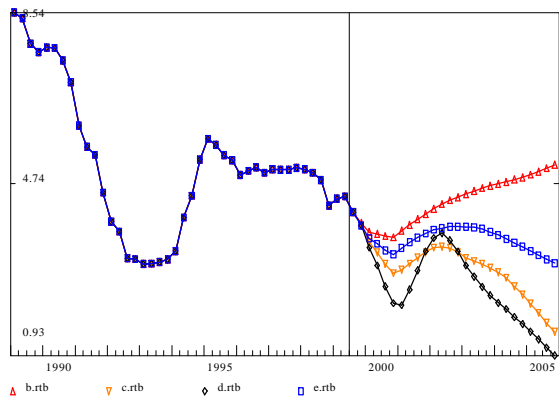
u -- Unemployment



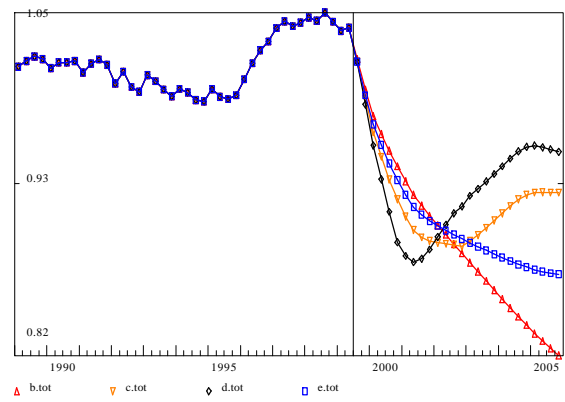
infl -- Inflation Rate of GDP Deflator



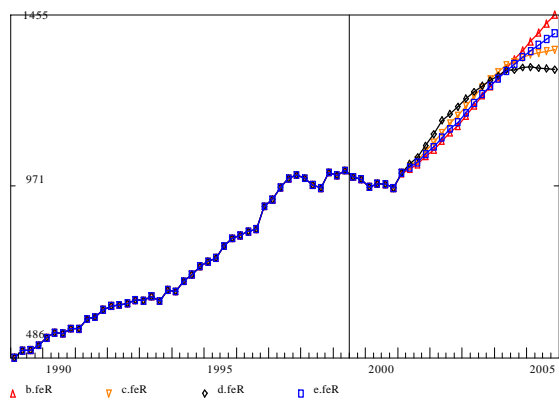
rtb -- Rate on New 90-day Treasury Bills



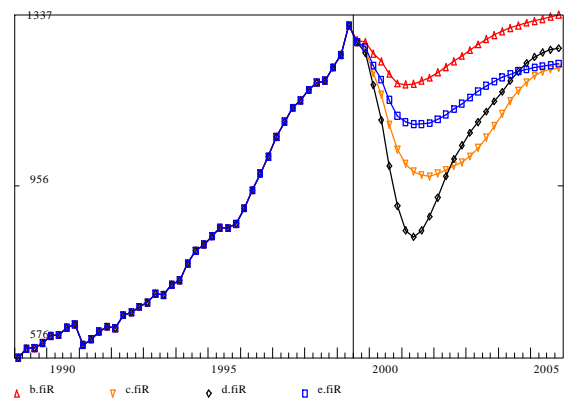
Terms of Trade



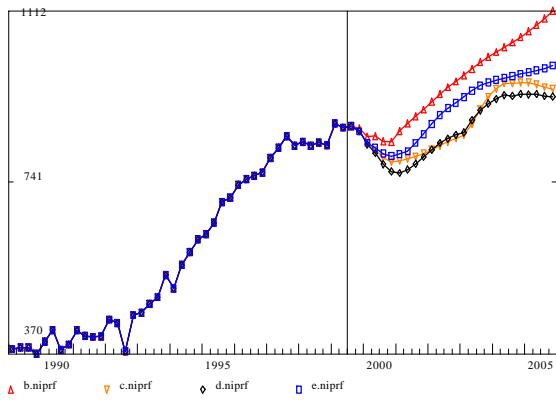
feR -- Exports



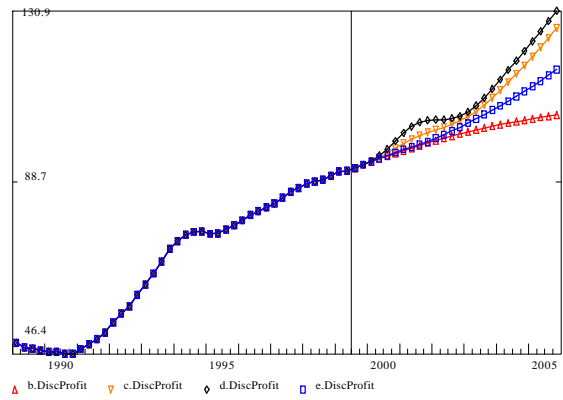
fiR -- Imports



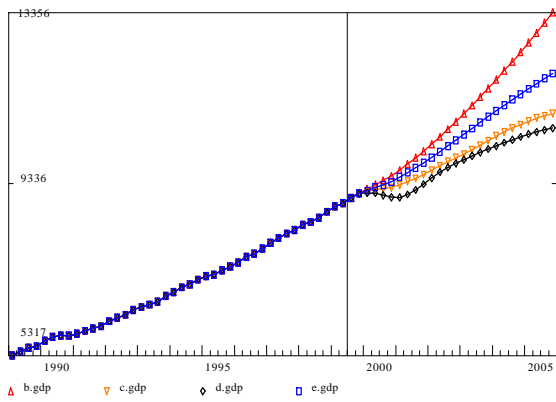
niprf -- Corporate Profits with CCA and IVA



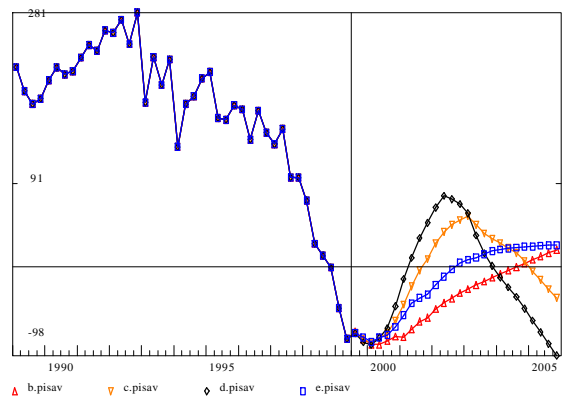
DiscProfit -- Discounted Profits



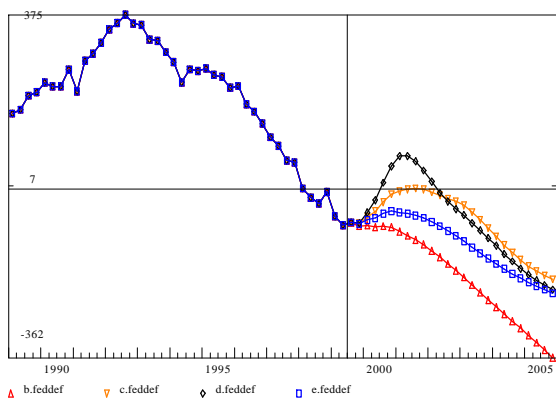
gdp -- Gross Domestic Product



pisav -- Personal Saving



feddef -- Federal Deficit



npini -- Personal Interest Income

