A WORLD MACRO SAVING FACT AND AN EXPLANATION

By

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Abstract

The world macro saving fact concerns the total financial saving of the world's private sector divided by world GDP. Relative to changes before 1994, there was a huge fall in this ratio between 1995 and 2000, a huge increase between 2000 and 2003, a huge fall between 2003 and 2006, and a huge increase between 2006 and 2009. This fact is documented in this paper. The paper also shows that the fluctuations in this ratio are highly correlated with fluctuations in world stock and housing prices. It thus appears that much of the variation in the world private saving rate can be explained by forces that affect world asset prices. Changes in these forces are for the most part unpredictable, and so much of the change in the world private saving rate is unpredictable.

1 Introduction

This paper shows that there have been huge fluctuations in the world private saving rate since 1995 relative to the size of prior fluctuations. It also shows that these fluctuations are highly correlated with fluctuations in world stock and housing prices. It thus appears that much of the variation in the world private saving rate

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can be explained by forces that affect world asset prices. Changes in these forces are for the most part unpredictable, and so much of the change in the world private saving rate is unpredictable.

The variable of interest in this paper is as follows. First, a country's current account (S) is its financial saving vis á vis the rest of the world. If its current account is in surplus, there is an increase in its net foreign assets, and conversely if its current account is in deficit. The sum of the current accounts of all countries in world is zero after converting the current accounts to a common currency. The financial saving of a country's government (SG) is total government revenue minus total government expense. If a government's financial saving is positive, there is an increase in the government's net financial assets, and conversely if the government's financial saving is negative. The financial saving of a country's private sector (SP) is $S - SG$. Because the sum of S across all countries is zero after converting to a common currency, the sum of SP is equal to minus the sum of SG after converting each to a common currency. If the sum of SP after converting to a common currency is positive, this means there is a net flow of funds from the world's private sector to the world's government sector, and conversely if the sum is negative.

The world macro saving fact in this paper concerns the sum of SP (in U.S. dollars) divided by world GDP (in U.S. dollars). Call this ratio sp^*. Annual data on sp^* are computed from 1980 through 2009. It will be seen that fluctuations in sp^* between 1980 and 1994 are small relative to those between 1995 and 2009. Relative to changes before 1994, there was a huge fall in sp^* between 1995 and 2000, a huge increase between 2000 and 2003, a huge fall between 2003 and 2006, and a huge increase between 2006 and 2009. This paper documents this fact and

then presents a possible explanation.

The fact concerns *financial* saving—flows of funds among sectors and countries. Financial saving does not distinguish between consumption and investment expenditures. The financial saving of a sector or country is total revenue minus total expenditures, including expenditures that are classified in the national income and product accounts as investment expenditures.[1] In the GDP definition $Y = C + I + G + EX - IM$, where Y is GDP, C is consumption, I is investment, G is government spending, EX is the level of exports, and IM is the level of imports, S as used in this paper is $Y - C - I - G$, namely the country's current account, $EX - IM$. A country's saving, on the other hand, which will be denoted SAV, is $Y - C - G$, so $S = SAV - I$. In this paper SAV will be called "saving," and S, SP, and SG will be called "financial saving."

Much of the literature on saving behavior is concerned with SAV. It is important to realize that a country's current account (S) can be large relative to its GDP even though it has a low saving rate (because I is small). If one is talking about which countries are financing, say, a large U.S. current account deficit, it is not necessarily countries with high saving rates. By definition all current account deficits are financed by current account surpluses (because the sum of S across countries is zero), but this in itself says nothing about which countries have high saving rates and which have low saving rates.

Bernanke (2005) in a well known speech discussed the possibility of a global saving glut in the early 2000s, and econometric studies—for example, Chinn and

[1] The difference between consumption and investment expenditures in national income and product accounts is, of course, somewhat arbitrary. For example, consumer durable expenditures and clothing expenditures have an investment component to them, as do educational expenditures.

Ito (2007) and Gruber and Kamin (2007)—examining this theory followed. In the econometric work current account balances for a number of countries are regressed on a variety of variables. To the extent that the right hand side variables are exogenous, these regressions can be considered reduced form regressions. An issue with this work is that there cannot be a global saving glut regarding current account balances, since they sum to zero across countries. It is thus not clear what to make of the regression results regarding a possible global saving glut. Bernanke's speech is in fact not really concerned with a global saving glut, but with the large U.S. current account deficit. He discusses a number of possible reasons for the large U.S. deficit and for the surpluses of some other countries. None of this discussion requires the concept of a global saving glut.

Obstfeld (2010) focuses on current account deficits and surpluses leading up to the world economic slowdown in 2008-2009—what he calls "current account imbalances." He discusses possible connections between the imbalances and the U.S. financial crisis, and he argues that there is no simple cause and effect story. This paper is not concerned with current account imbalances. Instead, the world is divided into two sectors—private and government—and the financial saving of the world's private sector is examined, not the financial flows among countries.

There is an interesting literature showing that after taking into account capital gains and losses on net foreign assets, the change in a country's net foreign assets can be quite different from the country's current account—see, for example, Gourinchas and Rey (2007) and Obstfeld (2010). The financial flow data used in this paper do not include capital gains and losses, so these valuation issues are not taken into account.

There is finally a literature explaining the private saving of various countries, both across time and across countries—see, for example, Maason, Bayoumi, and Samiei (1998) and Loayza, Schmidt-Hebbel, and Servén (2000). This latter reference provides a good summary of previous work. In this literature the private saving rate is regressed on a number of variables, generally using panel data sets. Again, if the right hand side variables are exogenous, these regressions can be considered reduced form regressions. Government saving is usually one of the right hand side variables, which seems problematic. If, say, there is a negative shock to consumption, thus increasing private saving, this is likely to lead to a fall in output and income, which will lead to a fall in tax revenue and possibly an increase in some kinds of government spending. Government saving will thus fall. Government saving is an endogenous variable, and it is not clear that it should be on the right hand side of an equation explaining private saving. At any rate, this is not an issue in this paper. Total private financial saving in the world is equal to the negative of total government financial saving in the world, and the latter is certainly not a variable explaining the former.

2 The Data

Except for the asset data discussed in Section 4, all the data used in this paper were taken from the IMF International Financial Statistics (IFS). Only annual data were used. The current account for each country in U.S. dollars ($S\$$) was taken to be (from the Balance of Payments section) the sum of 78ald (current account, n.i.e.) and 78bcd (capital account, n.i.e.). The latter variable is minor and

covers net transfers linked to the acquisition of a fixed asset and the net disposal of nonproduced, nonfinancial assets. The sum of these two variables is the balance on the financial account except for net errors and omissions. These variables are in U.S. dollars.

Government financial saving (SG) for each country was taken to be (from the Government Finance section) agob (net operating balance) if data on this variable were available or ccsd (cash surplus/deficit) if data on agob were not available. If the country's fiscal year were not the same as the calendar year, the variable was converted by interpolation to the calendar year under the assumption that the value in each quarter of a fiscal year is one-fourth the value in the fiscal-year. SG is in units of the country's currency, and it was converted to U.S. dollars by dividing by the exchange rate (e): $SG\$ = SG/e$. e is variable rf in the IFS data.

GDP for a country (Y) was taken to be (from the National Accounts section) 99b or 99b.c. If the data were for the country's fiscal year rather than the calendar year, the variable was converted by interpolation to the calendar year under the same assumption mentioned above. Y is in units of the country's currency, and it was converted to U.S. dollars by dividing by e: $Y\$ = Y/e$.

The private financial saving of a country in U.S. dollars is taken to be: $SP\$ = S\$ - SG\$$. The country's private financial saving rate is taken to be: $sp = SP\$/Y\$$. The country's government financial saving rate is taken to be: $sg = SG/Y$ ($= SG\$/Y\$$).

The data are thus constructed from only six IFS variables. Data were collected for every country possible. Prior to 1980 there were many missing observations, and 1980 was taken to be the first year considered. The last year is 2009. In a

few cases there were small gaps of a year or two in the SG data for a country, and in these cases values for SG were constructed by interpolating values of sg and then computing values for SG from the interpolated values for sg and the actual values for Y. Also, in a few cases values for sg at the end of the period were extrapolated using the last available value for sg and then computing SG from the extrapolated values for sg and the actual values for Y. The computed values for SG then allowed values of sp to be computed.

For the 1980-2009 period, there are 23 countries for which observations on sp are available for all years. These are listed in Table 1. For the 1990-2009 period, 19 more countries are added, and for the 2000-2009 period, an additional 28 countries are added. These countries are also listed in Table 1. In each group the countries are listed in the order they appear in the IFS data. What is of interest in this paper is the sum of $SP\$$ across all countries divided by the sum of $Y\$$, denoted sp^*. As a check on the data, it is informative to look at the sum of $S\$$ across all countries divided by the sum of $Y\$$, denoted s^*. This ratio should be zero, and it is of interest to see how far away from zero it is. sp^* and s^* are examined in the next section.

Table 1
Countries in the Summation

	IFS code	Country
	Group 1: 1980–2009	
1	111	UNITED STATES
2	112	UNITED KINGDOM
3	124	BELGIUM
4	132	FRANCE
5	134	GERMANY
6	136	ITALY
7	138	NETHERLANDS
8	146	SWITZERLAND
9	158	JAPAN
10	172	FINLAND
11	178	IRELAND
12	184	SPAIN
13	193	AUSTRALIA
14	199	SOUTH AFRICA
15	223	BRAZIL
16	233	COLOMBIA
17	238	COSTA RICA
18	273	MEXICO
19	293	PERU
20	456	SAUDI ARABIA
21	542	KOREA, REPUBLIC OF
22	576	SINGAPORE
23	664	KENYA
	Group 2: 1990–2009	
1	128	DENMARK
2	182	PORTUGAL
3	253	EL SALVADOR
4	258	GUATEMALA
5	268	HONDURAS
6	288	PARAGUAY
7	419	BAHRAIN, KINGDOM OF
8	436	ISRAEL
9	524	SRI LANKA
10	534	INDIA
11	556	MALDIVES
12	564	PAKISTAN
13	618	BURUNDI
14	666	LESOTHO
15	684	MAURITIUS
16	744	TUNISIA
17	918	BULGARIA
18	924	CHINA,P.R.: MAINLAND
19	944	HUNGARY

Table 1 (continued)
Countries in the Summation

	IFS code	Country
	Group 3: 2000–2009	
1	122	AUSTRIA
2	137	LUXEMBOURG
3	142	NORWAY
4	144	SWEDEN
5	156	CANADA
6	174	GREECE
7	176	ICELAND
8	228	CHILE
9	278	NICARAGUA
10	298	URUGUAY
11	313	BAHAMAS, THE
12	443	KUWAIT
13	536	INDONESIA
14	616	BOTSWANA
15	746	UGANDA
16	913	BELARUS
17	916	KAZAKHSTAN
18	917	KYRGYZ REPUBLIC
19	921	MOLDOVA
20	922	RUSSIAN FEDERATION
21	926	UKRAINE
22	935	CZECH REPUBLIC
23	939	ESTONIA
24	941	LATVIA
25	946	LITHUANIA
26	960	CROATIA
27	964	POLAND
28	968	ROMANIA

3 The Fact

Table 2 presents values of sp^* and s^* for three sets of countries. Observations begin in 1980 for the first set (group 1), 1990 for the second set (groups 1 and 2), and 2000 for the third set (groups 1, 2, and 3). It is important to note that the summation for the first set is always over only countries in that set—countries are not added as observations become available for them. The values for sp^* and s^* for, say, 1990 for the first set are thus different than those for the second set because the summation is different. Remember that in principle s^* should be zero for each year.

Table 3 is the same as Table 2 except that the United States is excluded for all calculations. It is of interest to know if the values of sp^* in Table 2 are dominated by the United States, and this can be seen by comparing Tables 2 and 3. The values of s^* in Table 3 are, of course, not expected to be zero because the United States is excluded from the sum.

As a check on the data, consider first in Table 2 how close the values of s^* are to zero. The values of s^* range from -0.0136 for 2006 for set 1 to 0.0032 for 2009 for set 3. The means of the absolute values for the three sets are 0.0061, 0.0045, and 0.0035, respectively. From the IMF World Economic Outlook Database (October 2010 used here) one can get annual data on the world current account balance and on world GDP (in U.S. dollars). For the 1980–2009 period the ratio of the world current account balance to world GDP ranges from -0.0078 to 0.0056, and the mean of the absolute values is 0.0042. This mean compares to the mean of 0.0061 for set 1 in Table 2. The values in Table 2 are thus of roughly the same magnitude

as

Table 2
Values of sp^* and s^*

	sp^*			s^*		
Year	1	2	3	1	2	3
1980	0.0270			−0.0050		
1981	0.0349			−0.0018		
1982	0.0409			−0.0061		
1983	0.0490			−0.0059		
1984	0.0406			−0.0083		
1985	0.0405			−0.0073		
1986	0.0401			−0.0025		
1987	0.0305			−0.0034		
1988	0.0263			−0.0016		
1989	0.0239			−0.0040		
1990	0.0248	0.0254		−0.0061	−0.0055	
1991	0.0302	0.0306		−0.0038	−0.0032	
1992	0.0350	0.0346		−0.0025	−0.0023	
1993	0.0380	0.0365		0.0009	−0.0002	
1994	0.0286	0.0282		−0.0015	−0.0016	
1995	0.0274	0.0265		0.0004	−0.0002	
1996	0.0222	0.0215		−0.0008	−0.0011	
1997	0.0140	0.0151		0.0018	0.0026	
1998	0.0043	0.0058		−0.0018	−0.0014	
1999	−0.0113	−0.0087		−0.0074	−0.0067	
2000	−0.0224	−0.0188	−0.0164	−0.0134	−0.0123	−0.0075
2001	−0.0145	−0.0100	−0.0090	−0.0120	−0.0106	−0.0073
2002	0.0021	0.0055	0.0044	−0.0116	−0.0093	−0.0063
2003	0.0115	0.0141	0.0134	−0.0101	−0.0076	−0.0042
2004	0.0098	0.0122	0.0110	−0.0076	−0.0053	−0.0013
2005	−0.0018	0.0038	0.0021	−0.0122	−0.0072	−0.0021
2006	−0.0148	−0.0060	−0.0084	−0.0136	−0.0064	−0.0009
2007	−0.0127	−0.0021	−0.0077	−0.0101	−0.0015	0.0016
2008	0.0021	0.0116	0.0047	−0.0130	−0.0038	0.0003
2009	0.0445	0.0471	0.0395	−0.0049	0.0016	0.0032
Mean of absolute values				0.0061	0.0045	0.0035

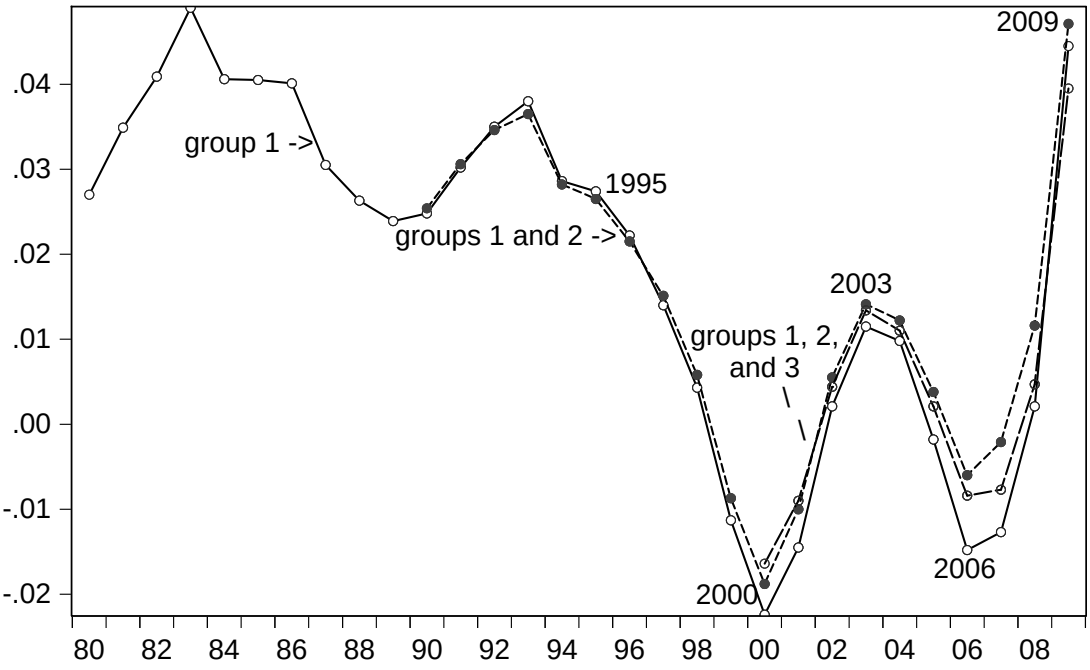
1 = group 1 (28 countries)
2 = groups 1 and 2 (42 countries)
3 = groups 1, 2, and 3 (70 countries)

Table 3
Values of sp^* and s^*
United States Excluded

	sp^*			s^*		
Year	1	2	3	1	2	3
1980	0.0296			−0.0081		
1981	0.0406			−0.0039		
1982	0.0403			−0.0078		
1983	0.0522			−0.0010		
1984	0.0546			0.0056		
1985	0.0572			0.0118		
1986	0.0589			0.0183		
1987	0.0499			0.0147		
1988	0.0373			0.0107		
1989	0.0303			0.0042		
1990	0.0245	0.0255		−0.0014	−0.0010	
1991	0.0225	0.0237		−0.0055	−0.0045	
1992	0.0343	0.0338		0.0002	0.0002	
1993	0.0456	0.0426		0.0081	0.0058	
1994	0.0380	0.0367		0.0065	0.0057	
1995	0.0381	0.0358		0.0078	0.0063	
1996	0.0360	0.0335		0.0069	0.0056	
1997	0.0316	0.0311		0.0125	0.0123	
1998	0.0279	0.0272		0.0121	0.0110	
1999	0.0121	0.0132		0.0084	0.0075	
2000	0.0046	0.0068	0.0072	0.0056	0.0048	0.0099
2001	0.0059	0.0102	0.0092	0.0063	0.0058	0.0088
2002	0.0201	0.0229	0.0189	0.0109	0.0112	0.0130
2003	0.0268	0.0286	0.0255	0.0135	0.0140	0.0160
2004	0.0279	0.0287	0.0246	0.0197	0.0190	0.0213
2005	0.0206	0.0253	0.0195	0.0158	0.0188	0.0221
2006	0.0064	0.0158	0.0088	0.0149	0.0206	0.0240
2007	0.0017	0.0144	0.0038	0.0134	0.0215	0.0217
2008	0.0032	0.0165	0.0064	0.0051	0.0143	0.0166
2009	0.0323	0.0390	0.0299	0.0077	0.0141	0.0143
Mean of absolute values				0.0089	0.0102	0.0168

1 = group 1 (27 countries)
2 = groups 1 and 2 (41 countries)
3 = groups 1, 2, and 3 (69 countries)

Figure 1
Financial Saving Rate of the World's Private Sector (sp*)
1980-2009



the IMF values, which suggests that most of the world that matters for this purpose is being captured.

Figure 1 plots the three sets of values of sp^* in Table 2. This figure is easy to summarize. First, the values since 2000 have a similar pattern for the three sets, and the values since 1990 have a similar pattern for the two sets. The results are not sensitive to the addition of more countries. Second, the pattern is as follows: 1) modest fluctuations around about .03 between 1980 and about 1995, 2) a large fall between 1995 and 2000, 3) a large rise between 2000 and 2003, 4) a large fall between 2003 and 2006, and 5) a large rise between 2006 and 2009, especially in 2009. This figure captures the world macro saving fact.

Figure 2
sp* with and without the United States
1980-2009

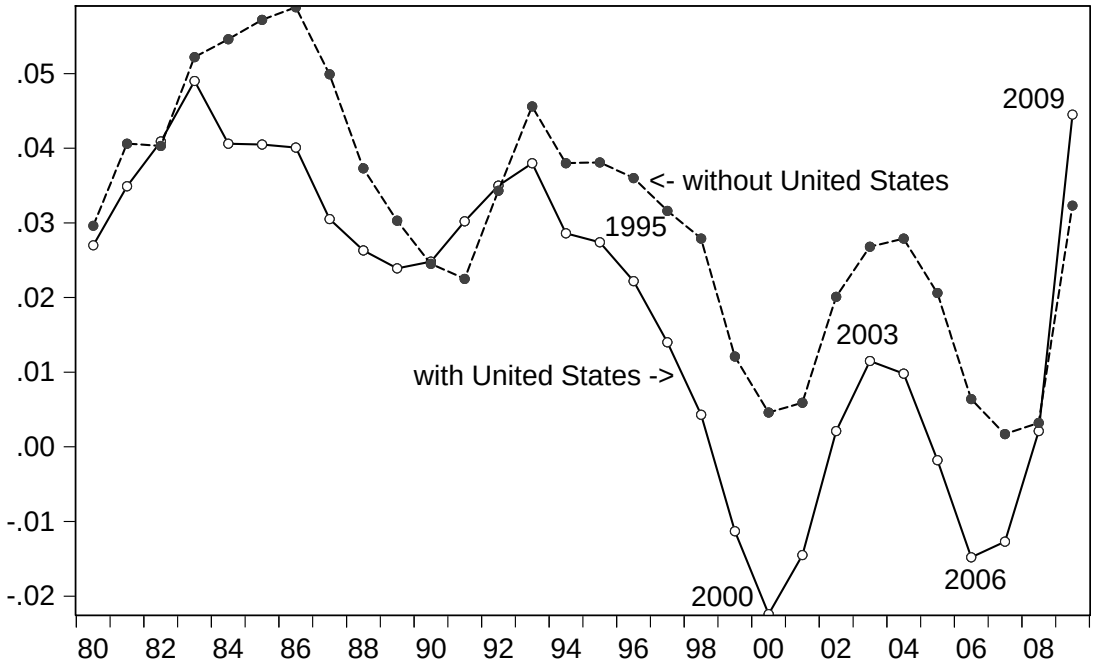
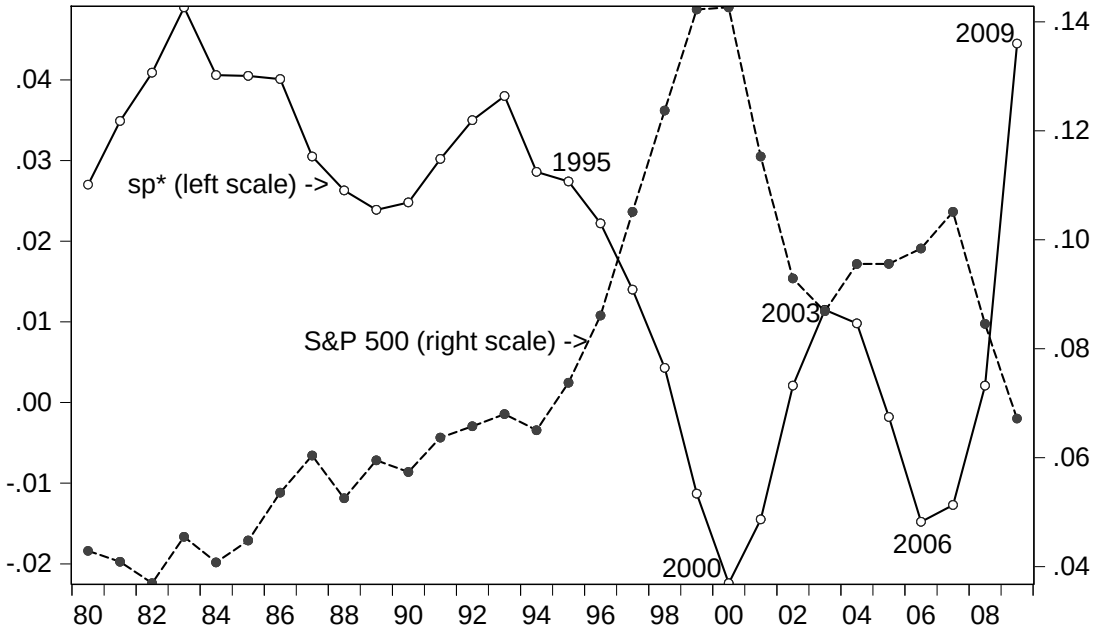


Figure 2 plots the values of sp^* for set 1 from both Tables 2 and 3. The values of sp^* are on average larger with the United States excluded, but the patterns of the two plots are quite close. The overall pattern is not driven by the United States.

Another way of looking at, say, the large positive value of sp^* in 2009 is that governments were on average running large deficits. sp^* was about .04 in 2009, and so the deficit of the world's government sector was about 4 percent of world GDP. One might say there was a world-wide government deficit problem in 2009, which is the same as saying there was a problem of a large world-wide private financial saving rate.

Figure 3
sp* and S&P 500: 1980-2009



4 Some Correlations

Before discussing a possible explanation of the fluctuations of sp^* in Figure 1, it will be useful to examine some correlations. Figure 3 plots sp^* in Table 2 for set 1 (countries in group 1 including the United States) and the ratio of the S&P 500 stock price index to U.S. nominal GDP in billions, denoted $S\&P500$. It is clear from this figure that the two series are inversely correlated (regression results are presented later in this section).

Although sp^* pertains to the entire world, whereas $S\&P500$ pertains only to the United States, it is the case that stock prices across many countries are highly

positively correlated (Japan being an exception), and so $S\&P500$ can be considered to some extent to be a proxy for world stock prices. Figures 4a–4e and 5 show some of these correlations.

Figures 4a–4e plot $S\&P500$ against a stock price index of another country: 4a for the U.K. FTSE100, 4b for the German DAX, 4c for the French CAC 40, 4d for the Hong Kong Hang Seng, and 4e for the Japanese Nikkei. Each of these indices is divided by the country's nominal GDP (in the country's currency in billions) except for the Hang Seng, where world GDP in billions of Hong Kong dollars is used. Figures 4a–4c show a strong positive correlation: European and U.S. stock prices are highly correlated. Figure 4d also shows a strong correlation except for 1998 and 1999, where the Asia crises affected the Hang Seng but had no noticeable effect on the $S\&P500$. The Nikkei in Figure 4e is dominated by the huge increase to 1988 and the huge fall thereafter. Since about 1999, however, the pattern of the Nikkei is similar to the pattern of the $S\&P500$.

From the OECD Economic Outlook Annex Table 58 one can get values of net financial wealth for six countries not counting the United States for 1998–2009. (The variable is the ratio of net financial wealth to nominal disposable income in percentage points.) The six countries are Canada, France, Germany, Italy, Japan, and the United Kingdom. An index of net financial wealth for these six countries was computed using as weights the country's GDP in 2005 in dollars. Figure 5 plots this index against $S\&P500$. The positive correlation is again evident. The timing is not quite as tight, which is due in part to the fact that the index is the end of year value and $S\&P500$ is the average for the year.

Figure 4a
S&P 500 and FTSE 100: 1984-2009

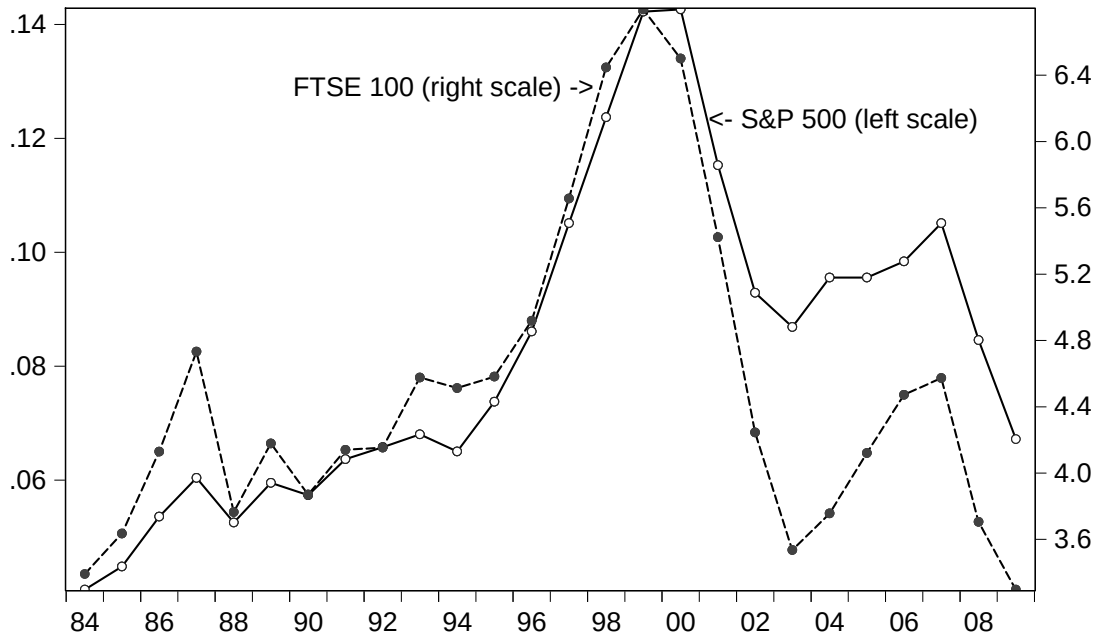


Figure 4b
S&P 500 and DAX: 1991-2009

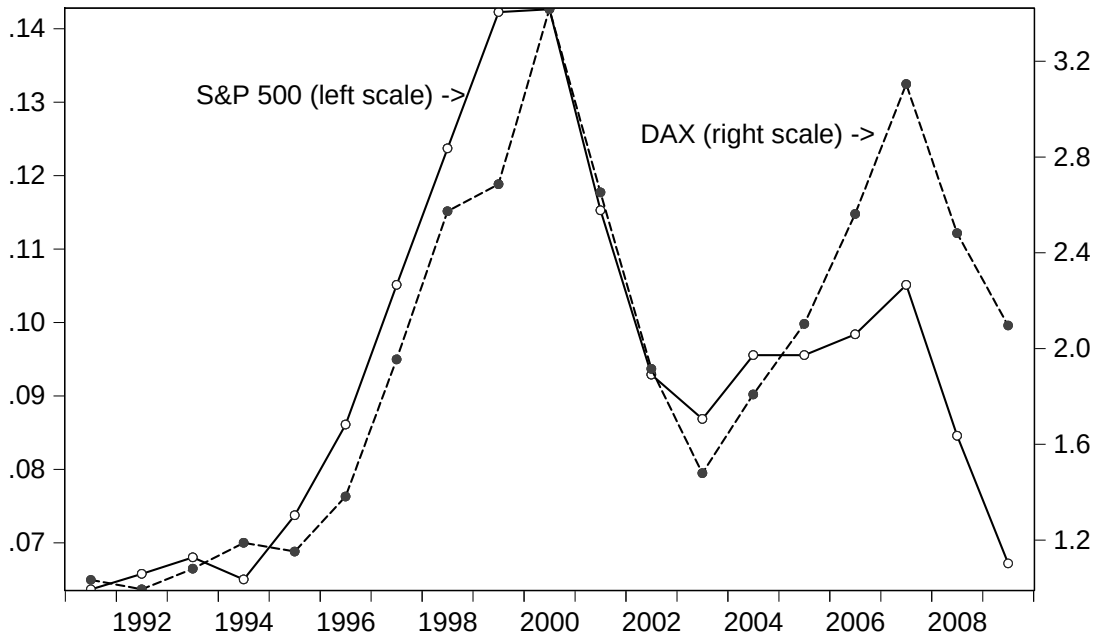


Figure 4c
S&P 500 and CAC 40: 1990-2009

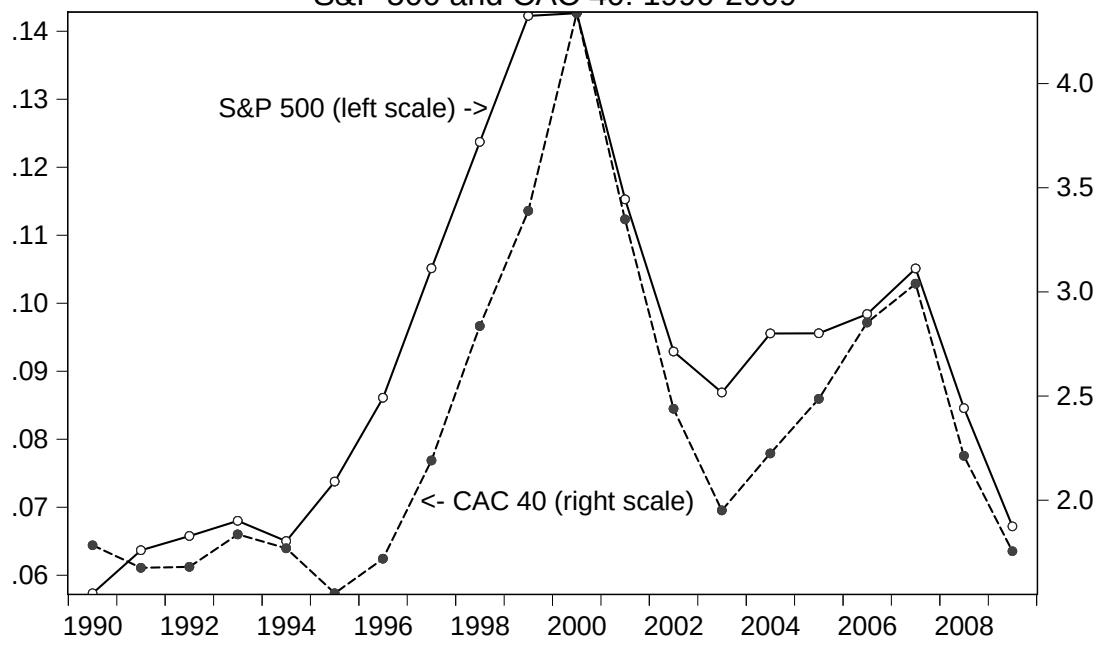


Figure 4d
S&P 500 and Hang Seng: 1987-2009

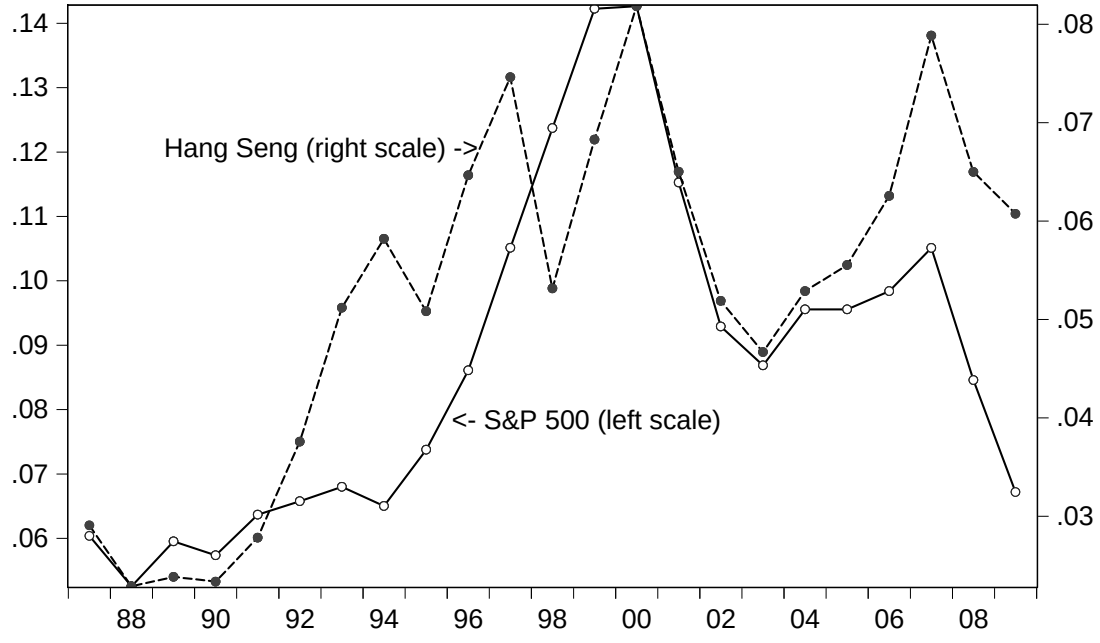


Figure 4e
S&P 500 and Nikkei: 1984-2009

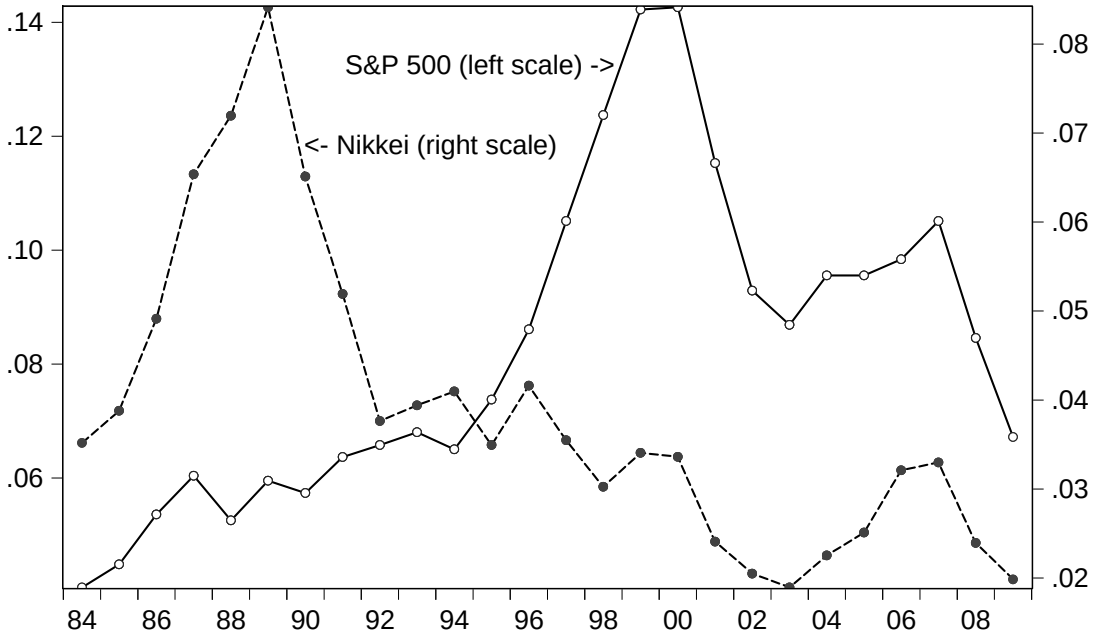
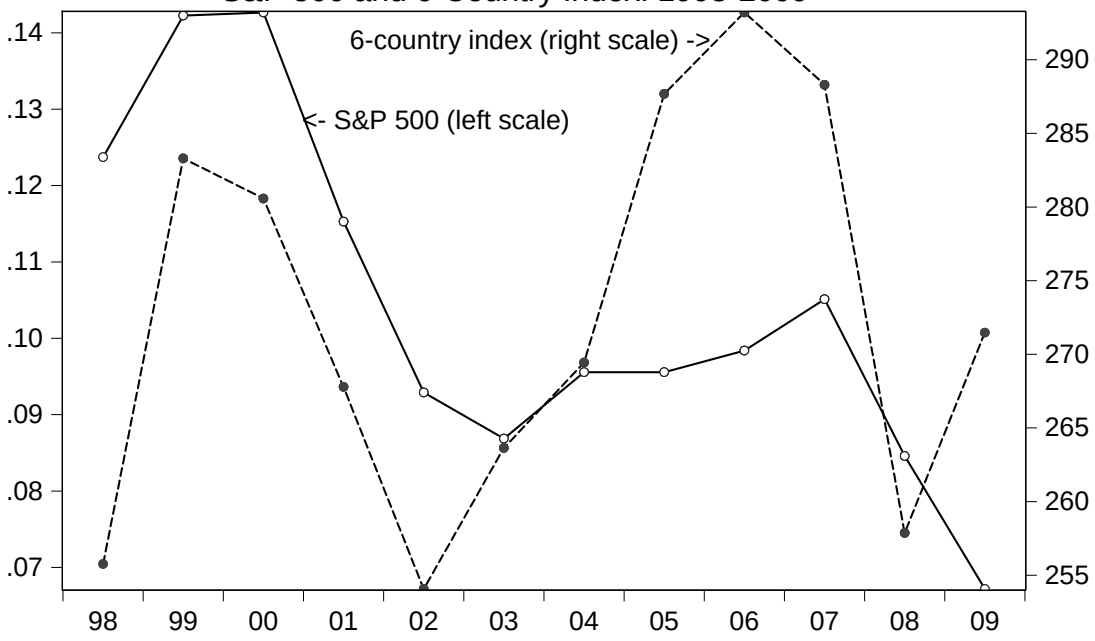


Figure 5
S&P 500 and 6-Country Index: 1998-2009



Turning now to housing prices, Figure 6 plots the ratio of a U.S. housing price index to the U.S. GDP deflator, denoted $PHOUSE$, and $S\&P500$. It can be seen that the large increases in housing prices did not begin until the late 1990s, whereas the large increases in stock prices began in 1995. Also, housing prices did not fall in the 2000–2003 period, contrary to stock prices. The most striking similarity in the two series is the large fall in both housing prices and stock prices in 2008 and 2009.

As with stock prices, there is a positive correlation of housing prices across many countries. From the OECD Economic Outlook Annex Table 60 one can get values of housing price ratios for 18 countries not counting the United States for 1993–2009.[2] (The variable is a price to rent ratio in percentage points.) An index of these ratios for the 18 countries was computed using as weights the country's GDP in 2005 in dollars. Figure 7 plots this index against $PHOUSE$ for the 1993–2009 period, and a positive correlation is evident. The index begins to rise a year later (1998 versus 1997) and it peaks a year later (2007 versus 2006). Also, the fall in the index in 2008 and 2009 is not as large. But it is clear that the boom in housing prices between the late 1990s and the mid 2000s is not just a United States phenomenon. Nor is the large fall in housing prices in 2008 and 2009. $PHOUSE$ can thus to some extent be taken to be a proxy for world housing prices.

[2]The 18 countries are Japan, Germany, France, Italy, the United Kingdom, Canada, Australia, Belgium, Denmark, Finland, Ireland, Korea, the Netherlands, Norway, New Zealand, Spain, Sweden, and Switzerland.

Figure 6
S&P 500 and U.S. Housing Price Variable: 1980-2009

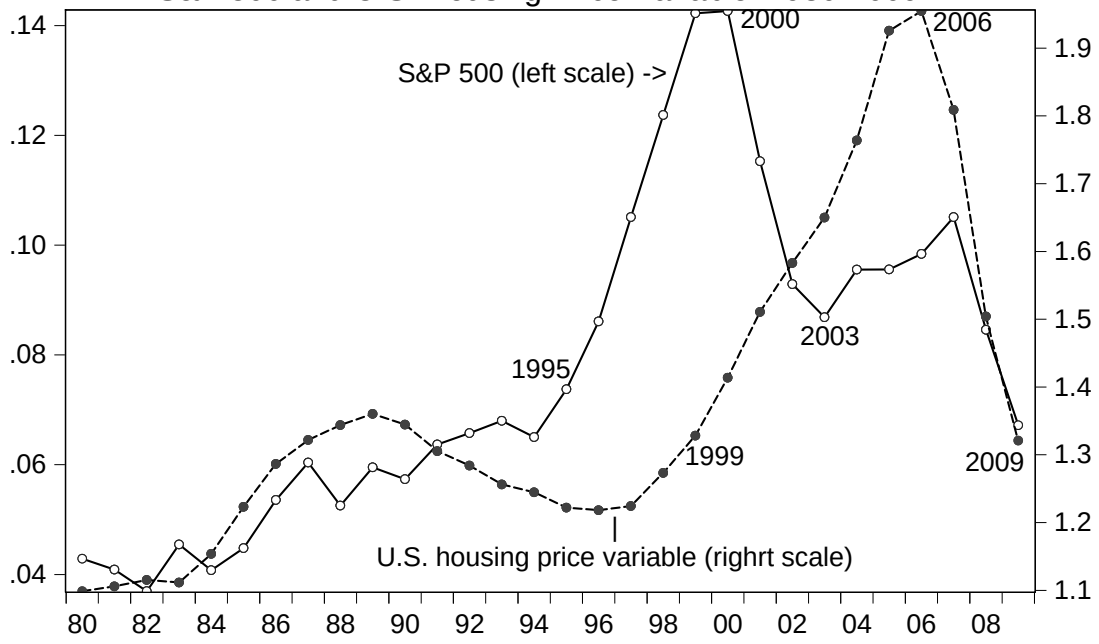


Figure 7
U.S. Housing Price Variable and 18-Country Index: 1993-2009

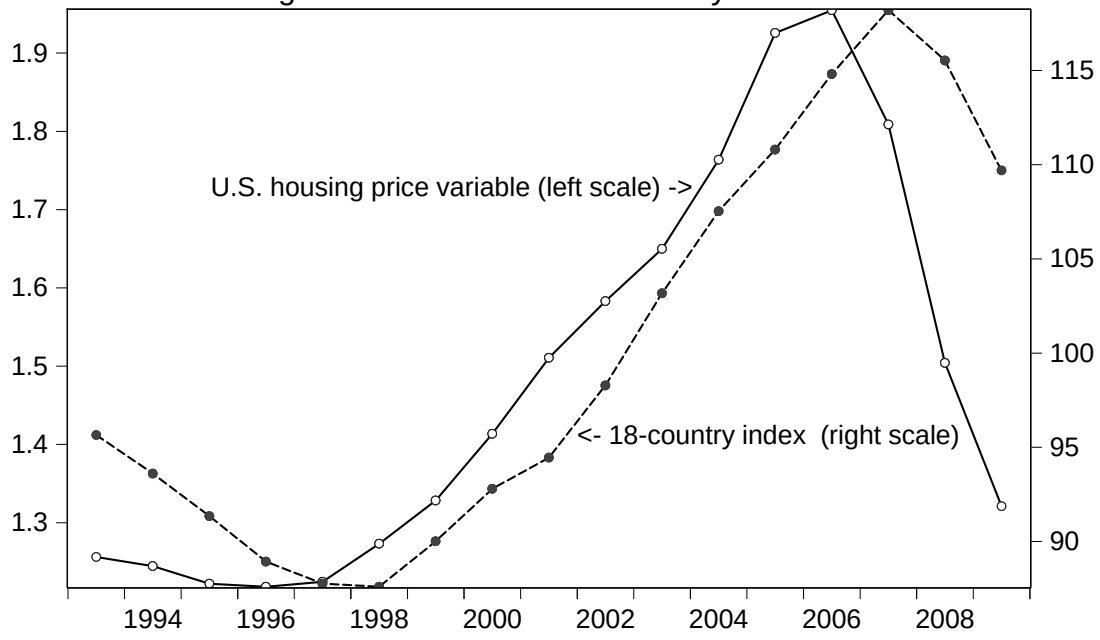


Figure 8
sp* and U.S. Housing Price Variable: 1980-2009

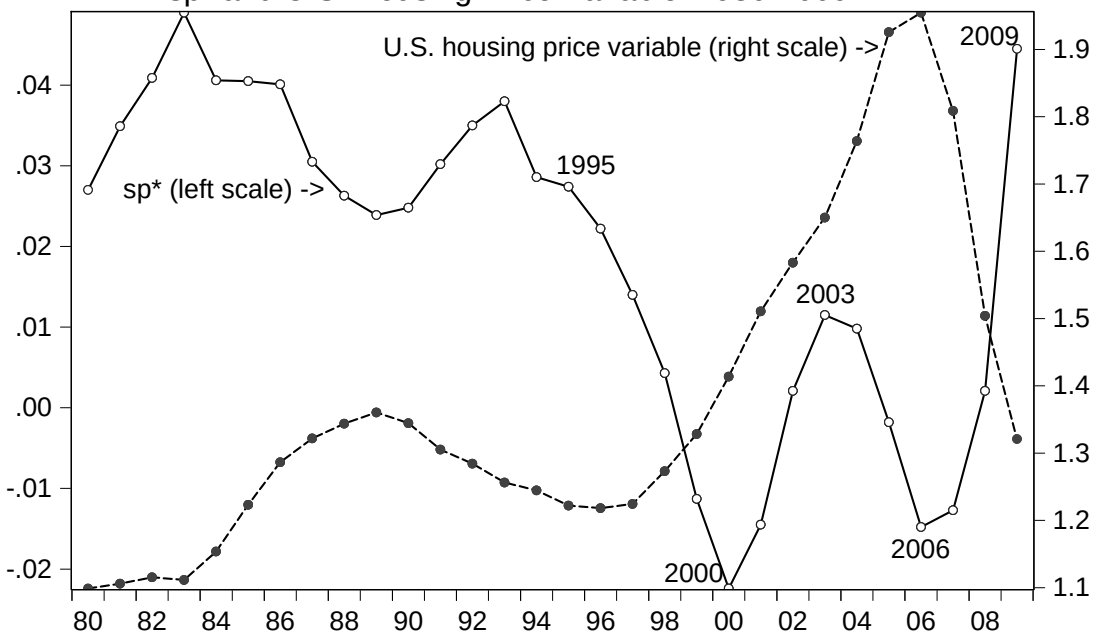


Figure 8 plots $PHOUSE$ and sp^* in Table 2 for set 1 (countries in group 1 including the United States) for 1980–2009. The two series are in general negatively correlated except for the 2000-2003 period, where both sp^* and $PHOUSE$ increased.

Table 4
Regression Results
Δsp^* is the left-hand-side variable.

	constant	$\Delta S\&P500$	$\Delta S\&P500_{-1}$	$\Delta PHOUSE$	$\Delta PHOUSE_{-1}$	SE	R^2	DW
United States included in sp^*								
1	0.0024	-0.239	-0.541	-0.008	-0.067	0.0046	0.87	1.89
	(2.72)	(-2.79)	(-6.04)	(-0.59)	(-4.12)			
2	0.0025		-0.658		-0.079	0.0051	0.82	1.53
	(2.49)		(-7.49)		(-6.76)			
United States excluded from sp^*								
3	0.0014	-0.061	-0.447	0.034	-0.083	0.0059	0.69	1.72
	(1.21)	(-0.54)	(-3.89)	(1.76)	(-4.02)			
4	0.0012		-0.482		-0.056	0.0060	0.64	1.57
	(1.07)		(-4.69)		(-4.13)			

Estimation period: 1982–2009, 28 observations
OLS estimates
t-statistics are in parentheses
Range of sp^* is -0.0224 to 0.0445 with United States included
Range of sp^* is 0.0017 to 0.0589 with United States excluded

Row 1 in Table 4 presents results of a regression of the change in sp^*, Δsp^*, on the change in $S\&P500$, $\Delta S\&P500$, and the change in $PHOUSE$, $\Delta PHOUSE$, both current and lagged one year. The lagged values dominate the current values, and row 2 presents results using only the lagged values. The coefficeint estimates of $\Delta S\&P500_{-1}$ and $\Delta PHOUSE_{-1}$ in row 2 are negative and highly significant. The estimated standard error is 0.0051 (the range of sp^* in Table 2 is -0.0224 to 0.0445). The R^2 is 0.82. A considerable amount of the variation in the change in sp^* is thus explained by the previous year's changes in $S\&P500$ and $PHOUSE$. This conclusion also holds if the United States is excluded from sp^*, as can be seen in rows 3 and 4 in Table 4.

5 A Possible Explanation

The discussion up to this point has been atheoretical. A fact has been documented, and some correlations have been discussed. What is striking about the results is how much of the variance of the change in sp^* has been explained in row 2 in Table 4 by simply the one-year lagged changes in the U.S. stock price index and the U.S. housing price variable. What can one say about this?

First, if we go back to Figure 1 and ask what exogenous variables might explain the large fluctuations in sp^* since 1995, it seems unlikely that demographic variables and fiscal-policy variables like tax rates and some kinds of government spending are candidates. Demographic variables are too slow moving, and it seems unlikely that fiscal-policy decisions across countries are coordinated enough and/or changed quickly enough to account for the large changes in sp^* since 1995. Regarding monetary policies, it seems unlikely that world interest rate fluctuations are candidates. This is not to say that demographic variables, fiscal-policy variables, and interest rates have no effect on sp^*. It's just that the fluctuations in sp^* since 1995 seem too large for these effects to be the main story.

If one takes $S\&P500$ as a proxy for world stock prices and $PHOUSE$ as a proxy for world housing prices, then the results in row 2 in Table 4 show that the world private saving rate is highly negatively correlated with world asset prices as measured by one-year-lagged values of stock prices and housing prices.[3]One possible theory is thus that world asset-price changes like stock-price changes affect

[3]No attempt was made for the regression work in Table 4 to include other countries' stock prices and housing prices. Given data availability, the estimation period would have to be shorter, and given the high correlation of stock prices across countries and housing prices across countries, it seemed unlikely that sensible estimates could be obtained.

world consumption through wealth effects and affect world investment through cost of capital effects. The simple life cycle model, for example, says that an unanticipated increase in wealth leads, other things being equal, to an increase in consumption. According to this model, the large fluctuations in sp^* since 1995 are explained by the large fluctuations in world asset prices during this period. This theory relies on asset-price changes being exogenous to the households' and firms' decision making processes: asset prices change for some reason independent of these processes, and after the asset-price changes, households and firms respond.

A second possible theory is one in which there is an exogenous change in households' and firms' expectations of some future variable, like future productivity, and this leads them to both bid asset prices up or down and to change consumption and investment. If productivity is expected to be higher in the future than originally thought, this would lead households to bid asset prices up and increase consumption at the same time. Lantz and Sarte (2001) have a general equilibrium model in which this effect is at work. In this theory asset-price changes do not cause consumption and investment changes, since all three are determined by changes in expectations. In this case it does not make sense, for example, to talk about the marginal propensity to consume out of wealth.

It is difficult to test which of these theories is a better approximation of reality. It is interesting that in Table 4 the one-year lagged changes dominate the current-year changes. If the second theory is correct, one might expect the current-year changes to be more highly correlated with the change in sp^*, since the expectation change affects both asset-price changes and consumption and investment changes at the same time. On the other hand, costs of adjustment could lead consumption

and investment changes to lag asset-price changes, and so the evidence in Table 4 in favor of the first theory is weak.

In the first theory the driving force behind changes in sp^* is an unexpected change in asset prices, and in the second theory the driving force is an unexpected change the future values of some variable (like productivity). Because the correlation between sp^* and world asset prices is so large, whatever driving force is at work, it is very important. It explains a large fraction of the variation in sp^*. The contribution of this paper is showing that whatever force is operating, it changes world asset prices. Whether the force is such that asset prices change first, which then affect consumption and investment, or that asset prices and consumption and investment change at the same time is not something this paper needs to take a stand on.

The explanation offered here of the path of sp^* in Figure 1 is thus that a large fraction of the variance of sp^* is due to forces that change world stock prices and world housing prices.

This explanation is to some extent bad news for macroeconomic forecasters. Asset-price changes are essentially unpredictable, whether they are driven by changes in productivity expectations or some other force, and so much of the change in sp^* is unpredictable. Much of the world macro economy is at the mercy of unpredictable forces.

This explanation is a "big picture" explanation. The present analysis is not a substitute for structural econometric modeling of the world economy. What the analysis suggests is that any structural model should account for the effects of the forces that change asset prices on aggregate demand. How this is modeled

depends in part on which of the two theories discussed above one thinks is the best approximation of reality. The big picture that emerges from the present analysis is that the forces behind asset price changes are very important in influencing the world macro economy.

6 Judging Policy Makers

If the forces behind asset-price changes are unpredictable, this does not necessarily mean that policy makers have no ability to affect these changes. Take the huge boom in U.S. stock prices between 1995 and 2000. Many people thought at the time that this boom was a stock market bubble, but this did not appear to be the Fed's view. Alan Greenspan talked about a new age of productivity, and the Fed lowered interest rates during certain bad times in the stock market.[4] The view among many was that there was a "Greenspan put" regarding stock prices. It is possible that the Fed could have curtailed this boom by raising interest rates and margin requirements. Policy actions like these are themselves unpredictable, and thus changes in stock prices and housing prices can be unpredictable even though they are influenced by (unpredictable) policy actions.

Another example is the lack of much regulation of the U.S. housing market during the boom in housing prices between the late 1990s and 2006. Had there been more regulation, housing prices may not have risen as much as they did. The

[4]Perhaps the most dramatic Fed action in this period was the surprise lowering of the federal funds rate on October 15, 1998. The U.S. stock market was down from its highs in late September, and the Fed cited unsettled conditions in financial markets as one of the reasons for the decrease. This resulted in a huge increase in stock prices after the announcement.

bailout of financial institutions during the 2008–2009 recession is also a policy action that may affect stock prices.

Therefore, to the extent that the large fluctuations in sp^* since 1995 are undesirable, policy actions or lack thereof may bear part of the blame.

References

[1] Bernanke, Ben S., 2005, "The Global Saving Glut and the U.S. Current Account Deficit," Sandridge Lecture, Virginia Association of Economics, Richmond, Virginia, March 10.

[2] Chinn, Menzie D., and Hiro Ito, 2007, "Current Account Balances, Financial Development and Institutions: Assaying the World 'Saving Glut,"' *Journal of International Money and Finance*, 26, 546–569.

[3] Gourinchas, Pierre-Olivier, and Hélène Rey, 2007, "International Financial Adjustment," *Journal of Political Economy*, 115, 665–703.

[4] Gruber, Joseph W., and Steven B. Kamin, 2007, "Explaining the Global Pattern of Current Account Imbalances," *Journal of International Money and Finance*, 26, 500–522.

[5] Loayza, Norman, Klaus Schmidt-Hebbel, and Luis Servén, 2000, "What Drives Private Saving Across the World," *The Review of Economics and Statistics*, 82, 165–181.

[6] Lantz, Carl D., and Pierre-Daniel G. Sarte, 2001, "Consumption, Savings, and the Meaning of the Wealth Effect in General Equilibrium," *Federal Reserve Bank of Richmond Economic Quarterly*, 87/3, 53–71.

[7] Maason, Paul R., Tamim Bayoumi, and Hossein Samiei, 1998, "International Evidence on the Determinants of Private Saving," *World Bank Economic Review*, 12, 483–501.

[8] Obstfeld, Maurice, 2010, "The Immoderate World Economy," *Journal of International Money and Finance*, 29, 603–614.