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## Policy Effects in the Post Boom U.S. Economy

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# Policy Effects in the Post Boom U.S. Economy\*

Ray C. Fair

## Abstract

The paper analyzes the question why the U.S. economy in the 2000:4–2004:3 period was sluggish in light of the large expansionary fiscal and monetary policies that took place. The answer does not appear to be that there were large structural changes in the economy or systematic bad shocks. This paper tests for such changes and shocks, and the results are generally negative. Instead, the main culprits seem to be large negative effects from declines in the stock market and exports. Although not tested in this paper, some of the decline in exports may be the result of the stock market decline, in which case most of the explanation is simply the stock market decline itself.

**KEYWORDS:** fiscal policy, monetary policy

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# 1 Introduction

The United States had in the 2000:4–2004:3 period large expansionary fiscal and monetary policies and yet a recession and fairly slow recovery from the recession. The sluggish economy in this period can be seen from Figures 1–3, which contain plots for the 1985:1–2004:3 period. Figure 1 plots the log of real GDP; Figure 2 plots the log of the total number of jobs (called “employment”); and Figure 3 plots the unemployment rate.<sup>1</sup> Figure 2 is striking in showing essentially no job growth for the entire 2000:4–2004:3 period. Figure 4 shows that the inflation rate has remained low during the 2000:4–2004:3 period: inflation has clearly not been a problem.

The expansionary fiscal and monetary policies can be seen from Figures 5–8. Figure 5 plots the ratio of federal personal income taxes to taxable income; Figure 6 plots the ratio of federal corporate profit taxes to corporate profits; Figure 7 plots the ratio of real federal purchases of goods to a measure of potential real output;<sup>2</sup> and Figure 8 plots the three-month Treasury bill rate. (Ignore for now the dotted horizontal lines in Figures 5, 7, and 8—and in Figure 12 below.) Taxes fell dramatically beginning in 2001, and federal spending as a share of output rose fairly consistently from 2001:1 on. The Fed began lowering interest rates in 2001:1, as Figure 8 shows. Finally, Figure 9 shows the movement of the federal government budget from large surplus to large deficit in the period after 2000, and Figure 10 shows that the U.S. current account deficit remained large after 2000. The period 2000:4–2004:3 will be called the “post boom” period in this paper. The 2000:4 quarter was chosen to begin this period because it is the first quarter following the peak of U.S. stock prices (see Figure 13).

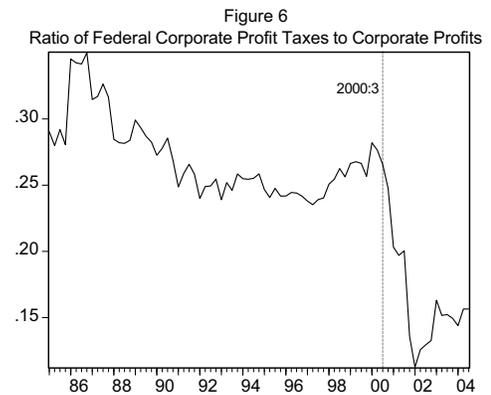
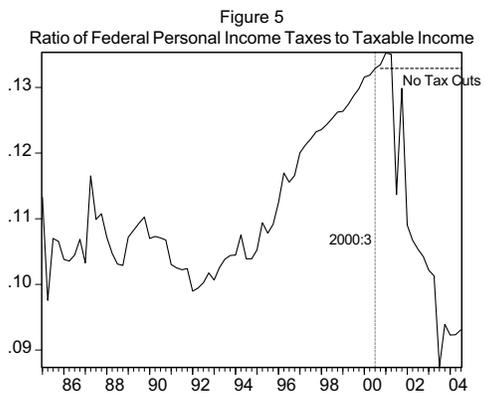
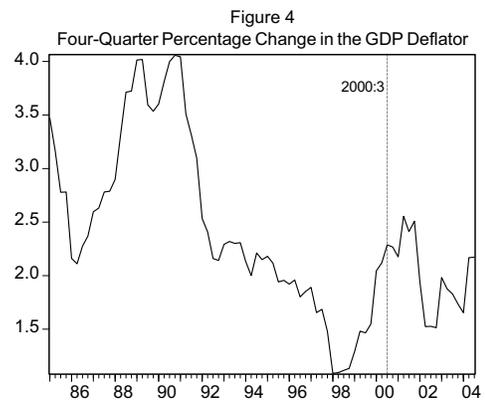
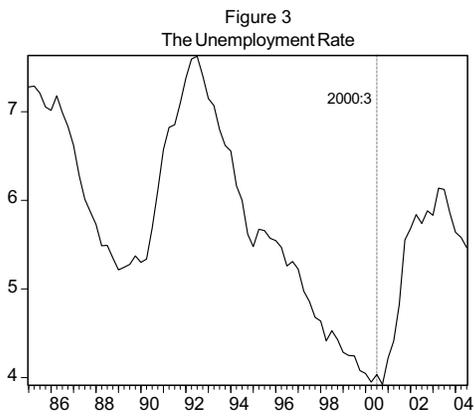
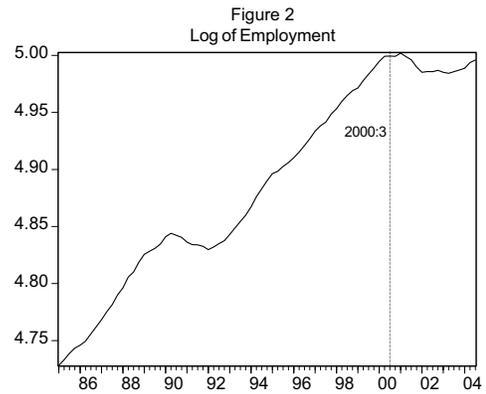
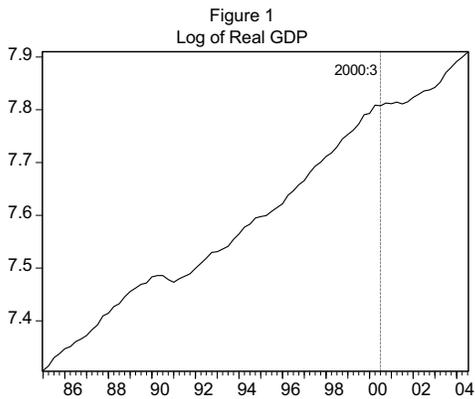
A key question about this period is why with so much stimulus from 2000:4 on (Figures 5–8) did the economy not do better (Figures 1–3)? This paper uses a structural multicountry macroeconomic model, called the “MC” model, to try to answer this question. The MC model is briefly outlined in Section 2. A structural model like the MC model is needed to perform the kinds of experiments in this paper. VAR models are not detailed and structural enough. Calibrated models, while structural in one sense, are not detailed enough regarding tax-rate, wealth, and export effects to allow the present experiments to be performed. The MC model is fully estimated, and it incorporates all the main macroeconomic links

<sup>1</sup>The data are discussed in Section 2.

<sup>2</sup>The measure of potential real output is discussed in Section 2. In Figure 7, and in Figures 11 and 12 below, the variables of interest have been divided by potential rather than actual real output to avoid having the plots be influenced by cyclical fluctuations in actual real output.

# Plots for 1985:1-2004:3

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**Plots for 1985:1-2004:3**  
 Fair: Policy Effects in the Post Boom U.S. Economy

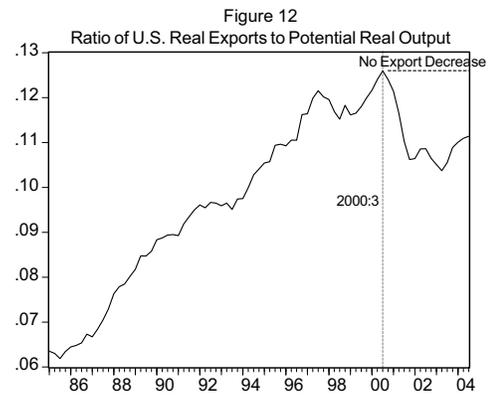
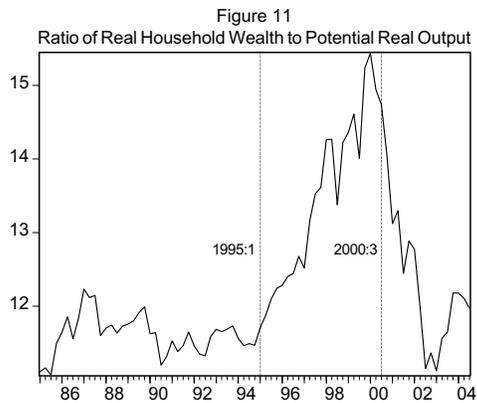
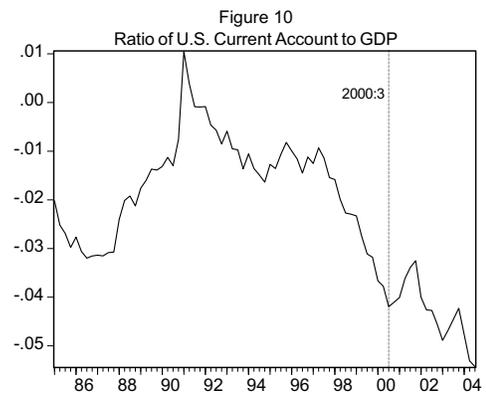
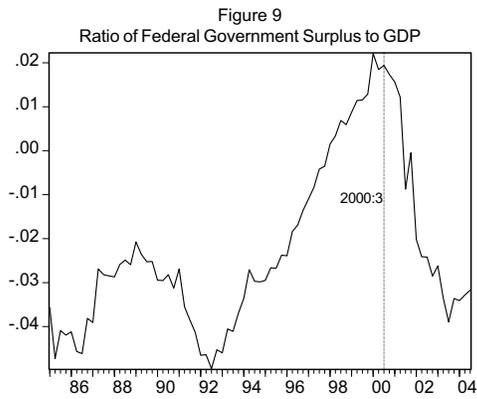
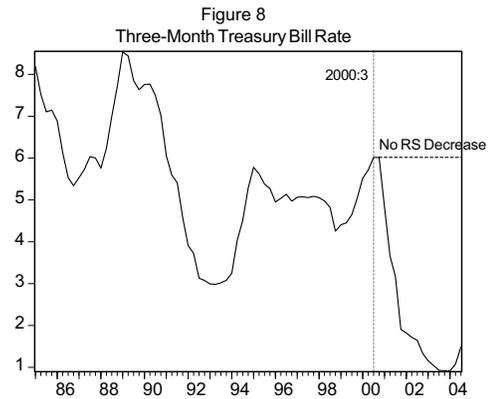
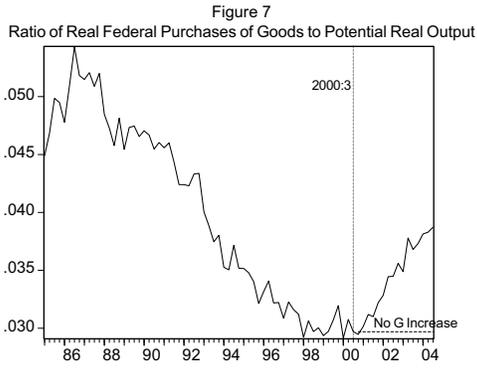
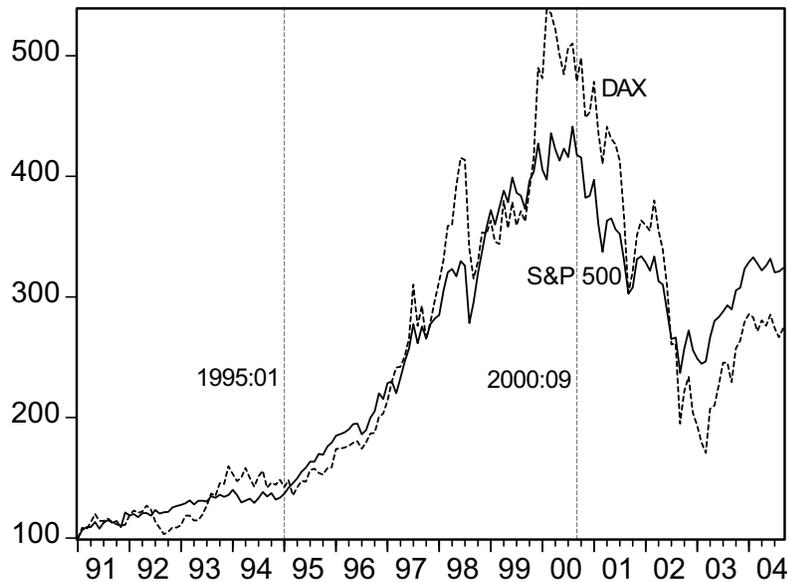


Figure 13

U.S. S&P 500 Stock Price Index and German DAX Stock Price Index  
1991:01-2004:09: 1991:01 = 100



among countries and within the United States. It is structural in that economic theory has been used to guide the specification of the equations. The estimated equations are approximations of decision equations. Expectations are not taken to be rational (model consistent) because there appears to be little empirical support for the rational expectations hypothesis. Although the MC model is only briefly outlined in this paper, a complete discussion is in Fair (2004b) along with many tests. From these tests the model appears to be a good approximation of the economy, which adds support to the results in this paper. Although the model is large, it is not a black box. The entire MC model can be downloaded, estimated, and used to duplicate the experiments in this paper.

In Section 3 the estimated U.S. equations are tested for structural change beginning in 2000:4. Did the U.S. economy change in structural ways in the post boom period, which might then account for its unusual behavior? The results in Section 3 suggest no. In Section 4 the post boom period is examined for possible bad shocks. Were there a series of negative demand shocks that contributed to

the sluggish economy? The estimated residuals of the U.S. consumption and investment equations are examined for large systematic values. There do not appear from this exercise to be systematically bad shocks.<sup>3</sup> Another test in Section 4 is to set the U.S. consumption and investment residuals to zero (with all the other residuals set to their estimated values), solve the model, and see if the solution yields a stronger economy. This is not the case, and so the demand residuals do not appear to be the culprit.

Having ruled out structural change and bad shocks, what explanations are left? One important characteristic of the post boom period was a large fall in stock prices. The effect of the decrease in stock prices on U.S. household wealth can be seen from Figure 11, where the ratio of real U.S. household wealth to potential real output is plotted. There was a huge decrease in wealth beginning in the middle of 2000. Clearly, part of the sluggishness of the post boom period could be due to negative wealth effects. The experiments using the MC model suggest that this is the case.

Another important characteristic of the post boom period was a sharp fall in U.S. exports, which can be seen in Figure 12, where the ratio of U.S. real exports to potential real output is plotted. It is interesting that the fall in exports began almost exactly at the same time as the fall in stock prices. The fall in stock prices that began in the middle of 2000 was a worldwide phenomenon. An example of this is presented in Figure 13, where the U.S. S&P 500 stock price index is plotted along with the German DAX stock price index. It is clear that there is a strong positive correlation. Although not shown, the same is true of most other countries' stock price indices. It is thus possible that some of the decline in the demand for U.S. exports was due to negative wealth effects on demand in other countries. More will be said about this later.

Section 5 consists of a number of counterfactual experiments using the MC model. These experiments are designed to estimate various quantitative effects. The first three experiments provide estimates of the effects of the expansionary fiscal and monetary policies in the post boom period. The estimates are briefly as follows. Had there been no tax cuts, employment would have been 2.2 percent lower by 2004:3 than it actually was; had there been no large increases in federal purchases of goods, employment would have been 1.2 percent lower; and had there been no fall in short-term interest rates, employment would have been 2.5 percent lower. These effects are roughly additive in the model (fourth experiment), and

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<sup>3</sup>The word "shocks" in this paper is *not* meant to refer to changes in stock prices and changes in exports. As will be seen, these changes were large and negative in the post boom period.

the combined estimate is that employment would have been 5.6 percent lower in 2004:3 than it actually was. Note from Figure 2 that what actually took place in the post boom period was essentially no employment growth, and so had there been no policy stimulus, it is estimated that employment would have fallen by about 5.6 percent rather than remaining roughly unchanged. In the fourth experiment the estimate is that the unemployment rate in 2004:3 would have been 2.9 percentage points higher than it actually was. The actual unemployment rate in 2004:3 was 5.5 percent, and so had there been no policy stimulus, the estimate is that the unemployment rate would have been 8.4 percent.

The fifth experiment in Section 5 provides an estimate of the size of the U.S. wealth effect. Had there been no U.S. stock market decline, it is estimated that employment by the end of the period would have been 1.4 percent higher than otherwise and the unemployment rate would have been 1.6 percentage points lower. The sixth experiment provides an estimate of the effect of the decline in U.S. exports. Had U.S. exports not declined, it is estimated that employment by the end of the period would have been 2.7 percent higher than otherwise and the unemployment rate would have been 1.2 percentage points lower.<sup>4</sup> Again, these effects are roughly additive (seventh experiment), and the combined estimate is that employment would have been 4.0 percent higher than otherwise and the unemployment rate would have been 2.6 percentage points lower.

These results thus suggest that the policy stimulus in the post boom period offset much of the stock market and export effects. Focusing on 2004:3, where the actual unemployment rate was 5.5 percent, the estimate is that it would have been 8.4 percent without the policy stimulus. However, had there been no stimulus and no stock market and export decline, the estimate is that the unemployment rate would have been 5.8 percent (8.4 minus 2.6), which is close to the actual.

There do not appear to be other estimates of the size of the negative wealth effect in the post boom period. For example, essentially no mention is made of stock-market effects in the Economic Report of the President (2005), the OECD Economic Outlook (2005), Weller, Bivens, and Sawicky (2004), and Zandi (2004). The stimulative fiscal and monetary policies in the post boom period have been extensively discussed in the press, and it has been argued that these policies helped mitigate the 2001 recession. But the real puzzle has not been addressed, namely why given the very large changes in policy (Figures 5–8) there was a recession and

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<sup>4</sup>As discussed later, in the model wealth has a negative effect on labor supply, and so, other things being equal, an increase in wealth decreases the labor force, which lowers the unemployment rate. This is the reason the unemployment rate falls more in the stock market experiment than in the export experiment even though employment rises more in the export experiment.

a fairly sluggish recovery from it.

The results in this paper also suggest that some policy stimulus would have been needed even with no stock market and export decline to keep the unemployment rate from rising from its low of 3.9 percent in 2000:4. Figures 4–6 show that in 2000:3 the ratio of federal personal income taxes to taxable income was fairly high, federal government spending was fairly low, and the interest rate was fairly high. According to the model, even with no stock market and export decline, some change in at least one of these policy variables would have been needed to avoid an increase in the unemployment rate.

## 2 The MC Model

### Overview

The latest discussion of the MC model is in Fair (2004b). There are 39 countries in the MC model for which stochastic equations are estimated.<sup>5</sup> There are 31 stochastic equations for the United States and up to 15 each for the other countries. In addition, there are about 1200 estimated trade share equations. Trade share data were collected for 59 countries, and so the trade share matrix is  $59 \times 59$ .<sup>6</sup>

The estimation periods begin in 1954 for the United States and as soon after 1960 as data permit for the other countries. The estimation technique is two stage least squares except when there are too few observations to make the technique practical, where ordinary least squares is used. The estimation accounts for possible serial correlation of the error terms. The variables used for the first stage regressors for a country are the main predetermined variables in the model for the country. The model is completely estimated; there is no calibration.

The exact model that is used for the results in this paper is on the author's website. The specification of the U.S. part of the model, called the US model, is exactly as in Fair (2004b). The only difference is that the equations have been estimated through 2004:3 rather than 2002:3. A few minor changes were made

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<sup>5</sup>The 39 countries are the United States, Canada, Japan, Austria, France, Germany, Italy, the Netherlands, Switzerland, the United Kingdom, Finland, Australia, South Africa, Korea, Belgium, Denmark, Norway, Sweden, Greece, Ireland, Portugal, Spain, New Zealand, Saudi Arabia, Venezuela, Colombia, Jordan, Syria, India, Malaysia, Pakistan, the Philippines, Thailand, China, Argentina, Brazil, Chile, Mexico, and Peru.

<sup>6</sup>The 20 other countries that fill out the trade share matrix are Turkey, Poland, Russia, Ukraine, Egypt, Israel, Kenya, Bangladesh, Hong Kong, Singapore, Vietnam, Nigeria, Algeria, Indonesia, Iran, Iraq, Kuwait, Libya, the United Arab Emirates, and an all other category.

to the rest of the MC model, and the estimation periods were extended whenever possible. The model can be used on the website, where all the results in Section 5 can be replicated. The model can also be downloaded to one's own computer, and if this is done, all the coefficient estimates, including the trade-share coefficient estimates, can be replicated.<sup>7</sup>

The MC model has been extensively tested, including tests for rational expectations, and it appears to be a good approximation of the economy. These tests and the general case for the model and the methodology used in its specification is in Fair (2004b), and this discussion is not repeated here. The following is a brief outline of the estimated equations of the US model, which are examined in Sections 3 and 4.

### The U.S. Stochastic Equations

The household-sector and firm-sector equations are specified under the assumption that households maximize utility and firms maximize profits. The theory is used to guide the choice of explanatory variables. Lagged dependent variables are used to pick up expectational and lagged adjustment effects. The explanatory variables in the four household expenditure equations (service, nondurable, and durable consumption and housing investment) include after-tax income, lagged wealth, and interest rates. They also include variables to pick up age distribution effects. The consumer durables equation includes the lagged stock of durable goods, and the housing investment equation includes the lagged stock of housing. The explanatory variables in the four household labor supply equations (labor force of males 25-54, females 25-54, all others 16+, and moonlighters) include the real wage, a variable to pick up discouraged worker effects, and lagged wealth. As noted in the Introduction, wealth has a negative effect on labor supply.

The nonresidential fixed investment equation has two cost of capital variables. One is an estimate of the real AAA bond rate, and the other is a function of stock price changes. It is through the second variable that stock prices affect investment.

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<sup>7</sup>All the data are downloaded with the model. In terms of the variables in the model and the above figures, real GDP is  $GDP_R$ , employment is  $JF + JG + JM + JS$ , the unemployment rate is  $UR$ , the GDP deflator is  $GDP_D$ , the ratio of federal personal income taxes to taxable income is  $THG/YT$ , the ratio of federal corporate profit taxes to corporate taxes is  $D2G$ , the ratio of real federal purchases of goods to potential real output is  $COG/Y_S$ , the three-month Treasury bill rate is  $RS$ , the ratio of the federal government surplus to GDP is  $SGP/GDP$ , the ratio of the U.S. current account to GDP is  $-SR/GDP$ , the ratio of real household wealth to potential real output is  $AA/Y_S$ , and the ratio of U.S. real exports to potential real output is  $EX/Y_S$ . The data for Figure 13 are monthly data and were taken from the Yahoo website.

This equation also includes output variables. The explanatory variables in the inventory investment equation include sales and the lagged stock of inventories. The explanatory variables in the demand for workers and demand for hours per worker equations include output and the amount of excess labor on hand. There are price and wage equations, where the price equation includes as explanatory variables the wage rate, the price of imports, and the unemployment rate, and the wage equation includes the price level and a productivity term.

There is a demand for money equation for the household sector, one for the firm sector, and a demand for currency equation. The explanatory variables in each of these equations include a transaction variable and an interest rate. There is a stock price equation where the value of capital gains or losses on stocks held by the household sector depends on the change in earnings and the change in the bond rate.

There is an estimated interest rate rule of the Fed, where the explanatory variables include the rate of inflation, the unemployment rate, and the lagged growth of the money supply. The AAA bond rate and a mortgage rate are explained by term structure equations, where the explanatory variables are current and lagged values of the short term interest rate.

The demand for imports depends on a domestic activity variable and the ratio of the domestic price level to the import price level. The remaining equations explain overtime hours, dividends, interest payments of the firm sector, interest payments of the federal government sector, inventory valuation adjustment, depreciation for the firm sector, bank borrowing from the Fed, and unemployment benefits.

### **Some Properties of the Model**

Some of the effects in the model that are relevant for the experiments in Section 5 are the following. All variables are U.S. variables unless otherwise stated. Also, the following discussion focuses only on primary effects; there are many secondary effects.

Personal income tax cuts increase disposable personal income,  $YD$ , which is an explanatory variable in the consumption and housing investment equations. Tax cuts thus increase demand. There are no income distribution effects in the model:  $YD$  is increased by the amount of any tax decrease regardless of whose taxes are decreased. This will be discussed further in Section 4. Personal income tax cuts also increase the aggregate after-tax wage, which is an explanatory variable in the labor supply equations. An increase in the after-tax wage increases labor supply.

An increase in government purchases of goods increases firms' sales, which

leads to an increase in production and then employment and investment. This is a straightforward increase in demand. The same is true for an increase in exports.

A fall in interest rates increases consumption and investment: interest rates appear as explanatory variables in the consumption and investment equations. A decrease in U.S. interest rates relative to other countries' interest rates leads to a depreciation of the dollar, which is expansionary in the United States through an increase in exports and a decrease in imports.

An increase in stock prices increases household wealth and lowers firms' cost of capital. An increase in household wealth increases consumption since wealth is an explanatory variable in the consumption equations. A fall in the cost of capital increases plant and equipment investment since the cost of capital is an explanatory variable in the plant and equipment investment equation. Also, as noted in the Introduction, an increase in household wealth has a negative effect on labor supply.

One other feature of the model that needs to be discussed is the effect on the economy of a decrease in the federal corporate profit tax rate, denoted  $D2G$ , which is plotted in Figure 6. When  $D2G$  falls, after-tax corporate profits increase, which in turn in the model has a positive effect on dividends (and thus household income) and stock prices (and thus household wealth). The increase in stock prices also lowers the cost of capital, which has a positive effect on firms' investment. While these effects are, as expected, expansionary, they are initially quite small in the model because the effects on both dividends and stock prices are small. A decrease in  $D2G$  has very little short run effect on real GDP. The model thus says that decreasing  $D2G$  is not an effective way to stimulate the economy; the main effect is just an increase in the federal government deficit. The model may or may not be a good approximation in this regard, but at least for present purposes it makes experiments changing  $D2G$  uninteresting. Therefore, no  $D2G$  experiments are performed. If one believes the model, the main effect of the fall of  $D2G$  in Figure 6 in the post boom period was simply to increase the federal government deficit.

### **3 End-of-Sample Stability Tests**

The first test in this paper is to see if there were structural changes in the post boom period. The hypothesis tested is that the coefficients in each of the 30 U.S. stochastic equations are the same both before and after 2000:4. The method in Andrews (2003) is used for the tests. The exact version of the test used here is

discussed in Fair (2004b), pp. 11–12, and this discussion will not be repeated.<sup>8</sup> The method requires estimation over different subsets of the overall sample period.<sup>9</sup> The test produces a p-value for each equation tested. A p-value of, say, less than .05 is a rejection of the hypothesis of stability at the 95 percent confidence level.

The results for the 30 equations are presented in Table 1. There are five rejections of the hypothesis of stability at the 95 percent confidence level. The first, and most important, is for durable consumption, equation 3. In 2001:4, the first quarter after 9/11, there was a huge increase in durable consumption, due in large part to the introduction of zero percent financing for cars, and, as will be seen in the next section, the equation substantially underpredicted durable consumption in this period. This was enough to lead to a rejection of the stability hypothesis. More will be said about this in the next section.

Three of the other four rejections are for minor equations in the model: 9) the demand for money of the household sector, 21) depreciation, and 28) unemployment benefits. The demand for money equations are not important in the model because the short-term interest rate is determined by the Fed interest rate rule. The depreciation and unemployment benefits rejections are due to legislative changes not accounted for in the equations.

The other rejection is for equation 25, which explains capital gains or losses on corporate stocks held by the household sector, denoted  $CG$ . In this equation  $CG$  depends on the change in after-tax profits and the change in the bond rate, although very little of the variance is explained. Not surprisingly, the change in stock prices is essentially unpredictable. Neither of the explanatory variables in this equation has values in the 1990s and early 2000s that would predict the huge increase in stock prices in the last half of the 1990s and the huge decrease beginning in 2000. For the experiments in Section 5, equation 25 has been dropped and  $CG$  has been taken to be exogenous.

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<sup>8</sup>One is never sure about the power of these kinds of tests, although the results in Andrews (2003) suggests that the test has good power properties. Also, as discussed in the next paragraph, one bad residual is enough to lead to a rejection of the stability hypothesis.

<sup>9</sup>Dummy variables appear in a few of the U.S. stochastic equations. These variables take on a value of 1.0 during certain quarters and 0.0 otherwise. For example, there are four dummy variables in the U.S. import equation that are, respectively, 1.0 in 1969:1, 1969:2, 1971:4, and 1972:1 and 0.0 otherwise. These are meant to pick up effects of two dock strikes. A dummy variable coefficient obviously cannot be estimated for sample periods in which the dummy variable is always zero. This rules out the use of the end-of-sample test if some of the sample periods that are used in the test have all zero values for at least one dummy variable. To get around this problem when performing the test, all dummy variable coefficients were taken to be fixed and equal to their estimates based on the entire sample period.

**Table 1**  
**End of Sample Stability Test Results**  
**for the 30 U.S. Equations**

Eq.	Dependent Variable	p-value
1	Service consumption	.948
2	Nondurable consumption	.645
3	Durable consumption	.000
4	Housing investment	.738
5	Labor force, men 25-54	.645
6	Labor force, women 25-54	.657
7	Labor force, all others 16+	.750
8	Moonlighters	.913
9	Demand for money, h	.017
10	Price level	.924
11	Inventory investment	.866
12	Nonresidential fixed investment	.145
13	Workers	.628
14	Hours per worker	1.000
15	Overtime hours	.939
16	Wage rate	.826
17	Demand for money, f	.477
18	Dividends	.140
19	Interest payments, f	.140
20	Inventory valuation adjustment	.087
21	Depreciation, f	.017
22	Bank borrowing from the Fed	1.000
23	AAA bond rate	.227
24	Mortgage rate	.384
25	Capital gains or losses	.023
26	Demand for currency	.785
27	Imports	.709
28	Unemployment benefits	.000
29	Interest payments, g	.384
30	Fed interest rate rule	.436

- h = household sector, f = firm sector, g = federal government sector.
- Overall sample period: 1954:1–2004:3 except 1956:1–2004:3 for equation 15.
- Break point tested: 2000:4.
- Estimation technique: 2SLS.

Overall, the results in Table 1 are supportive of the view that there were no major structural changes in the post boom period. The equations for which the stability hypothesis is not rejected include all the aggregate demand equations (consumption, investment, imports) except for the durable consumption equation, the price and wage equations, the labor supply and labor demand equations, and the estimated interest rate rule of the Fed.

## 4 Examination of Residuals

If there were large negative demand shocks in the post boom period, one would expect the estimated residuals from the demand equations to show this. This is examined in two ways in this section. The first is simply to look at the large residuals from the demand equations. Table 2 presents these residuals for seven demand equations—three consumption equations, three investment equations, and the import equation. For each equation the residuals in the post boom period were divided by the estimated standard error of the equation, and values greater than or equal to 0.75 in absolute value were chosen for Table 2. A value in Table 2 is the actual value minus the predicted value divided by the estimated standard error of the equation. For imports the sign is reversed because a positive residual is a negative domestic demand shock. If no number is presented, the ratio was less than 0.75 in absolute value.

If there were large negative demand shocks, Table 2 should show many negative values. This is not the case. The largest absolute value is 4.7 percent for 2001:4 for durable consumption, which, as noted in the previous section, is primarily the huge response to zero percent financing for cars, which is not explained by the equation. So this shock is in the wrong direction. The worst quarter for negative shocks is 2001:1, where the three values presented are negative and the value for plant and equipment investment is large in absolute value at -3.3 percent. Otherwise, there are no systematic patterns. The next largest absolute value is -2.3 percent for durable consumption in 2002:1.

Table 2 examines only fairly large shocks. It could be that there are a series of smaller (negative) shocks that cumulate over time to large negative effects. To test for this, the residuals in the seven equations were set to zero for the post boom period and the MC model was solved. All the other residuals were set to their estimated values for this solution. For a given endogenous variable and quarter, the difference between the actual value and the solution value is an estimate of the effect of the residual change on the variable. (If the model is solved using

**Table 2**  
**Large Absolute-Value Residuals**  
**100(Actual - Predicted)/Standard Error**

	Equation						
	1	2	3	4	12	11	27
2000:4	1.1		-1.4		0.8		
2001:1		-1.1			-3.3	-1.3	
2001:2		-0.9	-0.9		-1.0		-1.0
2001:3	-1.4		-1.6	-1.7	0.9	-1.0	-1.1
2001:4		0.9	4.7		-1.1	-1.9	-1.2
2002:1			-2.3		0.8		
2002:2		-1.0			-0.8		0.9
2002:3		-1.3	1.6				
2002:4		1.2					
2003:1		0.8	-1.1				
2003:2			1.9		1.3		
2003:3	-1.0	1.1	1.4				-1.1
2003:4				1.0		-1.0	
2004:1		1.0	-1.0		-1.0		
2004:2		-1.2	-1.4	1.7			
2004:3			1.7	0.9			

Equation 1: Service consumption  
 Equation 2: Nondurable consumption  
 Equation 3: Durable consumption  
 Equation 4: Housing investment  
 Equation 12: Nonresidential fixed investment  
 Equation 11: Inventory investment  
 Equation 27: –Imports

estimated values for all the residuals, the solution values are just the actual values—a perfect tracking solution.) Table 3 shows the actual and solution values for real GDP and the unemployment rate. If this period were dominated by negative shocks, the actual values of real GDP, which are based on the actual demand shocks, should be smaller than the solution values, where are based on zero demand shocks. Similarly, the actual values of the unemployment rate should be greater than the solution values. The results in Table 3 show no clear pattern. In fact, the actual real GDP values are slightly larger than the solution values at the end of the period and the actual unemployment rate values are slightly smaller.

Tables 2 and 3 thus say that conditional on the equations being good approximations, the post boom period does not appear to be one of unusually bad shocks. Demand shocks do not appear to explain the sluggishness of the post boom period.

**Table 3**  
**Estimated Effects of No Demand Shocks**

	Real GDP			Unemployment Rate		
	Actual	Solution	% Diff.	Actual	Solution	Diff.
2000:4	9887.8	9863.5	0.25	3.92	3.98	-0.06
2001:1	9875.6	9937.6	-0.63	4.22	4.10	0.12
2001:2	9905.9	9941.9	-0.36	4.41	4.26	0.15
2001:3	9871.1	9926.0	-0.56	4.82	4.61	0.21
2001:4	9910.0	9914.6	-0.05	5.55	5.43	0.12
2002:1	9993.5	9955.6	0.38	5.68	5.72	-0.04
2002:2	10052.6	10043.5	0.09	5.84	5.89	-0.05
2002:3	10117.3	10115.5	0.02	5.74	5.78	-0.04
2002:4	10135.9	10162.5	-0.26	5.88	5.84	0.04
2003:1	10184.4	10214.1	-0.29	5.83	5.75	0.08
2003:2	10287.4	10276.7	0.10	6.14	6.12	0.02
2003:3	10472.8	10377.1	0.91	6.12	6.35	-0.23
2003:4	10580.7	10512.5	0.64	5.86	6.16	-0.30
2004:1	10697.5	10650.2	0.44	5.64	5.92	-0.28
2004:2	10784.7	10758.2	0.25	5.58	5.80	-0.22
2004:3	10883.4	10846.5	0.34	5.47	5.67	-0.20

**Notes:** Solution based on zero values for the residuals in equations 1, 2, 3, 4, 11, 12, and 27 and actual values for the other residuals.

There is one further interesting point from Table 2. Remember that the income variable in the consumption and housing investment equations is aggregate disposable income,  $YD$ . This is an aggregate variable, and it is not affected by income distribution changes. There was much talk in the 2004 presidential election campaign and earlier about the ineffectiveness of the tax cuts passed during the Bush administration because so much of the tax savings went to very high income people.<sup>10</sup> A test of this ineffectiveness hypothesis is to examine the residuals from the first four equations in Table 2. Under this hypothesis there should be many negative residuals: the consumption and housing investment equations should overpredict demand because they are treating all of the tax savings flowing into  $YD$  the same. If the people receiving most of the tax savings spend less of their income than others, then the equations, which treat all income the same, should overpredict spending. Since Table 2 does not show a preponderance of large negative residuals, the results do not support the ineffectiveness hypothesis. This test, of course, relies only on aggregate data and may have low power, but the

<sup>10</sup>Zandi (2004) argues that the tax cuts would have been more effective had they been aimed less at high income people. Weller, Bivens, and Sawicky (2004), p. 59, also make this point.

results at least suggest that the income distribution effects on aggregate demand from the tax cuts may be small.<sup>11</sup>

## 5 Counterfactual Experiments: 2000:4–2004:3

Seven experiments using the MC model are reported in this section. As noted in Section 1, they are designed to estimate quantitative effects. In each experiment one or more exogenous variables are changed for the 2000:4–2004:3 period and the effects of these changes are analyzed. The experiments can be duplicated on the author's website. The estimated residuals are first added to all the stochastic equations. This means that when the model is solved using the actual values of all the exogenous variables, a perfect tracking solution is obtained. The actual values are thus the base values. Unless otherwise noted, the variables discussed below are U.S. variables.

In the regular version of the model monetary policy is endogenous: the short-term interest rate,  $RS$ , is determined by the estimated Fed interest rate rule, equation 30. For the experiments in this section, equation 30 is dropped.  $RS$  is taken to be exogenous, and its values are either taken to be the actual values or particular values chosen for the experiment. Similarly, the capital gains equation determining  $CG$ , equation 25, is dropped.  $CG$  is taken to be exogenous, and its values are either taken to be the actual values or particular values chosen for the experiment.

It should be stressed that the experiments in this section are meant to answer “what if” questions. For example, the first experiment asks what would have happened had personal income tax rates not been lowered and  $RS$  and  $CG$  not been changed from their historical values. In practice, of course, had tax rates been lowered the Fed would have behaved differently (by following equation 30 according to the model). Also,  $CG$  would have changed. But the interest here is to examine effects conditional on  $RS$  and  $CG$  being exogenous.

The first experiment concerns personal income tax rates. Figure 5 plots the ratio of federal personal income taxes to taxable income. In the model this ratio is endogenous because the tax system is progressive. The exogenous tax-rate variable in the model is denoted  $D1G$ . For the first experiment  $D1G$  was taken to be unchanged from its actual value in 2000:3. In Figure 5 this is roughly equivalent to taking the ratio to be the horizontal dotted line. After this change, the model is solved. The difference between the solution value and the actual value for each

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<sup>11</sup>Note that this is just an argument about aggregate demand effects. It is not an argument in favor of the particular tax legislation that was passed.

endogenous variable for each quarter is the effect of the  $D1G$  change. The solution values will be called values in the “no tax cuts” case.

Figure 14 plots results for six variables: the four-quarter percentage change in real GDP, the log of employment, the unemployment rate, the four-quarter change in the GDP deflator, the ratio of the federal government budget surplus to GDP, and the ratio of the U.S. current account to GDP. Table 4 presents results for the last quarter, 2004:3. In the no tax cuts case employment is 2.2 percent lower by 2004:3, the unemployment rate is 1.0 percentage points higher, and the government budget has improved by 2.6 percent of GDP.

For the second experiment real federal government purchases of goods was taken to be 2.97 percent of potential real output, which is the actual percent in 2000:3. This case will be called the “no G increase” case.<sup>12</sup> Figure 7 shows a plot of this assumption. Figure 15 and Table 4 present results. In this case employment is 1.2 percent lower by 2004:3, the unemployment rate is 0.6 percentage points higher, and the government budget has improved by 0.4 percent of GDP.

For the third experiment the short-term interest rate,  $RS$ , was kept unchanged from its 2000:3 value, as shown in Figure 8. In this case there is no easing by the Fed; it will be called the “no  $RS$  decrease” case. Figure 16 and Table 4 present results. In this case employment is 2.2 percent lower by 2004:3, the unemployment rate is 1.1 percentage points higher, and the government budget has worsened by 1.6 percent of GDP. The government budget worsens because of lower tax revenue due to the fall in taxable income and because of higher government interest payments due to the higher interest rates.

The fourth experiment is a combination of the first three. It will be called the “no stimulus” case. Figure 17 and Table 4 present results. As noted in the Introduction, the results across the first three experiments are roughly additive, which can be seen in Table 4. In the no stimulus case employment is 5.6 percent lower by 2004:3, the unemployment rate is 2.9 percentage points higher, and the government budget has improved by 1.5 percent of GDP.

The results so far show the quantitative effects of the fiscal and monetary policy stimulus. As would be expected from looking at the size of the changes in the policy variables in Figures 5, 7, and 8, the quantitative effects on the economy are estimated to be quite large. Had there been no stimulus the economy would have been much worse.

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<sup>12</sup>There is, of course, some increase in government purchases of goods because potential output is increasing.

**Table 4**  
**Predicted minus Base for 2004:3**  
**(percentage points)**

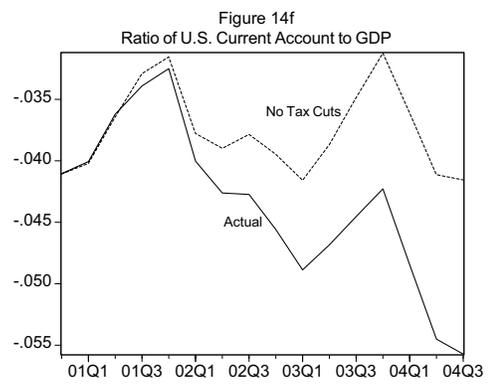
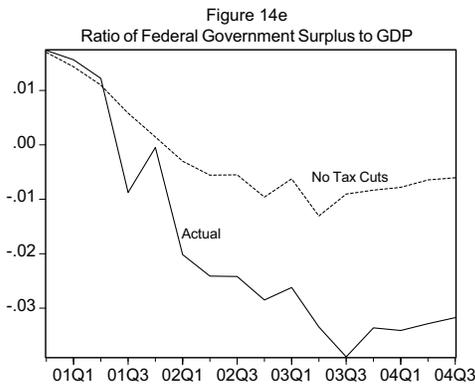
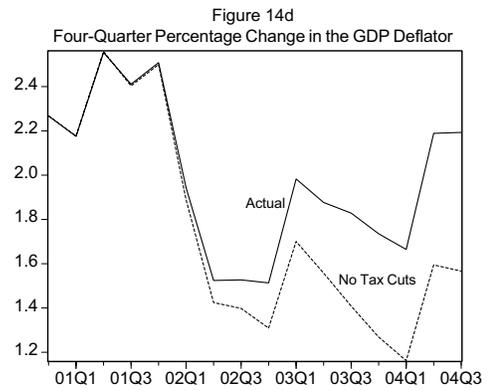
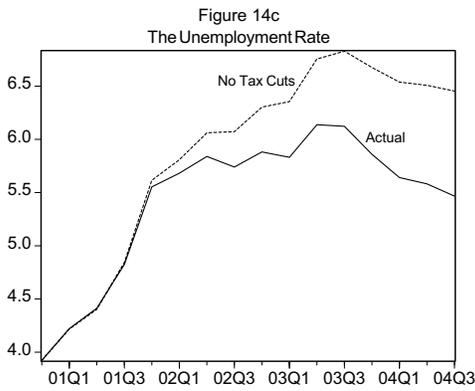
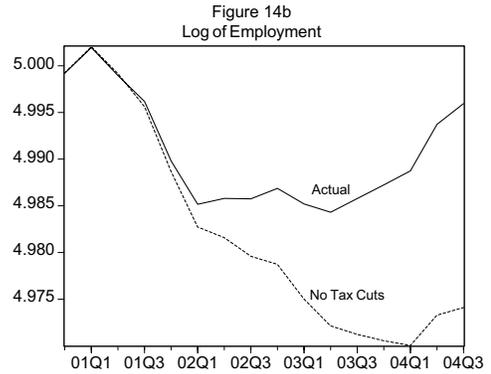
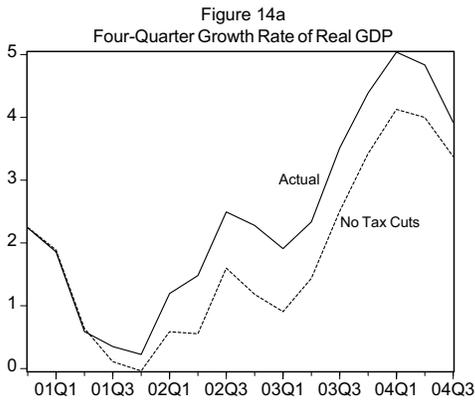
Experiment	Employment		Unemployment Rate		Fed. Gov. Surplus	
1. No Tax Cuts	-2.2		1.0		2.6	
2. No G Increase	-1.2		0.6		0.4	
3. No RS Decrease	-2.2		1.1		-1.6	
4. 1 + 2 + 3	-5.6		2.9		1.5	
		5 or 6 or 7 minus 4		5 or 6 or 7 minus 4		5 or 6 or 7 minus 4
5. 4 + no stock market fall	-4.2	1.4	1.3	-1.6	2.2	0.7
6. 4 + no export decrease	-2.9	2.7	1.7	-1.2	2.6	1.1
7. 5 + 6	-1.6	4.0	0.3	-2.6	3.3	1.8

The fifth experiment estimates the effects on the economy from the fall in stock prices. So far *CG*, the capital gains or losses on financial assets held by the household sector, has been taken to be exogenous. *CG*, which is from the U.S. Flow of Funds Accounts, is a good measure of the effects of stock price changes on the household sector. The sum of *CG* between 1995:1 and 2000:3, the period of the stock market boom, was \$13.557 trillion, an average of \$589 billion per quarter. Then between 2000:4 and 2002:3 the sum was -\$6.958 trillion, an average of -\$870 billion per quarter. So more than half of the gain during the boom was lost in this eight-quarter period. From 2002:4 on the stock market picked up, and the sum of *CG* between 2002:4 and 2004:3 was \$4.501 trillion, an average of \$563 billion per quarter.

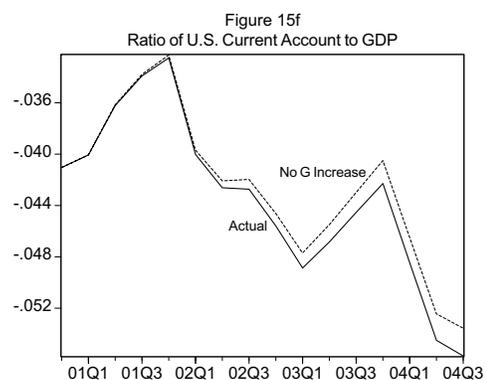
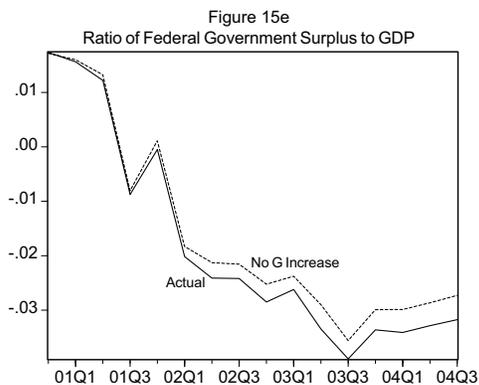
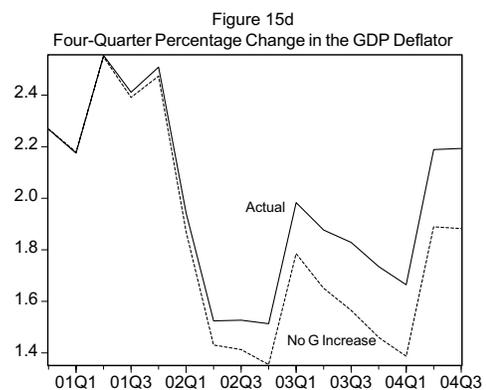
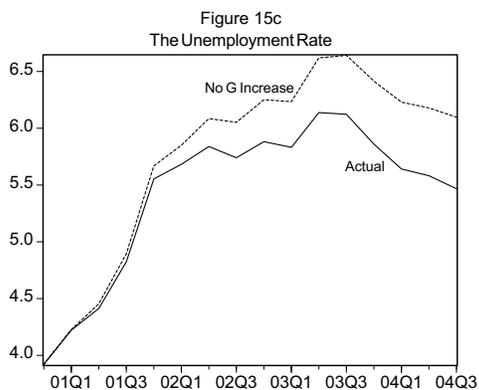
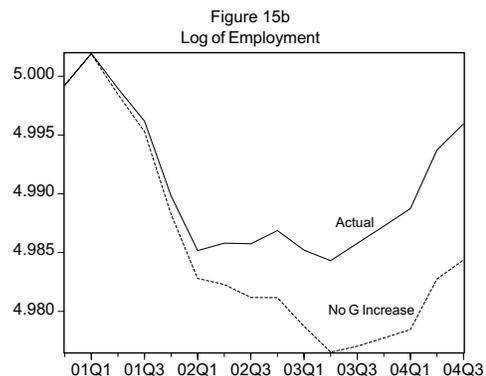
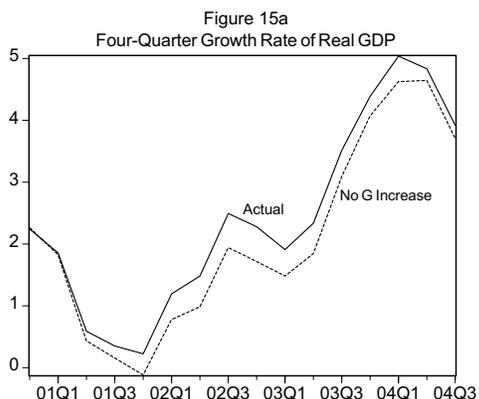
The ratio of *CG* to nominal GDP averaged 0.118 between 1954:1 and 1994:4. Between 1980:1 and 1994:4 the average was essentially the same, 0.117. For the fifth experiment the ratio of *CG* to nominal GDP was taken to be 0.118 in each quarter between 2000:4 and 2004:3. In other words, the stock market from 2000:4 on was taken to behave as it had on average from 1994:4 back. In this experiment there is no stock market “correction,” just historically average behavior going forward.

The fifth experiment combines the *CG* changes and the no stimulus changes. If only the *CG* changes were used (with policy taken as it actually happened), the economy would be driven to values of the unemployment rate below historical experience. Macroeconometric models like the MC model are not necessarily reliable when pushed beyond the range of the historical data, and it is best to avoid doing this whenever possible. In the present case this can be done by combining the *CG* changes with the no stimulus changes.

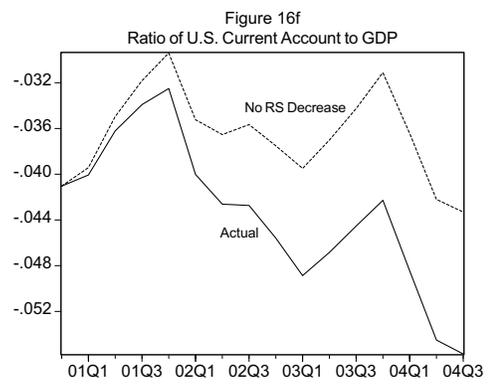
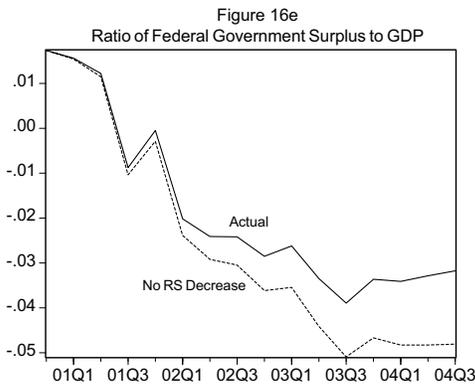
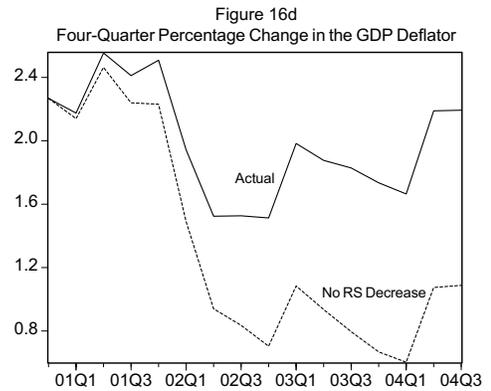
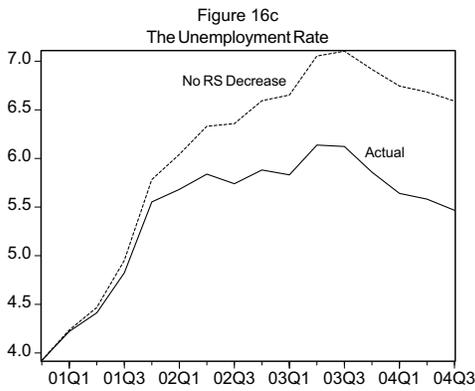
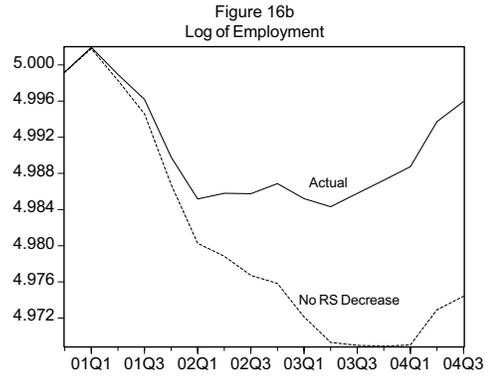
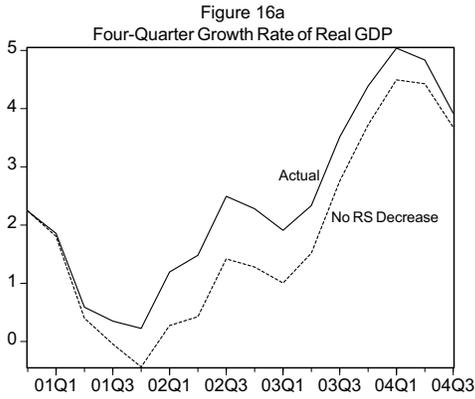
**Figure 14**  
**Experiment 1: Plots for 2000:4-2004:3**  
 Fair: Policy Effects in the Post Boom U.S. Economy



**Figure 15**  
**Experiment 2: Plots for 2000:4-2004:3**  
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**Figure 16**  
**Experiment 3: Plots for 2000:4-2004:3**  
 Fair: Policy Effects in the Post Boom U.S. Economy



**Figure 17**  
**Experiment 4: Plots for 2000:4-2004:3**  
*Topics in Macroeconomics*, Vol. 5 [2005], Iss. 1, Art. 19

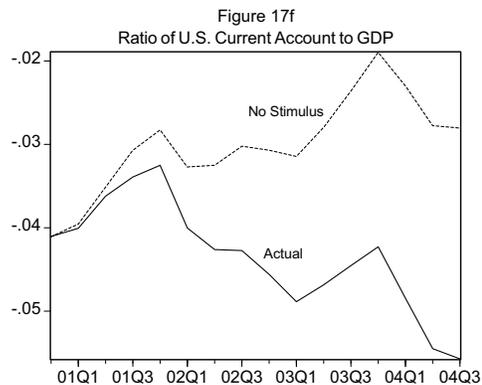
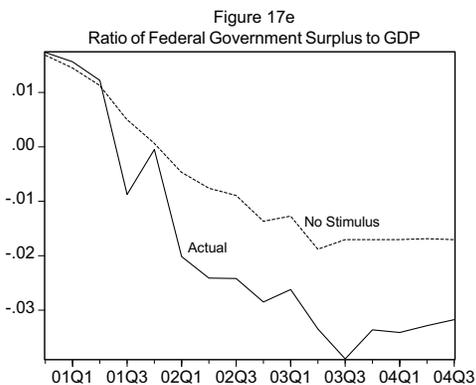
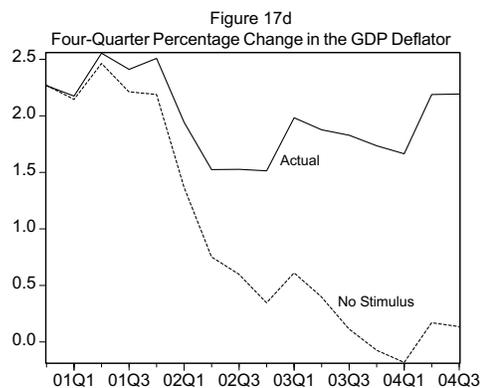
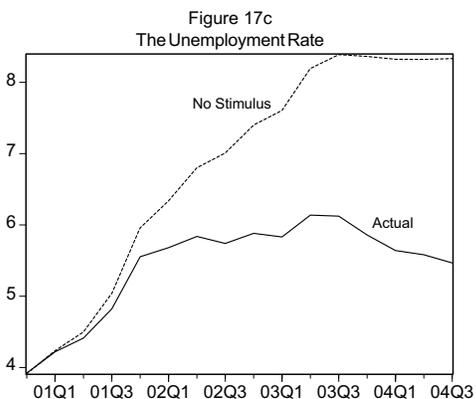
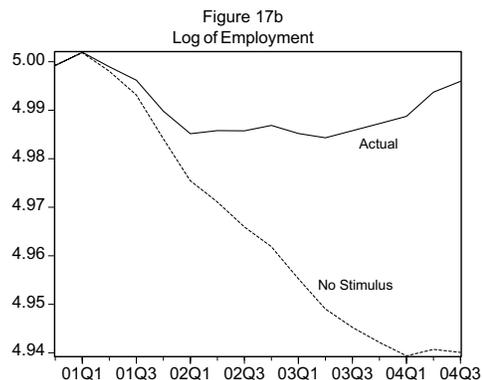
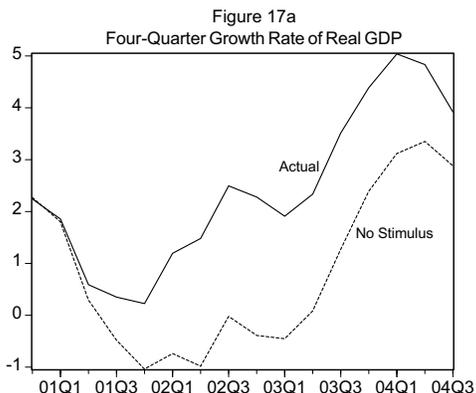


Figure 18 and Table 4 present results for the fifth experiment. Table 4 shows that in this case employment is 4.2 percent lower in 2004:3, which compares to 5.6 percent lower in experiment 4 using the actual stock market decrease. The fall in the stock market is thus estimated to have led employment to be 1.4 (= 5.6 - 4.2) percent lower than otherwise. Also, the fall is estimated to have led the unemployment rate to be 1.6 percentage points higher and the government budget to worsen by 0.7 percent of GDP.

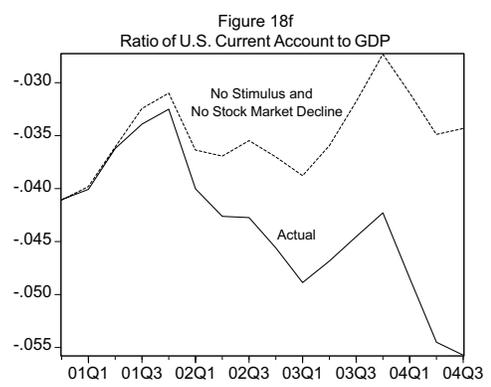
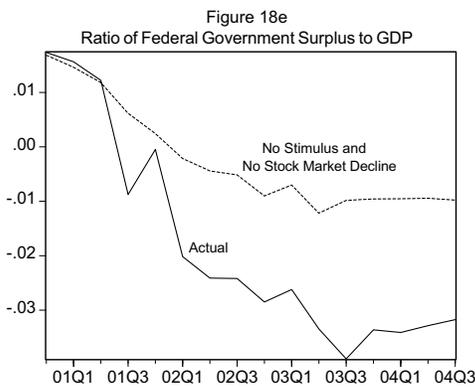
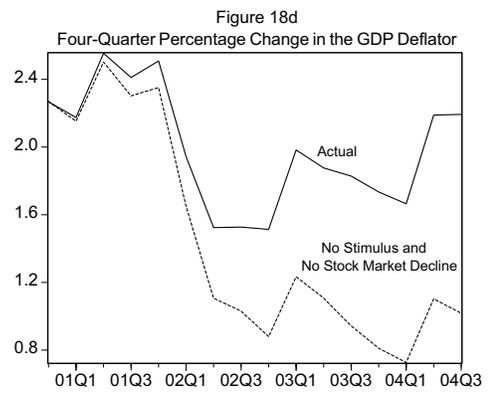
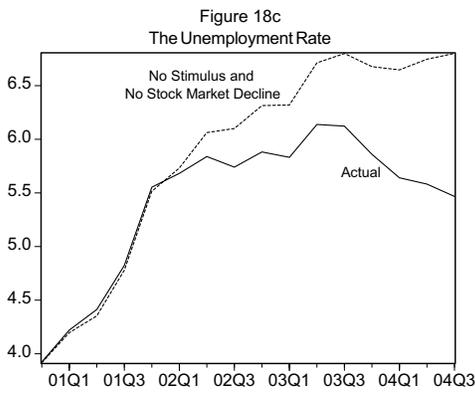
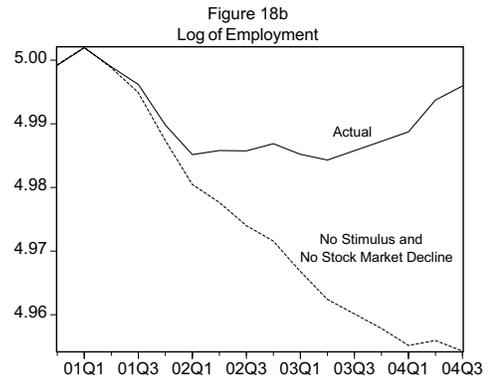
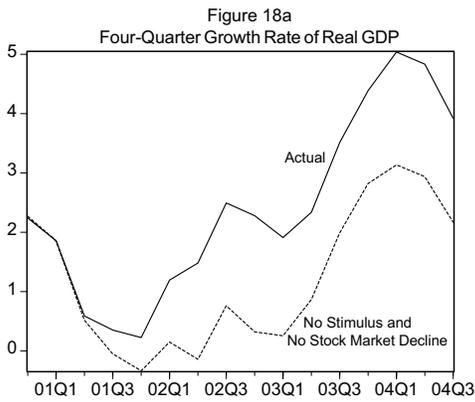
The sixth experiment estimates the effects on the economy from the fall in U.S. exports. This experiment is more complicated to perform because U.S. exports,  $EX$ , is endogenous.  $EX$  is determined by the other countries' import demands for U.S. goods and services, which are endogenous in the MC model. To perform this experiment the import demands from Canada, Japan, France, Germany, Italy, and the United Kingdom were taken to be exogenous and imports for these countries were raised to correspond to an increase in  $EX$  such that the ratio of  $EX$  to potential real output was equal to its value in 2000:3, as shown in Figure 12. In other words, demand from these six countries was exogenously increased to correspond to the desired increase in  $EX$ .

The sixth experiment combines the  $EX$  changes and the no stimulus changes. Figure 19 and Table 4 present results. In this case employment is 2.9 percent lower in 2004:3, which compares to 5.6 percent lower in experiment 4 using the actual export values. The fall in exports is thus estimated to have led employment to be 2.7 percent lower than otherwise. Also, the fall is estimated to have led the unemployment rate to be 1.2 percentage points higher and the government budget to worsen by 1.1 percent of GDP.

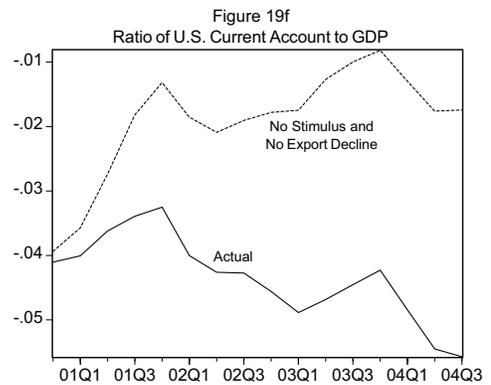
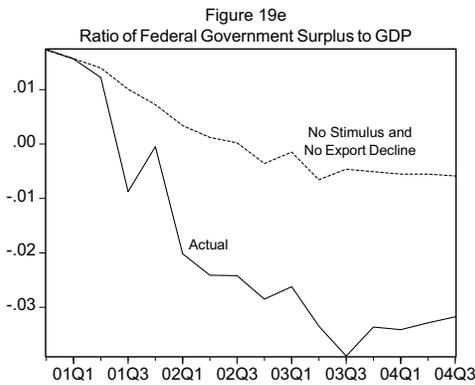
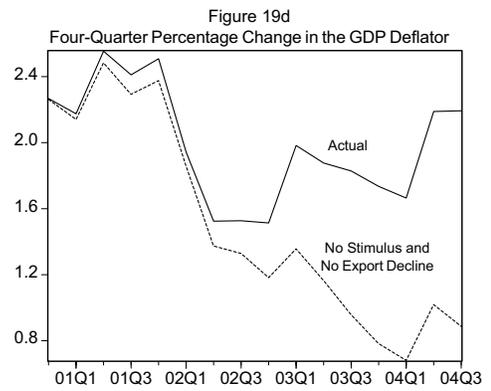
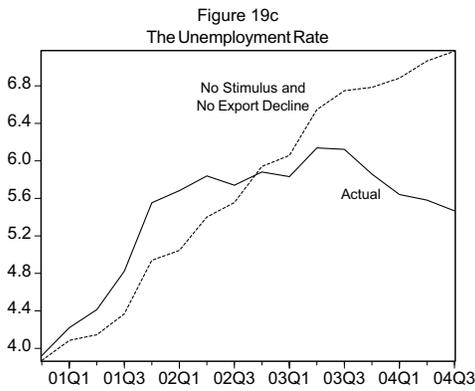
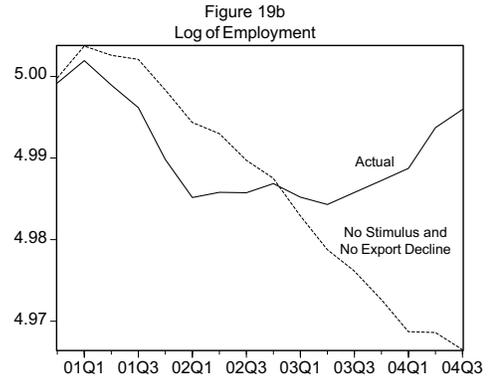
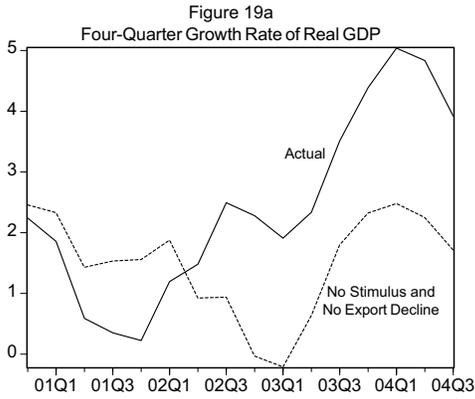
The seventh experiment is a combination of five and six. Figure 20 and Table 4 present results. Again, the results are roughly additive, which can be seen in Table 4. In this case of no stimulus, no decrease in the stock market, and no decrease in exports, employment is 1.6 percent lower by 2004:3, the unemployment rate is 0.3 percentage points higher, and the government budget has improved by 3.3 percent of GDP.

A useful way to summarize the overall results is to compare Figures 17c and 20c. Figure 17c shows that had there been no policy stimulus the unemployment rate would have risen to a little over 8 percent by 2003:2, whereas the actual rate was about 6 percent. Figure 20c shows that had there been no policy stimulus and also no stock market and export decline, the unemployment rate would have only gradually risen and would have remained below the actual rate until the last quarter, 2004:3. Some policy stimulus would have been needed to keep the unemployment rate from rising, but much less than actually occurred. Figure 20e is also

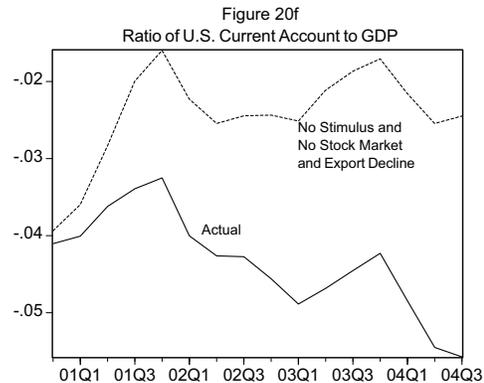
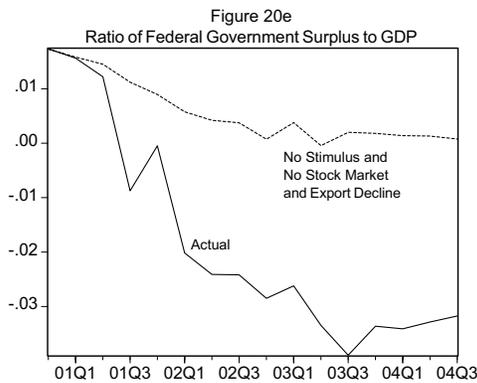
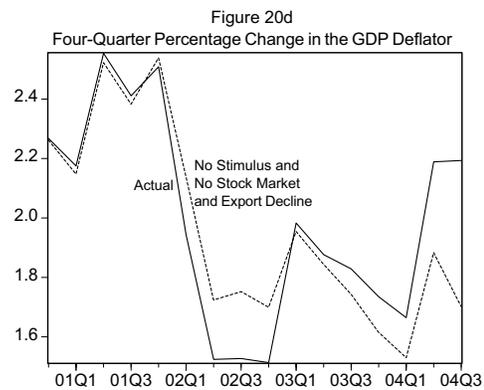
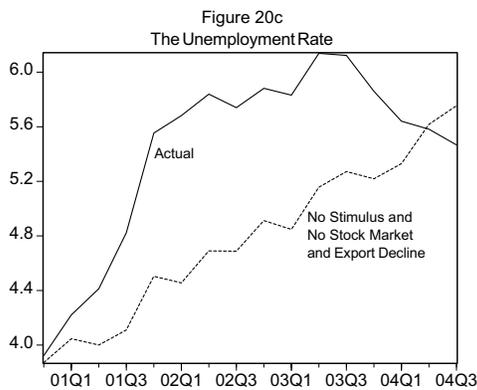
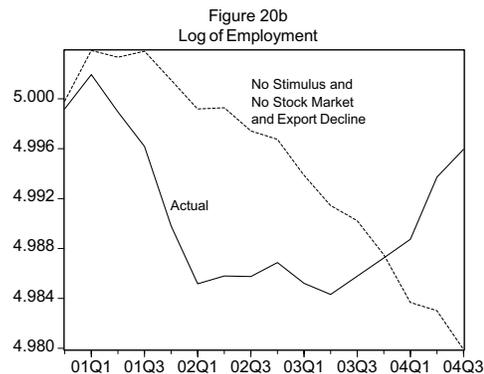
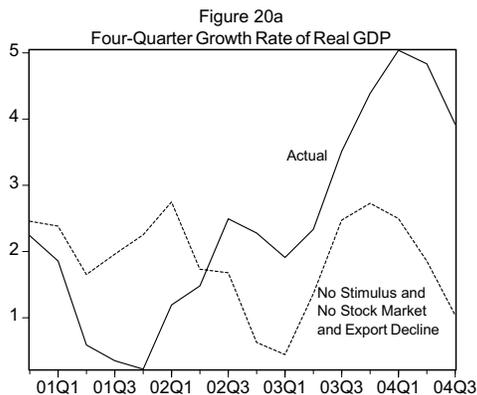
**Figure 18**  
**Experiment 5: Plots for 2000:4-2004:3**  
*Topics in Macroeconomics*, Vol. 5 [2005], Iss. 1, Art. 19



**Figure 19**  
**Experiment 6: Plots for 2000:4-2004:3**  
 Fair: Policy Effects in the Post Boom U.S. Economy



**Figure 20**  
**Experiment 7: Plots for 2000:4-2004:3**  
*Topics in Macroeconomics*, Vol. 5 [2005], Iss. 1, Art. 19



interesting in showing that the federal government budget would have been in surplus or roughly balanced over this period had there been no policy stimulus and no stock market and export decline.

## 6 Conclusion

The answer in this paper to the question posed in the Introduction, namely why the U.S. economy in the 2000:4–2004:3 period was fairly sluggish in light of the large expansionary fiscal and monetary policies, is that there were large negative effects from the decline in the stock market and exports. The answer is not that there were large structural changes in the economy or systematic bad shocks, since none were found. There is also no evidence that the tax cuts were less stimulative than they otherwise would have been because of after-tax income distribution effects.

The analysis in this paper has taken the decline in the stock market and exports to be exogenous. Whatever led to household wealth falling by \$6.958 trillion between 2000:4 and 2002:3 is not explained.<sup>13</sup> The decline in U.S. exports is also not explained. It is interesting, as noted in the Introduction, that the timing of the decline in exports matches closely the timing of the stock market decline. Between 2000:4 and 2002:1, U.S. exports of goods and services declined \$120.4 billion in real terms (2000 dollars). Of this, \$79.6 billion was in exports of capital goods, except automotive, and \$12.0 billion was in durable industrial supplies and materials. The decline in travel (mostly foreign tourism in the United States) was \$15.8 billion. The events of 9/11 undoubtedly contributed to this decline in travel, although travel was not the main source of the overall decline in exports. Much of the overall decline would appear to be a decrease in capital investment abroad, and this decrease could have been affected by the generally worldwide decline in stock prices.<sup>14</sup> If much of the decrease in capital investment was due to the decline in stock prices, then the decline in stock prices is the main source of the sluggish post boom period. In this case only the stock market decline need be considered

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<sup>13</sup>Productivity grew fairly well in the post boom period, and so the fall in stock prices cannot be blamed on any productivity slowdown.

<sup>14</sup>The effects of the decline in stock prices in other countries on those countries' demand for imports cannot be examined using the MC model because wealth effects from stock price changes are only estimated for the United States. The MC model also does not account for the possible correlation of U.S. exports and imports due to re-exports. For example, if exports are down because re-exports are down, then imports are down, and this correlation is not taken into account. In other words, none of any fall in imports is attributed to a fall in exports. The vulnerability of the economy to trade is thus likely to be at least slightly over stated in the MC model.

to be taken as exogenous.

The results in this paper are similar to those in Fair (2004a) except with the opposite sign. In this earlier paper most of the unusual features of the U.S. economy in the last half of the 1990s were attributed to the huge increase in stock prices. (Remember from Section 5 that the increase in household wealth between 1995:1 and 2000:3 was \$13.557 trillion.) In the present paper much of the unusual features of the economy in the first part of the 2000s are attributed to the huge decrease in stock prices, especially if much of the export decline was a result of the stock market decline.

The main point of these two papers is reflected in Figures 11 and 13. Had the stock market from 1995 on grown at its historically average rate rather than the actual rates in the figures, the MC model says that the economy would have been much different. The wealth effects both going up and going down are estimated to be quite large. No explanation is offered in these two papers as to why the stock market boomed in the last half of the 1990s and fell substantially after that. It seems highly unlikely that an econometrically estimated equation can be found that explains much of this variance. With hindsight, however, it is interesting to speculate whether monetary policy could have stopped the stock market boom in the late 1990s. Although this paper and the earlier one have no answer to this question because the stock market is not explained, the results do show that the quantitative effects of not stopping the boom if it could have been stopped are very large.

## Colophon

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## References

- [1] Andrews, Donald W.K., 2003, "End-of-Sample Instability Tests," *Econometrica*, 71, 1661-1694.
- [2] Council of Economic Advisers, 2005, *Economic Report of the President*. United States Government Printing Office, February.

- [3] Fair, Ray C., 2004a, "Testing for a New Economy in the 1990s," *Business Economics*, 39, 43-53.
- [4] Fair, Ray C., 2004b, *Estimating How the Macroeconomy Works*. Cambridge, MA: Harvard University Press.
- [5] *OECD Economic Outlook*, 2005, May.
- [6] Weller, Christian, Josh Bivens, and Max Sawicky, 2004, "Macro Policy Lessons from the Recent Recession," *Challenge*, 47, 42-72, May-June.
- [7] Zandi, Mark M., 2004, "Assessing President Bush's Fiscal Policies," *The Dismal Scientist*, [www.dismal.com](http://www.dismal.com), July.