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Wealth effects on world private financial saving

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ABSTRACT

This paper shows that about 70% of the variance of the yearly change in the world private financial saving rate can be explained by lagged changes in world stock and housing values for the sample period 1982–2013. A theory consistent with these results is that world asset-value changes affect world consumption and investment spending, which affects the world private financial saving rate.

1. Introduction

Annual data on the world private financial saving rate, denoted sp_t^*, are constructed in this paper for the 1980–2013 period, a measurement that is new to this paper. It will be seen that there is a high negative correlation between changes in sp_t^* and lagged changes in world stock and housing values. Regression results show that about 70% of the variance of the change in sp_t^* can be explained by lagged changes in world stock and housing values for the sample period 1982–2013. A theory consistent with these results is that asset-value changes affect consumption and investment spending through wealth effects, which affects the private financial saving rate.

The regression results are consistent with much of the literature on wealth effects on household expenditures. Wealth effects on household expenditures have been part of my U.S. macroeconometric model since its inception—Fair (1976). Recent estimates from the model—reported in Fair (2016)—show that a sustained increase in household wealth (financial plus housing) leads to an increase in household expenditures of about 4–5% of the wealth increase per year. In other words, about 4-5 cents on the dollar.

This estimate is consistent with results from other approaches. The size of the wealth effect is discussed in Ludvigson and Steindel (1999), where they conclude (p. 30) that "a dollar increase in wealth likely leads to a three-to-four-cent increase in consumption in today's economy," although they argue that there is considerable uncertainty regarding this estimate. Their approach is simpler and less structural than using a macroeconometric model, but the size of their estimate is similar. Starr-McCluer (1998) uses survey data to examine the wealth effect, and she concludes that her results are broadly consistent with a modest wealth effect.

Mian et al. (2013) find 5–7% effects of housing wealth on consumption (p. 1723), although these effects vary considerably

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across zip codes. Zhou and Carroll (2012) find 5% effects of housing wealth on consumption (p. 18). Case et al. (2012) test for asymmetrical effects and find that the housing wealth elasticity is estimated to be larger in falling markets than in rising markets. Their estimated elasticities are 0.10 and 0.032, respectively, in falling and rising markets. The elasticity of 0.10 in falling markets translates into roughly 4 cents on the dollar.

Finally, Chaney et al. (2012) find significant effects of real estate prices on corporate investment through a collateral channel. They estimate about 6 cents of investment for each dollar of collateral.

The next section discusses the construction of sp_t^* and how it relates to the literature. Section 3 discusses the data collection and examines plots of the data. In Section 4 reduced form regressions are run explaining sp_t^*. Theoretical issues are discussed in Section 5. Section 6 concludes the paper.

2. The construction of sp_t^* and related literature

Country *i*'s current account, denoted S_{it}, 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 the world is zero after converting the current accounts to a common currency. The financial saving of a country's government, denoted SG_{it}, 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, denoted SP_{it}, is $S_{it} - SG_{it}$. Because the sum of S_{it} across all countries is zero after converting to a common currency, the sum of SP_{it} is equal to minus the sum of SG_{it} after converting each to a common currency. If the sum of SP_{it} 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. sp_t^* is the sum of SP_{it} divided by world GDP, where all variables are converted to U.S. dollars.

This paper is concerned with *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.[2] Consider the GDP definition for a country, $Y_{it} = C_{it} + I_{it} + G_{it} + EX_{it} - IM_{it}$, where Y_{it} is GDP, C_{it} is consumption, I_{it} is investment, G_{it} is government spending, EX_{it} is the level of exports, and IM_{it} is the level of imports. S_{it} as used in this paper is $Y_{it} - C_{it} - I_{it} - G_{it}$, namely the country's current account, $EX_{it} - IM_{it}$. A country's saving, on the other hand, which will be denoted SAV_{it}, is $Y_{it} - C_{it} - G_{it}$, so $S_{it} = SAV_{it} - I_{it}$. In this paper SAV_{it} will be called "saving," and S_{it}, SP_{it}, and SG_{it} will be called "financial saving."

Much of the literature on saving behavior is concerned with SAV_{it}. It is important to realize that a country's current account, S_{it}, can be large relative to its GDP even though it has a low saving rate (because I_{it} 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_{it} across countries is zero), but this in itself says nothing about which countries have high saving rates and which have low saving rates.

It is useful to see how this paper relates to the literature on saving gluts. Bernanke (2005) in a well known speech discussed the possibility of a global saving glut in the early 2000 s, and econometric studies—for example, Chinn and 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, however, is that there cannot be a global saving glut regarding current account balances, since they sum to zero across countries, a fact this paper uses in the construction of sp_t^*. 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. Again, this paper is not concerned with current account imbalances, which sum to zero across all countries. 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 et al. (1998) and Loayza et al. (2000). This latter reference provides a good summary of previous work.

[2] 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.

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 an exogenous variable explaining the former.

3. Data collection and values of the variables

3.1. Data collection for sp_t^*

All of the data used in the construction of sp_t^* were taken from the IMF International Financial Statistics (IFS). Only annual data were used. The construction is discussed in the Appendix and summarized in Table A2. For each country, current account data, government financial saving data, GDP data, and data on its exchange rate relative to the U.S. dollar were collected and used. Data began earlier for some countries than others. For 38 countries (group 1) the beginning year is 1980. For 18 others (group 2) the beginning year is 1990, and for 36 others (group 3) the beginning year is 2000. The last year is 2013 for all countries. The three groups are listed in Table A1.

Also constructed in this study is a variable, denoted s_t^*, which is the sum of the current accounts across all countries divided by the sum of their GDP's. With no measurement error, this variable should be zero, which is examined next.

3.2. Tables and plots of sp_t^*

Table 1 presents values of sp_t^* and s_t^* 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_t^* and s_t^* for, say, 1990 for the first set are thus different than those for the second set because the summation is different.

As noted above, the values for s_t^* should all be zero. As a check on the data, consider in Table 1 how close the values of s_t^* are to zero. The values range from −0.0108 for 2000 for set 1-0.0061 for 2013 for set 1. The means of the absolute values for the three sets are 0.0040, 0.0036, and 0.0031, respectively. From the IMF World Economic Outlook Database (October 2014 used here) one can get annual data on the world current account balance and on world GDP (in U.S. dollars). For the 1980–2013 period the ratio of the world current account balance to world GDP ranges from −0.0090 to 0.0055, and the mean of the absolute values is 0.0041. This mean compares to the mean of 0.0040 for set 1 in Table 1. The values in Table 1 are thus of the same magnitude as the IMF values, which suggests that most of the world that matters for this purpose is being captured.

Fig. 1 plots the three sets of values of sp_t^* in Table 1. The plots show that the values since 2000 have a similar pattern for the three sets and that the values since 1990 have a similar pattern for the two sets. The results are thus not sensitive to the addition of more countries. The figure shows that there was a modest rise in the saving rate between 1980 and 1983, a modest fall to 1989, a modest rise to 1994, a large fall until 2000, a large rise to 2003, a fall to 2006, a remarkable rise to 2009, and then a fall to 2013, the end of the data. It will be seen below that these fluctuations are highly correlated with changes in world asset values.

As discussed in the Appendix, the world government financial saving rate, denoted sg_t^*, is $s_t^* - sp_t^*$. Since s_t^* is approximately zero, sg_t^* is approximately $-sp_t^*$. Given this, another way of looking at, say, the large positive value of sp_t^* in 2009 is that governments were on average running large deficits. sp_t^* for set 3 (all 92 countries) was 0.0637 in 2009, and so the deficit of the world's government sector was approximately 6.37% 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.

3.3. Data Collection for World Asset Values

A global stock index from MSCI, denoted $MSCI_t$, is available back to 1980. Another global stock index, from Standard & Poors, denoted $SP1200_t$, is available back to 1989. Observations on the last business day of each year were collected for each of these two variables. Each of these variables was normalized by world trend GDP. Let $Y\$_t^*$ denote the sum of $Y\$_{it}$ over the group 1 countries. $\log Y\$_t^*$ was regressed on a constant and time trend for the 1980–2013 period, and the exponential of each predicted value from this regression, denoted $\hat{Y\$}_t^*$, was used for the trend value. Let

Table 1
Values of sp_t^* and s_t^*.

	sp_t^*			s_t^*		
Year	1	2	3	1	2	3
1980	0.0279			−0.0026		
1981	0.0354			−0.0001		
1982	0.0405			−0.0053		
1983	0.0480			−0.0052		
1984	0.0399			−0.0074		
1985	0.0382			−0.0081		
1986	0.0391			−0.0027		
1987	0.0306			−0.0029		
1988	0.0258			−0.0015		
1989	0.0236			−0.0037		
1990	0.0257	0.0264		−0.0052	−0.0064	
1991	0.0288	0.0294		−0.0047	−0.0057	
1992	0.0342	0.0346		−0.0023	−0.0035	
1993	0.0360	0.0363		0.0002	−0.0012	
1994	0.0278	0.0285		−0.0014	−0.0020	
1995	0.0262	0.0269		0.0002	−0.0003	
1996	0.0215	0.0215		−0.0005	−0.0006	
1997	0.0148	0.0141		0.0031	0.0024	
1998	0.0069	0.0063		−0.0001	−0.0010	
1999	−0.0028	−0.0028		−0.0056	−0.0055	
2000	−0.0138	−0.0126	−0.0092	−0.0108	−0.0096	−0.0065
2001	0.0012	0.0026	0.0042	−0.0098	−0.0083	−0.0062
2002	0.0193	0.0199	0.0194	−0.0089	−0.0074	−0.0054
2003	0.0276	0.0276	0.0275	−0.0071	−0.0054	−0.0030
2004	0.0260	0.0250	0.0246	−0.0040	−0.0028	0.0000
2005	0.0166	0.0156	0.0163	−0.0061	−0.0052	−0.0009
2006	0.0057	0.0050	0.0046	−0.0045	−0.0038	0.0005
2007	0.0095	0.0081	0.0042	0.0007	0.0006	0.0019
2008	0.0262	0.0240	0.0180	−0.0007	−0.0016	0.0005
2009	0.0706	0.0666	0.0637	0.0033	0.0018	0.0030
2010	0.0670	0.0628	0.0599	0.0042	0.0024	0.0040
2011	0.0554	0.0522	0.0473	0.0029	0.0016	0.0032
2012	0.0515	0.0479	0.0437	0.0046	0.0023	0.0033
2013	0.0421	0.0401	0.0380	0.0061	0.0049	0.0052
Mean of absolute values				0.0040	0.0036	0.0031

sp_t^* is the world private financial saving rate.
s_t^* is the world total financial saving rate, which should be zero.
1=group 1 (38 countries). See Table A1.
2=groups 1 and 2 (56 countries). See Table A1.
3=groups 1, 2, and 3 (92 countries). See Table A1.

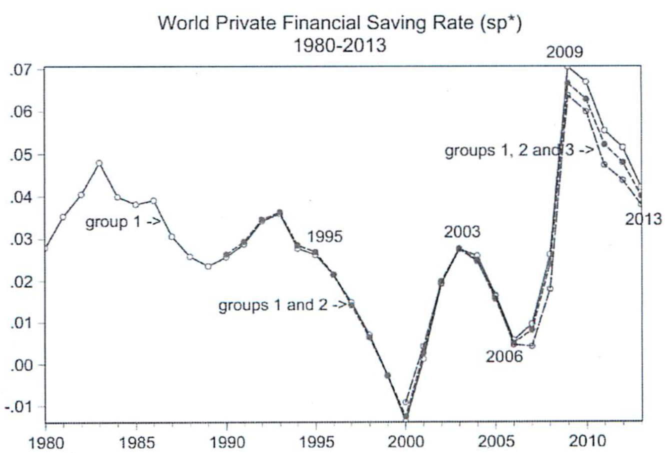

Fig. 1.

$$MSCI_t^* = MSCI_t / \hat{Y\$}_t^*$$

$$SP1200_t^* = SP1200_t / \hat{Y\$}_t^*$$

These are the two global stock indices used below. Values of $SP1200_t^*$ are only available back to 1989, and this variable was spliced to $MSCI_t^*$ for the years 1980–1988. The spliced variable will be denoted $SP1200_t^{**}$.

For comparison purposes data on the Standard & Poors 500 U.S. stock index, denoted $SP500_t$, were also collected, again observations for the last business day of the year. It was normalized by U.S. trend GDP. $\log Y\$_{USt}$ was regressed on a constant and time trend for the 1980–2013 period, and the exponential of each predicted value from this regression, denoted $\hat{Y\$}_{USt}$, was used for the U.S. trend value. Let

$$SP500_t^* = SP500_t / \hat{Y\$}_{USt}$$

Observations on this variable are available for the entire 1980–2013 period.

Regarding world housing prices, one can get from the Bank of International Settlements (BIS) indices of residential property prices by country (See Scatigna et al. (2014)). Data back to 1970 are available for 20 countries.[3] An overall index of these indices for the 20 countries was computed using as weights the country's GDP in 2005 in dollars. This index will be denoted BIS_t. Data beginning in 1980 were used here. An important feature of BIS_t is that it is a property price variable, not a housing wealth variable. It is obviously highly correlated with housing wealth, but it is not wealth.

A housing wealth variable is available for the United States, which will be denoted $USHOUSE_t$. It is the nominal market

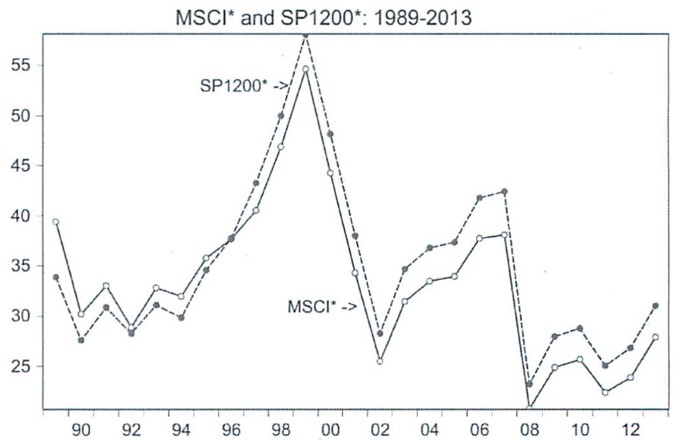

Fig. 2.

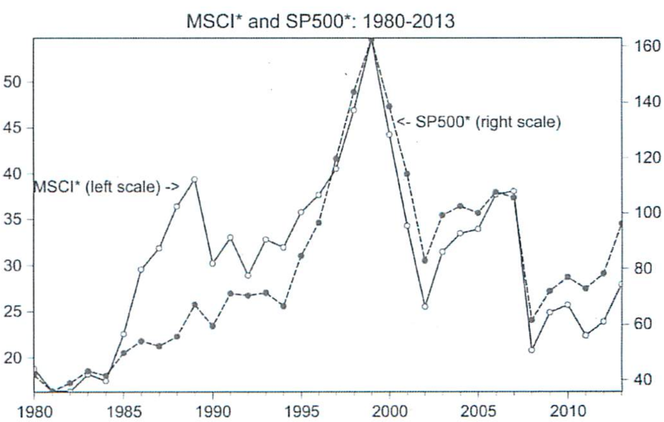

Fig. 3.

[3] The 20 countries are Australia, Belgium, Canada, Switzerland, Germany, Denmark, Spain, Finland, France, the United Kingdom, Ireland, Italy, Japan, Korea, the Netherlands, Norway, New Zealand, Sweden, the United States, and South Africa.

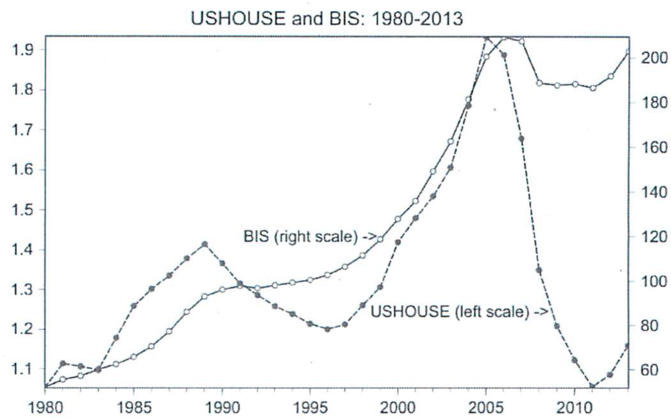

Fig. 4.

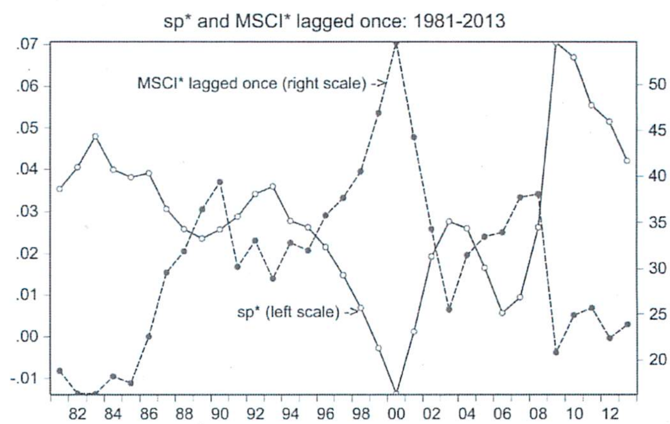

Fig. 5.

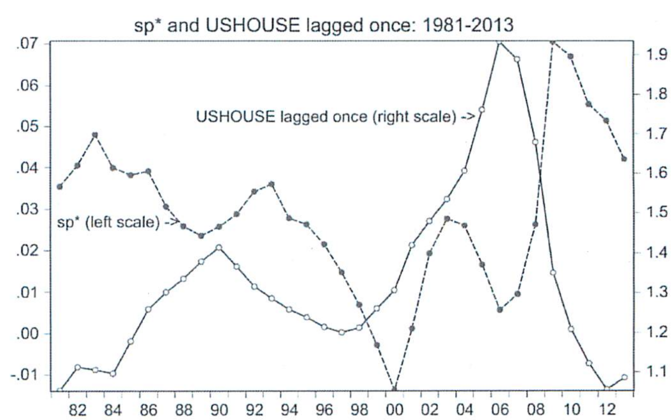

Fig. 6.

value of the stock of housing from the U.S. Flow of Funds accounts (for the fourth quarter of the year) divided by trend U.S. GDP above, $\hat{Y\$}_{USt}$.

It will be useful to examine plots of some of these variables. Fig. 2 plots $MSCI_t^*$ and $SP1200_t^*$ for the common 1989–2013 period. It is obvious that these two variables are highly correlated. They are essentially measuring the same thing.

Fig. 3 plots $MSCI_t^*$ and $SP500_t^*$ for the 1980–2013 period. Remember that $SP500_t^*$ is for the United States only. These two variables are highly correlated from 1997 on. From 1985 through 1996, $MSCI_t^*$ is noticeably larger. Stock markets were stronger outside of the United States during this period.

Fig. 4 plots BIS_t and $USHOUSE_t$ for the 1980–2013 period. Both variables show sharp increases between 1997 and 2006. However, the huge fall in *USHOUSE* between 2006 and 2011 is not reflected in *BIS*. There is a fall, but it is modest. Remember that *BIS* is a property price variable, not a wealth variable. Both variables are used in the regression analysis below.

3.4. Plots of sp_t^* and asset variables

Fig. 5 plots sp_t^* and $MSCI_t^*$ lagged one year, i.e., $MSCI_{t-1}^*$. The negative correlation is remarkable. The figure indicates why the regression results below are so strong. Finally, Fig. 6 plots sp_t^* and $USHOUSE_t$ lagged one year. Comparing Figs. 5 and 6, the large increases in housing values did not begin until the late 1990 s, whereas the large increases in stock values began in the mid 1990 s. Also, housing values did not fall in the early 2000 s, contrary to stock values.

Table 2
Regression Results, Δsp_t^* is the left-hand-side variable.

	(1)	(2)	(3)	(4)	(5)
constant	0.00045 (0.38)	0.00059 (0.52)	0.00082 (0.70)	0.00244 (1.70)	0.00045 (0.26)
$\Delta MSCI_{t-1}^*$	−0.00131 (−5.96)				
$\Delta SP1200_{t-1}^{**}$		−0.00131 (−6.58)		−0.00134 (−6.33)	−0.00132 (−6.44)
$\Delta SP500_{t-1}^*$			−0.00050 (−6.16)		
$\Delta USHOUSE_{t-1}$	−0.03763 (−2.91)	−0.03665 (−3.01)	−0.04323 (−3.48)		−0.03660 (−2.95)
ΔBIS_{t-1}				−0.00043 (−2.30)	
$\%\Delta WORLDY_{t-1}$					0.0000221 (0.10)
SE	0.00674	0.00636	0.00661	0.00670	0.00647
R^2	0.675	0.710	0.687	0.678	0.710
DW	1.52	1.42	1.71	1.34	1.43

Estimation period: 1982–2013, 32 observations.
OLS estimates.
t-statistics are in parentheses.
Range of sp_t^* is −0.0138 to 0.0706.
$MSCI^*$=MSCI global stock index normalized by world trend GDP.
$SP1200^{**}$=global stock index from Standard & Poors normalized by world trend GDP, spliced to $MSCI^*$ for 1980–1988.
$SP500^*$=U.S. stock index from Standard & Poors normalized by U.S. trend GDP.
BIS=BIS world residential property price index.
USHOUSE=U.S. nominal market value of housing normalized by U.S. trend GDP.
WORLDY=world GDP.

4. Reduced form regressions explaining sp_t^*

In Table 2 the change in sp_t^* is regressed on one-year lagged changes in asset values. Before discussing these results, how should these regressions be interpreted? Consider sp_t^* as an endogenous variable in a large world simultaneous equations structural model, with many endogenous, lagged endogenous, and exogenous variables, where some of the explanatory variables are lagged asset values. (Remember from the discussion in the Introduction that there are likely to be wealth effects on household expenditures.) Now solve for the reduced form equation for sp_t^*, where sp_t^* is then a function of lagged endogenous variables and exogenous variables. Take the first difference of this equation, where the change in sp_t^* is then a function of the changes in lagged endogenous variables and exogenous variables. If lagged asset values are explanatory variables in the overall model, then the changes in lagged asset values will be in the reduced form equation. Let ΔA_{t-1} denote the change in some lagged asset value. If ΔA_{t-1} is uncorrelated with all the variables in the reduced form equation, an OLS regression of Δsp_t^* on a constant and ΔA_{t-1} will result in a consistent estimate of the coefficient of ΔA_{t-1}.[4]

[4] This is assuming linearity. For a nonlinear structural model, it may not be possible to solve for the reduced form equation analytically. In this case estimating a linear reduced form equation is only an approximation.

How good is the assumption that ΔA_{t-1} is uncorrelated with all the variables in the reduced form equation, where A is a world stock index or a housing index? The assumption is valid if the change in A is simply a random walk with drift, which is supported by much of the finance literature. Results reported in footnote 11 in Fair (2016) are consistent with this assumption. No significant effects could be found of various lagged macroeconomic variables on the changes in U.S. stock and housing values. The results in Table 2 will thus be interpreted as producing consistent coefficient estimates, subject to the nonlinear issue discussed in the previous footnote.

The measurement error in sp_t^* is probably small, since the values of s_t^* in Table 1 are fairly small, although there is, of course, some measurement error. Measurement error in Δsp_t^* in Table 2 will increase the estimated standard errors, but it will not lead to bias in the coefficient estimates if the error is uncorrelated with the right hand side variables.

Equations (1), (2), and (3) in Table 2 use the U.S. housing wealth variable, *USHOUSE*, plus different stock variables: $MSCI^*$, $SP1200^{**}$, and $SP500^*$, respectively. Remember that $SP1200^{**}$ is spliced from 1988 back using $MSCI^*$. The R^2's are remarkably high–0.675, 0.710, and 0.687 respectively, consistent with the plots in Figs. 5 and 6. The largest R^2 is for $SP1200^{**}$, but they are all close. Remember that $SP500^*$ is for the United States only. Given the high correlation between $SP500^*$ and world stock values, especially since 1997, using $SP500^*$ in place of the world indices yields roughly the same results. The U.S. housing wealth variable has a consistent coefficient estimate in all three regressions, and its coefficient estimate is little affected by which stock variable is used.

Equation (4) is equation (2) with *BIS* replacing *USHOUSE*. The coefficient estimate of ΔBIS_{t-1} is negative as expected and significant, although the fit of the equation is not as good as when *USHOUSE* is used. It would appear that *USHOUSE* is capturing world housing wealth effects better than is *BIS*.

Equation (5) is equation (2) with the lagged percentage change in world GDP, denoted $\%\Delta WORLDY_{t-1}$, added. This variable is not significant and adds nothing to the explanatory power of the equation. It is not a good proxy for the other explanatory variables in the reduced form equation.

Other robustness checks were also made. The percentage change in world GDP lagged twice was added, and it was not significant. Nor were the change in asset variables lagged twice. The change in *USHOUSE* lagged twice was significant in equations (1) and (2), but the coefficient estimates were of the wrong sign.

Finally, it is interesting to note that the huge increase in sp_t^* in 2009 is an informative example of what the regression results are picking up. Consider Figs. 5 and 6. In 2008 (remember that the asset values are lagged once in the figures) both stock values and housing values fell dramatically. This is contrary to a number of other years in which they moved in opposite directions. The regression results are picking up the fact that these two falls preceded the huge increase in sp_t^* in 2009—an increase larger than any of the other increases in the sample period.

5. Theories

As noted in the Introduction, the regression results in Table 2 are consistent with the existence of estimated wealth effects in the literature. What is remarkable is how much of the variance of the change in sp_t^* can be explained by the lagged change in two asset variables.

A theory consistent with the results in Table 2 is that world asset changes like stock changes affect 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. 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.

As noted in Section 4, there are other variables in the reduced form equation for sp_t^* aside from the variables in Table 2. These are likely to include current exogenous fiscal-policy variables and various lagged endogenous variables. If, for example, the monetary policy rule for a country has the lagged value of the country's unemployment rate as an explanatory variable, the lagged value of the unemployment rate will be in the reduced form equation for sp_t^*. Given the above theory, the best explanation of sp_t^* is likely to come not from estimating a reduced form equation but from estimating a multi-country structural model with lagged asset values in the consumption and investment equations and then solving for sp_t^*.

Another 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.

Under this second theory the regressions in Table 2 are not causal. They are simply picking up correlations between changes in sp_t^* and changes in lagged asset values. What can be said is the following: Say there are two forces, like expectation changes. Say that one force affects both asset values and private spending and the other affects only spending. The effects of the second force go into the error term in the regressions, since the second force affects the left hand side variable but not the right hand side variables. The regressions will be picking up the effects of the first force, but not the second. The high correlations in Table 2 thus suggest that this first force is quite important.

If asset-price changes (or forces like changes in productivity expectations that drive asset-price changes) are essentially unpredictable, then the present results suggest that much of the change in sp_t^* is unpredictable. In a complete structural model some of the change in sp_t^* would be predictable because it would depend on various exogenous and lagged endogenous variables, including various exogenous fiscal-policy variables. The main message here is that so much of the change in sp_t^* seems to be driven by (unpredictable) changes in asset prices.

If the forces behind asset-price changes are largely 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.[5] 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 (or not lowering) 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 1990 s and 2006. Had there been more regulation, housing prices may not have risen as much as they did. The 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^* are undesirable, policy actions or lack thereof may bear part of the blame.

Finally, although the discussion in this paper has focused on sp_t^*, it could, of course, have focused on the world government financial saving rate, sg_t^*, which is $-sp_t^*$ aside from measurement error. Under the first theory discussed above, an increase in world asset values stimulates world consumption and investment and leads to a fall in sp_t^* and thus a rise in sg_t^*. The main reason for the rise in sg_t^* is the increase in tax revenue due to the more expansive world economy. Under this theory the behavioral changes caused by the increase in asset values are increases in world private consumption and investment. Governments play a passive role. sg_t^* changes because tax revenue changes. It may be that an increase in asset values leads to a decrease in discretionary government spending and/or an increase in discretionary tax rates, but this is probably quantitatively small. This paper is based on the assumption that these discretionary effects are negligible. The driving force behind the large government deficits in the world in 2009 is likely the huge fall in world equity and housing values that led to large decreases in private consumption and investment. Under the second theory the driving force is a change in expectations that led directly to large decreases in asset values, consumption, and investment. In either case the increases in the deficits were caused by the fall in tax revenue due to the fall in private spending.

6. Conclusion

This paper has constructed for the first time data on the world private financial saving rate. There is a large negative correlation between changes in this rate and lagged changes in world stock and housing values. A theory consistent with this result is that there are large wealth effects on consumption and investment spending.

Appendix A. Data collection for sp_t^*

Except for the stock and housing data, 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, $S\$_{it}$, was taken from the Balance of Payments section. When available, variable 129*ba*, balance on current and capital account, was used. When this variable was not available, the sum of variable 78*ald* (current account, n.i.e.) and variable 78*bcd* (capital account, n.i.e.) was used. Variable 78*bcd* 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 78*ald* and 78*bcd* is the balance on the financial account except for net errors and omissions. All three variables. 129*ba*, 78*ald*, and 78*bcd*, are in U.S. dollars.

Government financial saving, SG_{it}, for each country was taken from the Government Finance section. When available, variable *anob*, net operating balance, was used. If variable *anob* was not available but variable *agob*, gross operating balance, was, *agob* was used. If neither variable *anob* nor *agob* was available, variable *ccsd*, cash surplus/deficit, was used. 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 that fiscal-year. SG_{it} is in units of the country's currency, and it was converted to U.S. dollars by dividing by the exchange rate, e_{it}: $SG\$_{it} = SG_{it}/e_{it}$. e_{it} is variable *rf* in the IFS data.

Nominal GDP for a country, Y_{it}, was taken from the National Accounts section. It was one of the following five variables: 99*b*.., 99*b*. *c*, 99*b*. *d*, 99*bp*., and 99*bac*. Y_{it} is in units of the country's currency, and it was converted to U.S. dollars by dividing by e_{it}: $Y\$_{it} = Y_{it}/e_{it}$.

[5] 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.

The private financial saving of a country in U.S. dollars is taken to be: $SP\$_{it} = S\$_{it} - SG\$_{it}$. The country's private financial saving rate is taken to be: $sp_{it} = SP\$_{it}/Y\$_{it}$. The country's government financial saving rate is taken to be: $sg_{it} = SG_{it}/Y_{it}(= SG\$_{it}/Y\$_{it})$.

The data are thus constructed from only a few IFS variables, at most five per country. 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 2013. In a few cases there were small gaps of a year or two in the SG_{it} data for a country, and in these cases values for SG_{it} were constructed by interpolating values of sg_{it} and then computing values for SG_{it} from the interpolated values for sg_{it} and the actual values for Y_{it}. Also, in a few cases values for sg_{it} at the end of the period were extrapolated using the last available value for sg_{it} and then computing SG_{it} from the extrapolated values for sg_{it} and the actual values for Y_{it}. The

Table A1
Countries in the Summation.

	IFS code	Country
Group 1: 1980–2013		
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	243	DOMINICAN REPUBLIC
19	258	GUATEMALA
20	268	HONDURAS
21	273	MEXICO
22	278	NICARAGUA
23	288	PARAGUAY
24	293	PERU
25	313	BAHAMAS, THE
26	443	KUWAIT
27	456	SAUDI ARABIA
28	542	KOREA, REPUBLIC OF
29	548	MALAYSIA
30	558	NEPAL
31	576	SINGAPORE
32	616	BOTSWANA
33	664	KENYA
34	678	MALI
35	684	MAURITIUS
36	714	RWANDA
37	738	TANZANIA
38	924	CHINA,P.R.: MAINLAND
Group 2: 1990–2013		
1	128	DENMARK
2	144	SWEDEN
3	156	CANADA
4	182	PORTUGAL
5	196	NEW ZEALAND
6	253	EL SALVADOR
7	339	BELIZE
8	436	ISRAEL
9	449	OMAN
10	524	SRI LANKA
11	534	INDIA
12	556	MALDIVES
13	564	PAKISTAN
14	618	BURUNDI
15	666	LESOTHO

Table A1 (*continued*)

	IFS code	Country
16	744	TUNISIA
17	918	BULGARIA
18	944	HUNGARY
Group 3: 2000–2013		
1	122	AUSTRIA
2	137	LUXEMBOURG
3	142	NORWAY
4	174	GREECE
5	176	ICELAND
6	228	CHILE
7	298	URUGUAY
8	311	ANTIGUA AND BARBUDA
9	343	JAMAICA
10	369	TRINIDAD AND TOBAGO
11	469	EGYPT
12	474	YEMEN, REPUBLIC OF
13	513	BANGLADESH
14	522	CAMBODIA
15	532	CHINA,P.R.: HONG KONG
16	536	INDONESIA
17	686	MOROCCO
18	694	NIGERIA
19	746	UGANDA
20	911	ARMENIA
21	913	BELARUS
22	915	GEORGIA
23	916	KAZAKHSTAN
24	917	KYRGYZ REPUBLIC
25	921	MOLDOVA
26	922	RUSSIAN FEDERATION
27	926	UKRAINE
28	935	CZECH REPUBLIC
29	939	ESTONIA
30	941	LATVIA
31	946	LITHUANIA
32	948	MONGOLIA
33	960	CROATIA
34	963	BOSNIA & HERZEGOVINA
35	964	POLAND
36	968	ROMANIA

Table A2
Construction of the variables.

Variable	Construction
Data:	
$S\$_{it}$	IFS 129*ba* or 78*ald* + 78*bcd*
SG_{it}	IFS *anob* or *agob* or *ccsd*
e_{it}	IFS *rf*
Y_{it}	IFS 99*b*.. or 99*b*. *c* or 99*b*. *d* or 99*bp*. or 99*bac*
Individual Construction:	
$SG\$_{it}$	$=SG_{it}/e_i$
$Y\$_{it}$	$=Y_{it}/e_{it}$
$SP\$_{it}$	$=S\$_{it} - SG\$_{it}$
sp_{it}	$=SP\$_{it}/Y\$_{it}$
sg_{it}	$=SG\$_{it}/Y\$_{it}$
World Construction:	
s_t^*	$=\sum_{i=1}^{N} S\$_{it}/\sum_{i=1}^{N} Y\$_{it} \approx 0$
sp_t^*	$=\sum_{i=1}^{N} SP\$_{it}/\sum_{i=1}^{N} Y\$_{it}$
sg_t^*	$=s_t^* - sp_t^* \approx - sp_t^*$

N is the number of countries.

same procedure was followed for missing values of $S\$_{it}$, although there were very few of these. Finally, in a few cases values of Y_{it} had to be interpolated or extrapolated.

For the 1980–2013 period there are 38 countries for which observations on sp_{it} are available for all years. These are listed in Table A1. For the 1990–2013 period 18 more countries are added, and for the 2000–2013 period 36 more countries are added. These countries are also listed in Table A1. 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 $SP\$_{it}$ across all countries divided by the sum of $Y\$_{it}$, denoted sp_t^*.

As a check on the data, it is informative to look at the sum of $S\$_{it}$ across all countries divided by the sum of $Y\$_{it}$, denoted s_t^*. This ratio should be zero, and it is of interest to see how far away from zero it is. sp_t^* and s_t^* are examined in Section 3. The world government financial saving rate, denoted sg_t^*, is $s_t^* - sp_t^*$. Since (as shown in Table 1) s_t^* is approximately zero, sg_t^* is approximately $-sp_t^*$. Without measurement error it would be exactly $-sp_t^*$. Table A2 summarizes the data collection and the construction of the variables.

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