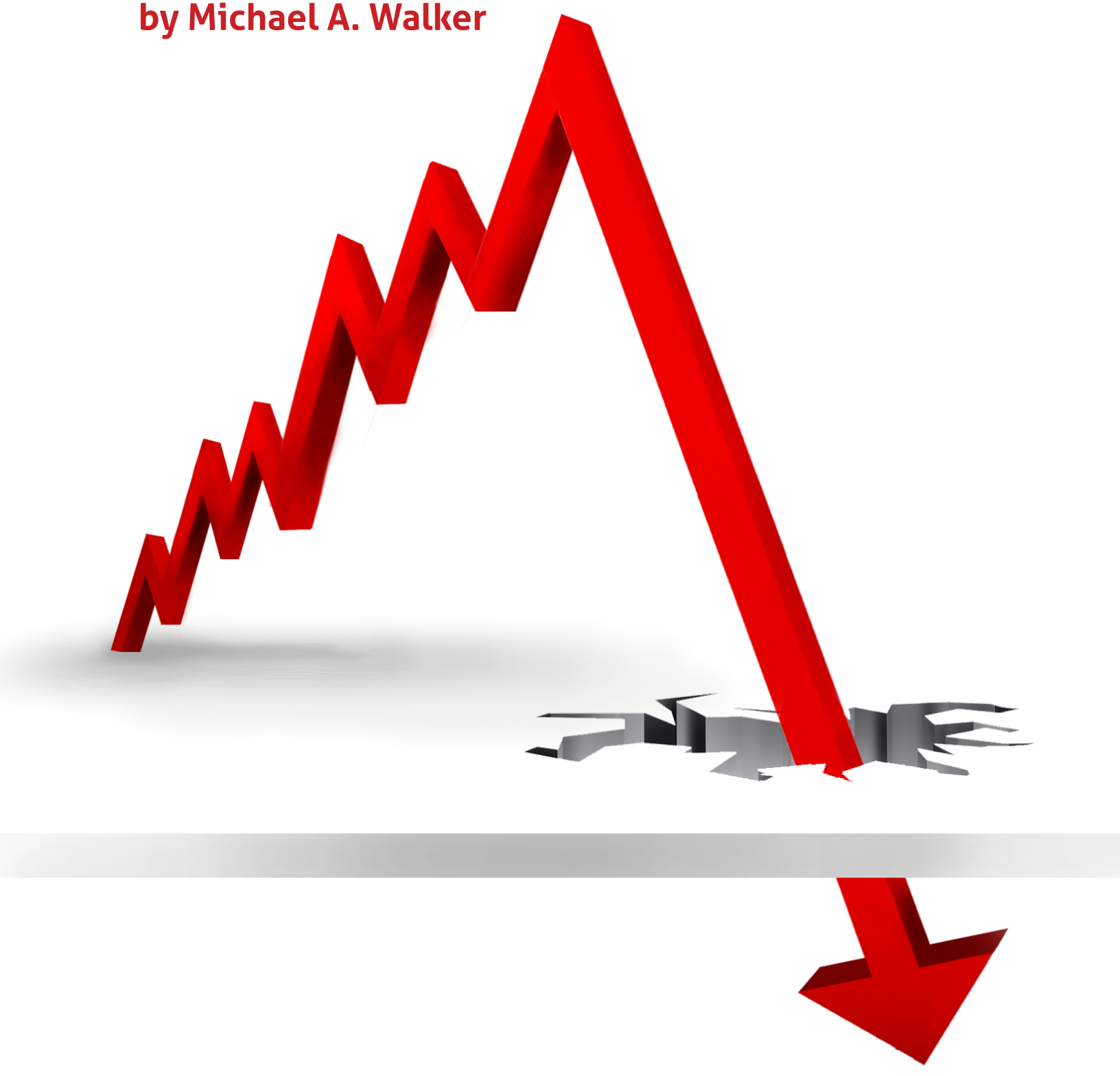
Why are Interest Rates So Low?

A Framework for Modeling Current Global Financial Developments

FRASER INSTITUTE

February 2016

by Michael A. Walker



February 2016 • Fraser Institute

Why Are Interest Rates So Low?

A Framework for Modeling Current Global Financial Developments

by Michael A. Walker

Contents

Executive summary

This paper is the latest version of my attempt to convey to others the sense of a model and my understanding about current financial markets that I have been developing and using for my own financial planning and my advice to others since 2009. It is an amalgam of some simple observations and statistical regularities with some comments about the economic theory toolbox that is in widespread use but which is not functional in current circumstances. One of my economist mentors and a founding member of the Fraser Institute's Editorial Advisory Board, Harry Johnson, used to say that most things about economics are simple; the problem is to recognize simplicity when you see it.

At the core of this paper are a few simple observations. The first is that while the virtues of saving and the evils of indebtedness are widely understood and universally supported, the fact is that every saver who wants to earn a return needs a debtor as an accomplice. Because of the anonymity of financial institutions, the connection is not appreciated and indeed most people taking a loan or a mortgage think they are getting it from the bank or credit union. Of course, they are getting it from a saver/depositor who needs the borrower as much as the borrower needs the saver.

The second observation is that our theories or models for describing whole economies rely on the extrapolation to the national level what we observe in the behavior of individuals. So, the standard theory about interest rates and saving is based on how an economy would behave if it were the simple aggregation or summation of all households on the assumption they all behave like a typical household. As long as the typical household is representative, that is not a problem. However, there is strong reason to believe that in the current economy of the world, typicality, if I can call it that, has broken down; as a consequence, the inferences made using the standard model are incorrect.

The third observation, though not so obvious, is that the only time the representative household model will work for understanding interest rates and most likely for other economic magnitudes is when there is constant population growth. Constant population growth ensures that there will al-

ways be a "typical" relationship between borrowers and savers. That typical relationship is that there is always a greater volume of incipient borrowing than incipient saving. So interest rates perform the function of "rationing" the number/volume of borrowers/borrowing to pair up with the smaller number/volume of savers/saving or encouraging more savers/saving to occur. The paper explores the implications for interest rates when, as at present, population growth is not constant and when, as a consequence, a relative shortage of borrowers emerges as saver cohorts dominate the population.

The conclusions are that:

1) Interest rates in the 29 economies that make up 90 percent of the world's GDP are low because—and to the extent that—these economies are experiencing a dearth of borrowers and hence a relatively high saver-to-borrower ratio;
2) The dearth of borrowers has removed the power of monetary policy to increase the inflation rate in many countries because the potency of monetary policy as currently operated is derived from loan growth in the banking system;
3) The Japanese deflation experience has been badly misdiagnosed because the standard model used in the diagnosis does not work in Japanese demographic circumstances;
4) The world's largest economies are rapidly approaching Japan-like demographics—and the deflationary implications of that situation;

This paper explores various implications of these main points and performs several statistical tests that support the paper's findings.

Introduction

Why are interest rates so persistently low? Is it due to the effect of monetary policy and the efforts of central banks to stimulate economic recovery? Is it the result of too much liquidity sloshing around the world economy as an after effect of the world economic crisis? Is it the declining rate of inflation that has followed the widespread use of inflation targeting by central banks? Whatever is causing the downward trend in interest rates and the yields on other assets, is it a temporary development or the harbinger of a very different sort of financial future?

This paper contends that the answer to this and other questions that will continue to crop up in financial markets may be found in the consideration of demographic patterns and how they work through the structure of the economy. While there is much discussion of demographics—now so pervasive that it is impossible to avoid—there seems to be very little integration of this discussion into the popular or professional consideration of financial sector developments that are so increasingly puzzling and worrisome.[1] The paper attempts to draw on considerable demographic data to show that a proper understanding of the emerging demographic profile of the world provides much understanding of what we are observing in financial markets and gives a relatively simple framework for probing the future.

[1] While the demographic impact on financial outcomes is not much in popular discourse, there has been considerable academic attention to the subject, particularly in regard to overlapping generations (OLG) modeling. These equilibrium models hypothesize a theoretical structure and simulate various outcomes by inserting parameters based on a further set of reasonable assumptions about the range of values these parameters might take in a real world context. A typical such model, which entails a global simulation of the impact of various demographic changes, was written for the IMF by Robin Brooks in 2003. Some of the structures in this model anticipate the real world statistical estimates contained in his paper. The causal pathways in his paper are, however, different.

What Determines Interest Rate Movements?

The first bit of the interest rate story has to be a reprise of the fundamentals of the sectoral flow of funds, which is the backbone of every economy's financial markets.[2]

The sectors in the traditional analysis are households, business, government, and the foreign sector. After the fact the flows between and amongst these sectors must sum to zero. If households are in deficit, one, some, or all of the other sectors must be in surplus. If governments are in deficit and the household and business sectors are in balance, then the foreign sector must have financed the government deficit.

While *ex post* all the sectors sum to zero, it often happen that the plans of the different sectors are not compatible. For example, if all the sectors except government are expecting to run surpluses, net savings in these sectors can only be realized if the government sector is in deficit. If all sectors plan for surpluses, some of these plans cannot be realized. If households are planning to be net savers, then the income of the business and government sectors will be reduced as national income is lower than anticipated and business and government will tend towards deficit and the lower levels of income will also reduce the ex post level of savings achieved by the household sector.

The plans and actual outcomes for the sectors produce corresponding flows of funds as the net wealth position of the sectors adjust to the inflows and outflows. Those changes are achieved in part by changes in market in-

[2] In his November 2012 paper, *Long-Run and Short-Run Determinants of Sovereign Bond Yields in Advanced Economies*, Tigran Poghosyan analyzes the factors suggested by the literature as determinants of the movements in real long-term government bond rates. He identifies the following variables as relevant and reflective of the current state of understanding: Ratio of general government debt to GDP, potential real GDP growth, changes in the debt ratio, changes in inflation, changes in real short-term interest rates, changes in potential real growth, and changes in the government's primary balance ratio. It is the conventional model, and yet the state-of-the-art, but it makes no mention of the mechanism discussed in this paper.

terest rates, which cause a change in the plans of the sectors as the clash of expectations is sorted out. Fundamental to the theory of how this happens is that the intended levels of savings rise as interest rates rise and fall as interest rates fall. The attempt of all sectors to save causes a fall in consumption levels, interest rates, and income levels, which in turn reduces the intended level of savings even as it reduces the actual level of savings achieved.

The supply and demand for financial assets

The lifeblood of financial services providers, which facilitates the inter-sectoral flow of funds, is the creation of financial instruments that are the manifestation of the surplus and deficit conduct of the sectors. Households that plan to run a deficit issue financial instruments in the form of mortgages, car loans, and credit card account increases, which in turn provide the opportunity for other sectors or households to realize their plan to save by acquiring these "investments" from the deficit households. Governments that plan to run a deficit issue bonds or non-interest bearing securities which provide an opportunity for those intending to save to be able to realize that ambition. Businesses issue mortgages, bonds, and equities to enable them to spend more than they earn so as to invest in increased capacity, etc. These primary securities are purchased by other firms and by households that are planning to save.

The foreign sector is the portal through which countries can globalize the adjustment to changes in the saving and investment behaviour of the domestic sectors. The acquisition of foreign assets enables domestic savers to realize their ambition, even if there are no domestic deficits to satisfy that appetite to acquire financial assets. Of course, the use of the foreign sector to balance the inter-sectoral flows of funds may also have exchange rate repercussions, which complicates the details but not the overall dynamics of the adjustment.

The accumulation and extinguishment of debts and financial assets

The intermediation of financial institutions obscures the direct connection between the elemental actors in the flow of funds and the accumulation of financial claims. Getting a bank loan is, in reality, getting a loan from some other member of society through the services of the bank. The person or business who acquired the savings account with the bank is the real provider of the loan or the mortgage. The bank is the go-between. This is not just a pedantic distinction. The fact that the focus is on the bank and not the

real recipients and the real providers of credit makes it more difficult to see what may be happening when financial markets produce unusual outcomes.

The bank, in turn, may not rely on the resources made available by its own deposit customers, but may sell the mortgage to a pension fund with a marked-up cost. The pension fund, in turn, is the pooled resources of the members of the pension plan or pension fund—predominantly, individuals about to retire or actually in retirement. The relationship between the ultimate saver and the ultimate borrower is further obscured by this sale of the mortgage by the bank and makes it even more difficult to see the forces that are at work.

While veiled by the institutions through which they are transacted, the by-product of these activities is the accumulation of wealth in the form of the promises to pay that the deficit units issue to the surplus units under some terms. The intention of the soon-to-be deficit units to acquire tangible assets—a house, say—is facilitated by the surplus units and the intention of the deficit units to spend more than they earn, and provides the savers with the asset they need to give effect to their intention to save. Of course the saver is not motivated by the needs of the deficit unit but rather is accommodating the needs of the deficit units in order to accumulate purchasing power that the saver will use to enable future consumption.

The mortgage used to buy the house creates a tangible asset with its stream of housing services while at the same time creating a stream of payments—the mortgage payments—that provide the income stream that the savers want. The house owners are the providers of the income stream and the house is a real asset that gives the savers—or their bank—confidence that the payments will continue to be paid. Cast in these terms, the accumulation of debt by consumers, which is often castigated as bad in media stories, can be seen as the necessary counterpart to the supposedly more virtuous behaviour of savers.

The interactions of surplus and deficit units in the economy and the creation of different kinds of debt instruments in this way lead to the gradual building of a stock of real assets as well as the production of the stock of financial assets that savers require. The real assets once created last for half a century or more. The associated financial assets begin to disappear almost as soon as they are created as payments by the borrower consist of both interest and return of capital.

Once a mortgage on a house is "paid off," the income stream that its owners provided to savers is extinguished unless the owners re-mortgage in order to use some of their equity in the house to buy other real assets or spend on consumption goods. Of course there is still a stream of income produced by the house, but it is in the form of housing services which are consumed by the owner/inhabitants.

So, while the tangible assets purchased by deficit units accumulate, the income streams to savers are constantly dwindling and the savings repaid must be constantly reinvested in the purchase of new income streams. This latter process is invisible to the saver who, relying on a bank or investment fund or other intermediary to find the income streams, only sees the interest paid on their savings account, or the growth of their pension assets or their mutual fund.

Adding the lifecycle of households, business, and nations

The flow of funds analysis is a powerful tool for analyzing what is happening in the economy and why. It becomes even more powerful when it is modified to include the lifecycle behaviours of the participants. By this we mean the fact that as people, businesses, and nations grow, develop, and age, their financial behaviours change to reflect the changing motives and objectives of their stage of life. While it may seem odd to apply the notion of lifecycle to a business or a nation, each has their own aspects of lifecycle transformation that emulate the lifecycle behaviour of households. In the case of nations, the lifecycle transformations arise largely from the changing age structure of their populations.

The lifecycle aspects of businesses are well recognized. New businesses have risk and opportunity, innovation, and real cost reduction, which attract people and firms to lend them money. The new business builds its asset value by using borrowed and shareholder money to expand its output and reduce its costs by adopting cost-saving technologies and learning how to be more efficient. Gradually the nature of the firm changes as its technology becomes standard and its income more predictable and less risky, and it becomes a "dividend" stock or a "cash cow." In both these stages the firm is generating real products or services flows for the economy and at the same time providing income streams to the bondholders and shareholders who own it. Eventually many firms are eclipsed by competitors and go into a liquidation phase where the income streams they have provided are extinguished. Of course, some firms last a very long time and through continuous innovation are successful in fending off the liquidation phase and the phases of development are not as obvious and predictable as are the phases of household development.

What is clear, however, is that continuous innovation and development is necessary if savers are to have access to the business-based assets and their income streams they need in order to realize their plans to defer some of their lifetime consumption to the latter stages of their life. As with

households, there is a relentless extinguishment of business-sourced income streams as the invested capital is returned to the owners either as debt repayment or capital dividend payments. An obvious exception is the firms that continue to innovate and grow and whose share prices and dividend streams continue to increase apace. But these firms are the exception as the normal process is that firms "pay out" and the owners reinvest the capital into new enterprises, or the capital is lost as the firm fails to compete.

To take the analysis to the next step, we return to consider the dynamics of the household sector, which is the fundamental source of the decisions that influence the course of economic development. The driving force of the householder is to smooth out their consumption expenditures so that their annual spending is as high as it can be subject to their need to spend no more over their lives, including any legacy they may leave, than they earn over their lives. In this behaviour we can distinguish three lifecycle phases: the spending-greater-than-income stage, the income-greater-than-spending stage and again, the spending-greater-than-income stage.

Spending-greater-than income in early life is the income deficit stage where the household is purchasing houses, automobiles, furniture, etc., and borrowing from banks and other institutions. This is the period when the household is acquiring real assets and issuing the counterpart financial claims against themselves and their newly produced real assets or their anticipated future income.

The income-greater-than-spending period of life is when the household is accumulating savings for retirement. Some of that will come from housing and other assets already accumulated, but a significant fraction of it will come from additional saving to ensure that their ability to spend will not sag during retirement. In late retirement, there is again, for many households, a consumption-greater-than-income phase as assets accumulated during the second phase are sold to sustain consumption toward the end of the lifecycle.

The lifecycle, the normal state of the world, and the determination of interest rates

For the purposes of understanding the movements in real interest rates, we can characterize these three phases of the lifecycle as: the supplying of financial instruments phase, the demanding for financial instruments phase, and the extinguishment of financial instruments phase. Of course they are not mutually exclusive. A young family borrowing to buy a house, a car, and other durables may also be setting aside money for retirement through private pension plans as well as the compulsory government retirement plans.

The classification still holds, however, if we think in terms of all of these activities in net terms.

So, there is a cohort that is basically trying to finance its spending and investment activities on favourable terms, a cohort that is trying to lend on favourable terms, and a small sector that is trying to sell its accumulated assets at the best price to finance its last period of consumption. In the normal course of development, as was experienced during much of the twentieth century, the borrowing cohort was large and growing as birth rates were generally far above replacement rates and population grew overall. There was a corresponding surge in the supply of financial instruments that hopeful borrowers were offering to the saver cohort. The borrower cohort was larger than the saver cohort and the cost of borrowing reflected that as the limited supply of savings was rationed amongst the borrowers by upward movements in interest rates.

The background of constant growth influenced not only the actual path of interest rates, but also the models that economists constructed to describe the economy and attempt to predict its course. The most famous such characterization was by John Maynard Keynes in his *General Theory of Employment, Interest and Money*. Keynes's theory was solidly grounded on the presumption that population growth was a normal feature of the economy and that he could safely assume that future population increases would be quite similar to those in the past. The core assumption of the theory was that household spending behaviour was driven by the household's current income; the key parameter of the Keynesian system is the so called "propensity to consume."

Keynes was aware of the fact that consumption behaviour changed over the lifecycle of the household. In fact, he had high praise for the 1928 "theory of lifecycle consumption optimization" that had been constructed by the brilliant mathematical economist Frank Ramsey (Ramsey, 1928). However, Keynes's model implies constant population growth and the belief that the trade-off between present and future consumption would not change as the economy grew. Given all the other things that Keynes was addressing in his *General Theory,* and the fact that population growth seemed in fact to be inexorable, he can be forgiven for allowing these assumptions to be built into his model.

Keynes, like all other theorists of macroeconomics, implicitly extended the behaviour of an individual household to the economy as a whole. While this aggregation of households can be a useful approximation of what would be the outcome of all households acting independently in some circumstances, there are some circumstances where it will not. One such circumstance is the one in which we are currently living and will live for the next 50 years or more.

What was missing from the Keynes framework were two crucial features of an economy that affect the propensity to consume. The first is the insight contained in the Ramsey optimization theory of savings, namely, that the consumption pattern of a household or nation would be influenced by interest rates, the extent to which consumers attached a high or low value to their future ability to consume, and their willingness to bear risk associated with those choices. The second is the possibility that there would be a systemic population disturbance that would completely upset the assumed aggregation of household behaviour as some cohorts in the population are over-represented in the observed outcomes.

The Crucial Assumption of the Standard Models—and What Happens When It Is Not Met

If the population is growing at a constant rate, then while the total population increases, the cohort structure of the population has a characteristic pyramidal shape: the number of members of younger generations always exceeds the number of members of older generations. Restated, constant population growth means that the portion of the population that is in the consumption-is-greater-than-income phase will be greater than the group for whom income is greater than consumption. In financial markets this means that there will always be an increasing supply of financial instruments potentially forthcoming as deficit households seek to finance their consumption by issuing debt instruments, as described above, against the security of their future earnings. Business entities faced with continuously increasing demand for their products have to continuously invest in new plant and equipment, and finance them with new debt and equity issues. On the demand side, constant growth means that usually the size of the group of age cohorts for whom income exceeds consumption will be smaller than the group potentially supplying financial assets. Of course the fact that wealth overall is increasing and income-producing assets are continuously being extinguished by those who issue them, means that the exact balance between supply and demand will be more complicated.

The crucial point for the integrity of the standard model is that the balance between the demand for, and supply of, financial assets is regulated by the price of financial assets—interest rates. The fact that the potential sectoral deficit and corresponding supply of such assets in a growing population economy incipiently exceeds the potential demand for them means that interest rates have to be high enough to encourage some potential deficit households or businesses to postpone their spending and solve their deficit problem in that way, or cause some potential demanders to demand more assets. The normal market of the standard model is a savers market.[3]

[3] In the Ramsey model mentioned above, it is the comparison between the interest rate

If the growth of the population is not constant because of changes in the birth rate, immigration rate, or the death rate, then the balance between the cohorts will be altered. If, to use a current example, the birth rate falls below replacement level and the death rate falls because of medical advances, the fundamental assumption of the standard model is not met. The supply of privately produced assets falls as younger cohorts are smaller than those that preceded them. Fewer households and businesses in the deficit phase of development means a slowing in the production of debt and equity instruments and an accelerated destruction of financial assets as mortgages and loans are repaid to the saver. Longer lives and the accumulation of cohorts in the surplus phase of life means an increased demand for financial instruments. The interaction of these two developments produces a decline in interest rates and increasing accumulation of cash as households in surplus are unable to replace the assets that are extinguished by the "paying off" of mortgages and consumer debt, and the retraction of corporate debt and repurchase of equity.

A world without growth is a world in which there is a gradual, but inexorable increase in the cash and near-cash holdings of the world as the growth in the increasing demand for financial instruments is not matched by the growth in the supply of them.

A digression on the implications for monetary policy and the Japan experiment

As a sidebar to this discussion, it is interesting, in light of the current discussions about the effectiveness of monetary policy in Japan, for example, to see how monetary policy works in the standard model. According to the rendition of the standard model presented here, monetary policy relies for its effectiveness on the existence of a preponderance of incipient borrowers seeking accommodation. To stimulate the economy, the central bank lowers interest rates, which encourages an increased number of incipient deficit households to borrow and consume or invest, and at the same time discourages households in a surplus position from saving as much. In this case, the accommodation is delivered through the increased supply of money as the central bank provides more reserves and lower interest rates simultaneously, which cause more borrowing, which in turn grows the asset side of the banks' balance sheets. By reducing the opportunity cost of cash, this process induces the public to hold the increased supply of bank deposits (Dingle, Sparks, and Walker, 1971).

and the subjective rate of time preference in conjunction with the household's taste for risk that influences the consumption decisions of households.

Whether central banks are successful in this attempt to stimulate in standard conditions is another matter. But one thing is clear: the power of the central bank to have any effect depends on there being a relative preponderance of borrowers over savers. If saver cohorts dominate, or if the degree to which they increase in importance changes, then monetary policy has a problem to that degree. When saver cohorts dominate, there is a chronic incipient shortage of financial instruments and an accumulation of cash waiting for suitable financial investments (where "suitable" is taken to mean investments with appropriate risk and return characteristics). Under these conditions the central bank is unable to stimulate by adding more cash to the system unless there is a simultaneous change in the risk tolerance of the savers.[4]

Indeed, if the saver cohorts are primarily concerned about the certainty of their ability to maintain their future consumption levels (i.e., very risk averse in Ramsey's model), then the attempt by the central bank to stimulate increased consumption by reducing interest rates will actually cause a reduction in current consumption and an increase in savings because of the future-capacity-to-consume effect of the reduction in interest rates. While this may appear as an unlikely scenario, a study of urban savings behaviour in China by the International Monetary Fund (Nabar, 2011) found that as interest rates dropped, and statistically holding a wide variety of influences constant, savings increased. The study attributed this to target-savers risk-averse behaviour. (Target savers are retirement-bound households who have a desired level of retirement income and who need a larger accumulation of savings to achieve that target when interest rates fall.) The paper recommended that to stimulate the Chinese economy it would be necessary to raise interest rates!

So one way to understand the ineffectiveness of monetary policy in Japan (and as we shall see, increasingly everywhere else) is that there are relatively too few potential qualified debtors! The current expansion of the supply of monetary reserves in Japan will cause a fall in the exchange rate to the extent that economic agents predict that there will be inflationary consequences from the expansion of the supply of reserves. In turn, the fall in the exchange rate may cause industrial prices to rise in Japan, but this will be a one-time change in the cost of imported materials. Saving/investing cohorts so dominate the Japanese financial landscape that it will be very difficult to achieve a sustained increase in the growth rate of the balance sheets of the banks, and therefore of the stock of bank-supplied money necessary to achieve a sustained increase in inflation rates.

[4] This circumstance is superficially similar to the "liquidity trap" implication of the Keynesian analysis, but in that case the elastic demand for cash is created by a lack of demand for investment rather than unsatisfied demand for investments as in the current case.

Summary of the argument

The standard economic model used to understand growth and development relies, whether stated or not, upon the assumption that population will always grow. The substrate of population growth was built into the model through the construction of the consumption and savings behaviour of the population, which was aggregated from the household level to the national level. This apparently innocent aggregation assumption distorted the interpretation of economic process in a way that becomes evident only when the population growth stops. Apart from being homogeneous, the consumption/savings behaviour of individual households in a population is composed of three distinct lifecycle phases and the evolution of economies depends crucially upon the proportions in which each of these phases is present in the population. (What is said of households can also be applied to business.)

The three stages are typified by the ratio of current income to anticipated lifecycle average household income—what Milton Friedman called permanent income. The first phase is when income is below the expected long-term level and households confidently borrow against future prospects to boost current spending above current income levels and the household is in a net deficit. The middle phase is when the household's income is above the lifetime expected average and the household is in net surplus to accumulate assets to sustain consumption when income once again falls below the lifetime average later in life. The final phase is when the household is once again in net deficit (in retirement) as assets are sold to maintain consumption levels. For many households there is no third phase and they remain in surplus until death.

The net deficit units—households and businesses—in any population are the providers of the assets and the net surplus units are the demanders for assets. The relative balance of surplus and deficit units sets the background against which all financial and fiscal processes work themselves out. In terms of our characterization of these phases, that balance is the proportion of the population whose current income is greater than their lifecycle average to those whose income is less than their lifecycle average. This saver/borrower ratio is the net asset demand structure parameter that determines whether the standard model will apply or not, and to what degree.

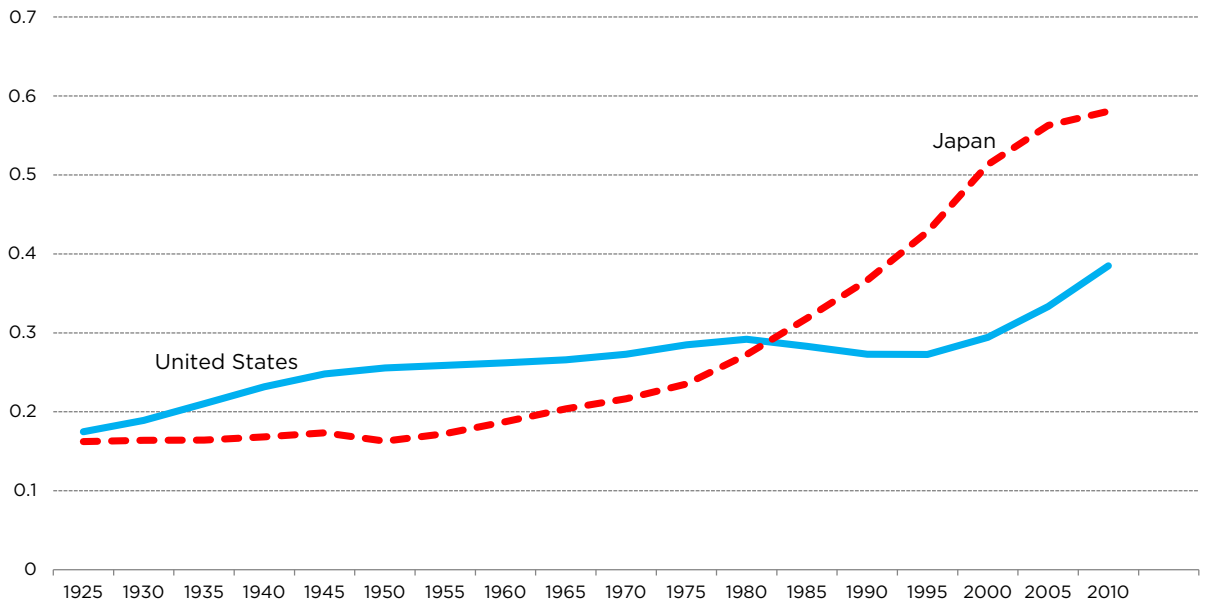
Low values of this ratio describe the sort of world that was anticipated by the standard model. Deficit units—or households or businesses that would like to be so—are much more numerous than surplus units and "the" interest rate moves to ration the scarce supply of savings amongst the deficit units who would like to use them. Generally the interest rate will be higher the greater is the incipient gap between the supply and demand. If,

or as, the ratio rises, there is increased competition amongst those with surpluses to find suitable places for their savings, and the standard model is less predictive of outcomes. At some point, the ratio reaches the level where the standard model ceases to apply and the outcomes become perverse seen through the focus of the standard model since declines in interest rates cause even more saving, not less.

Empirical Application

We cannot directly measure anticipated lifecycle average income and therefore cannot directly measure the saver/borrower ratio. However, we have a way of approximating it because the savers and borrowers are generally in different age groups. While that relationship is not precise, the ratio of the numbers of households in the population groups thought to be in the net savings phase of life to those in the net borrowing phase ought to be a reasonable approximation of what we are trying to measure. As a first attempt to quantify this ratio in this paper, we use the group aged 0 to 49 years as the financial-instrument-producing or borrower group, and the group aged 50 to 75 years as the financial-instrument-demanding or saver group.

Figure 1: Demographically derived saver/borrower ratios for the US and Japan 1920 – 2010



Sources: US Census Bureau and the Statistics Bureau of Japan.

The ratio is calculated as the proportion of the population in the age 50 to 75 group to the proportion in the age 0 to 49 group. The ratio for the US and Japan calculated by the author for five yearly datasets from the websites of the US Census Bureau and the Statistics Bureau of Japan are shown in figure 1. The data for both countries show very gradual change over the 20th century with divergence from a common ratio for both countries in 1920 and a convergence around 1980. From 1980 onwards there is rapid divergence as Japan's ratio increases in an unprecedented way while the US ratio falls marginally. The US ratio then rises rapidly from the early 1990s and in 2010 was rising at the same rate as Japan was in the early 1990s. Dramatic developments would have been expected in the asset markets in both countries around these periods of rapid change in the saver/borrower ratio. And in fact there were–and continue to be–historically unusual financial developments in both countries.

Real world tests for the saver/borrower ratio

There are a number of tests that might be useful to assess this novel way of looking at evolution in the financial sector. The first is whether the saver/borrower ratio fills the bill as a variable to explain the differences in interest rates in different economies at the same period in history when their individual positions in the demographic evolution are different. The second is whether knowledge of a given country's saver/borrower ratio evolution over time provides an explanation of the evolution of interest rates in that country.

Does the ratio help explain the wide variation in interest rates around the world?

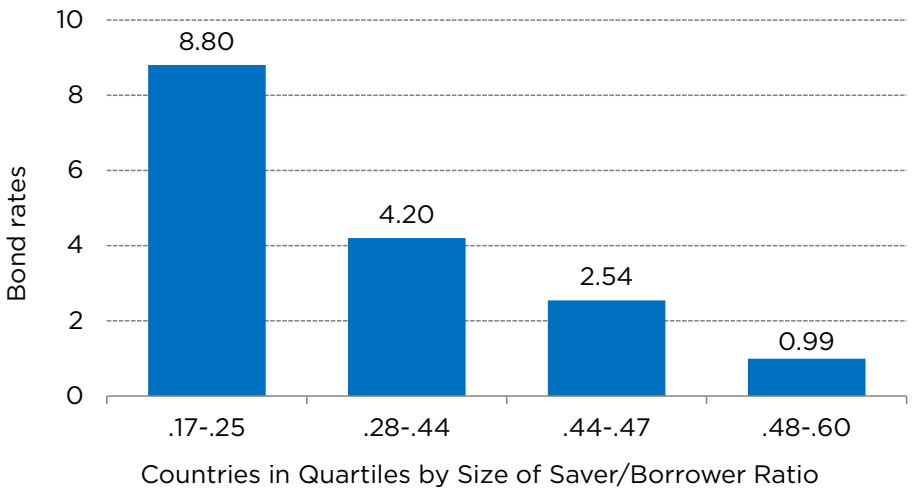
From an economic point of view, 30 countries comprise 90 percent of the world. Specifically, if we use real GDP as the yardstick, 30 countries together produce 90 percent of the world's income. So the first test to which we put the ratio is, can it explain the observed dispersion of interest rates across this diverse group of economic producers? To test this, we use the 10-year bond yields for 28 countries from the Trading Economics website for December 23, 2015. The 29th country, Argentina, has no data on that site, so we substituted the 10-year, US dollar yield bond posted on the website Investing.com, which was projected using a yield curve and data on a three-year, US dollar bond issued by the Treasury of Argentina. No bond yields were available for the 30th country, Saudi Arabia, so we had to settle for 29 of the world's largest economies for our test.

TABLE 1: The 29 countries arranged in ascending order by the size of the demographic ratio; the average level of bond rates declines as the size of the ratio increases

Countries ranked by saver/ borrower ratio	Saver/ borrower ratio 2015	10-year bond rate December 2015	Quartile average bond rate
South Africa	0.17	10.2	
India	0.2	7.76	
Mexico	0.2	6.17	
Indonesia	0.22	8.77	
Turkey	0.23	10.3	
Brazil	0.25	16.28	
Israel	0.25	2.09	8.8
Argentina	0.28	15.69	
China	0.34	2.94	
Thailand	0.35	2.59	
Australia	0.41	2.73	
Norway	0.42	1.46	
United States	0.43	2.2	
Spain	0.44	1.78	4.2
Russia	0.44	9.95	
Korea	0.44	2.09	
United Kingdom	0.45	1.84	
France	0.46	0.929	
Poland	0.47	2.86	
Belgium	0.47	0.89	
Switzerland	0.47	-0.1	2.64
Sweden	0.48	0.99	
Netherlands	0.5	0.742	
Austria	0.5	0.83	
Canada	0.51	1.38	
Italy	0.52	1.62	
Hong Kong	0.54	1.53	
Germany	0.59	0.585	
Japan	0.6	0.275	0.99

Source: Trading Economics website, December 23, 2015. The 29th country, Argentina, has no data on that site, so we substituted the 10-year, US dollar yield bond posted on the website *Investing.com*, which was projected using a yield curve and data on a three year, US dollar bond issued by the Treasury of Argentina.

Figure 2: 2015 Average 10-year bond rates in 29 largest economies arranged by saver/borrower ratio quartiles



Source: Table 1.

The crudest test is to determine if countries with similar saver/borrower ratio values have similar bond rate levels and if groups with higher saver/borrower ratio levels experience lower bond rates. In this test we use the saver/borrower ratio from 2015 to predict the December 2015 interest rates. When the 29 countries are arranged in ascending order by the size of the demographic ratio, we found that the average bond rate levels decline as the size of the ratio increases. The data and the corresponding quartile figure are shown in table 1 and figure 2. The entire dataset is shown because it suggests that while there is undoubtedly a correlation in the data, there are also significant outliers.

In the lowest saver/borrower ratio quartile of countries, Brazil's bond rate is nearly 85 percent higher than the average, and Israel's bond rate is only 24 percent of the average level. In the second quartile, Argentina's rate is much higher than that of the other countries having a similar saver/borrower ratio while the US rate is much lower. In the third quartile, Russia has a much higher bond rate than the ratio would suggest. Countries in the final quartile all have bond rates consistent with their high ratios except Italy and Hong Kong, which have somewhat higher rates than would be expected.

Of course, the ratio of savers to borrowers is not the only determinant of bond rates. Sovereign debt interest rates also reflect the credit worthiness of the sovereign. Argentina, Russia, Poland, and Italy clearly pay more because they are riskier performers as sovereigns go.[5]

[5] The US and Israel are also different than their peers in their quartile because they

This equation explains the 10 year government bond rate in the 29 countries making up 90% of world GDP

Equation 1

Regression Statistics	
Multiple R	0.946127492
R Square	0.895157232
Adjusted R Square	0.882576099
Standard Error	1.56621676
Observations	29

ANOVA

	df	SS	MS	F	Significance F
Regression	3	523.6059663	174.5353	71.15077	2.22923E-12
Residual	25	61.32587346	2.453035		
Total	28	584.9318398			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	12.40603425	4.256120761	2.914869	0.007401	3.640389456	21.171679
Saver/borrower ratio	-13.7325018	3.011962324	-4.55932	0.000117	-19.93575435	-7.5292493
EFW rating	-0.63957393	0.630861561	-1.01381	0.320385	-1.93885764	0.65970977
Inflation rate current	0.642239668	0.083988784	7.646731	5.3E-08	0.469261529	0.81521781

Equation 1 records the result of a regression analysis in which the 10-year bond rates in 29 countries on December 23, 2015 are "explained by" the saver/borrower ratio, the quality of the sovereign as measured by their Economic Freedom of the World Rating in 2015, and the most recently measured consumer inflation rate. This equation indicates that the data do not reject the conjecture of this paper that higher saver/borrower ratios mean lower interest rates, even adjusting for the quality of the sovereign and the impact of inflation. Further, the equation explains 88 percent of the variation in interest rates amongst the 29 countries.

There are many problems with this regression equation, not the least being the fact that there are reasons to suppose that the demographic information reflected in what we call the saver/borrower ratio will also affect the

have significant international interest in their sovereign debt issues. As a consequence, their government bond rates may reflect the saver/borrower ratios in the rest of the world more than those at home. US treasuries are the repository of much of the wealth of foreigners who, for a wide range of reasons, choose US treasuries over the sovereigns of their own country.

This equation explains the 10 year government bond rate in the 29 countries making up 90% of world GDP

Equation 2

Regression Statistics	
Multiple R	0.949320129
R Square	0.901208708
Adjusted R Square	0.87973234
Standard Error	1.585068537
Observations	29

ANOVA

	df	SS	MS	F	Significance F
Regression	5	527.1456677	105.4291	41.96281	8.15871E-11
Residual	23	57.78617212	2.512442		
Total	28	584.9318398			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	11.21866331	4.652709781	2.411211	0.024286	1.593799817	20.8435268	1.593799817	20.84352681
EFW	-0.36471098	0.683471726	-0.53362	0.598727	-1.778579967	1.04915801	-1.778579967	1.049158007
Inflation	0.674385607	0.090162211	7.479692	1.33E-07	0.487870862	0.86090035	0.487870862	0.860900352
Saver/Borrower ratio	-16.5882824	3.915207103	-4.23689	0.000312	-24.68750535	-8.4890594	-24.68750535	-8.489059409
Debt/ GDP ratio	0.007812457	0.008536928	0.915137	0.369615	-0.009847525	0.02547244	-0.009847525	0.025472438
GDP Growth rate	-11.9699799	17.63026459	-0.67894	0.503948	-48.44096087	24.5010012	-48.44096087	24.50100117

inflation rate and the political choices influencing the institutional features captured in the Economic Freedom of the World rating. Nevertheless, the equation does not reject the hypothesis that the structure of the population's lifecycle stage in a country has an impact on the observed level of interest rates. The theory outlined in this paper suggests that the demographic factors driving the net financial balance between the generations may well be the single most important economic feature of an economy and evidently one of the most important outcomes of the balancing process is the level of interest rates.

One glaring problem with this simple equation for modelling interest rates is that it does not include the factors that the conventional theory suggests are important, other than the inflation rate. These factors were discussed in footnote 2 earlier in the paper. The two most significant factors omitted from the equation are the level of general government debt compared to the level of gross domestic product in the country, and the rate of growth in the economy.

Equation 2 remedies this deficiency and includes both these factors. Their inclusion has no meaningful effect on the equation. The coefficients

This equation explains variation in the Lending Rate published by the World Bank for Japan over the 49 years up to 2010

Regression Statistics

Multiple R	0.950611932
R Square	0.903663045
Adjusted R Square	0.899474481
Standard Error	0.008126619
Observations	49

ANOVA

	df	SS	MS	F	Significance F
Regression	2	0.028496479	0.01424824	215.7453484	4.23874E-24
Residual	46	0.003037929	6.60419E-05		
Total	48	0.031534408			

Equation 3	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	0.112439888	0.005221721	21.53310829	1.15754E-25	0.101929109	0.122950668
Infl lagged	0.055474856	0.032143855	1.725830819	0.091090227	-0.009227369	0.120177081
Saver/borrower Ratio	-0.16782684	0.012158724	-13.80299771	5.7195E-18	-0.192301082	-0.143352598

on the inflation rate and the saver/borrower ratio are not much affected, and the power of the equation to explain the variation in interest rates amongst the 29 countries is not increased. In fact, there is a small reduction in the percentage of the variation explained. The Economic Freedom of the World measure of sovereign risk is not significant in either equation but its impact is further reduced by including the government debt-to-GDP ratio.

At the very least, these statistical tests suggest that the conventional model could benefit from including the saver/borrower ratio.

Does the Saver Borrower Ratio explain the path of interest rates within a country?

A second sort of test of the hypothesis that the saver/borrower ratio is an important determinant of interest rates is to see how well the path of interest rates within a country can be explained by the ratio. Japan and the United States were selected as test cases. We tested both the World Bank lending rate for the period 1961 to 2010 and the 10-year bond rate from

This equation explains the variation in the 10 year Government of Japan bond rate over the 39 years up to 2010. (Japanese bond rates began publication in 1972)

Regression Statistics	
Multiple R	0.947354241
R Square	0.897480057
Adjusted R Square	0.891784505
Standard Error	0.900366458
Observations	39

Equation 4

	df	SS	MS	F	Signif F
Regression	2	255.4803883	127.7401941	157.5755954	1.56513E-18
Residual	36	29.18375131	0.810659759		
Total	38	284.6641396			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	12.60314582	0.781131191	16.13448031	4.66704E-18	11.01893833	14.1873533
Ratio	-20.53804818	1.742683557	-11.7852998	6.47786E-14	-24.07237425	-17.00372211
Infl lagged	2.234509974	4.819720261	0.463618188	0.645712353	-7.540335773	12.00935572

1972 to 2010. (Bond rate data are published by the Japan Statistics Bureau from 1972 onward.)

The Japanese World Bank lending rate data over half a century are well explained by the ratio and the lagged inflation rate. These two variables, shown in equation 3, account for 90 percent of the variation over the period 1961 to 2010.

The Japanese long-term bond rate equation, equation 4, accounts for 89 percent of the variation in the 10-year government bond rate and once again the lagged inflation rate is not a significant contributor to the variance. The Durbin Watson test (d = .6) indicated auto-correlated residuals causing unreliable estimation of the standard error and hence unreliable tests of significance. A Cochrane Orcutt transformation of the equation was undertaken to produce equation 4T, and as can be seen there is no material change in the coefficient on the ratio, while the T statistic is somewhat lower but not by enough to change the inference that the data does not reject the ratio as an explanation of the course of 10-year bond rates.

The equations for US interest rate movements are presented as equation 5 and equation 6. Equation 5 is the attempt to explain the World Bank

This equation explains variation in the 10 year Government of Japan bond rate over the 38 years up to 2010 after correction for auto-correlated residuals

Regression Statistics	
Multiple R	0.951279521
R Square	0.904932727
Adjusted R Square	0.870928883
Standard Error	0.678178617
Observations	38

ANOVA

	df	SS	MS	F	Significance F
Regression	3	153.2291844	51.0763948	111.0534488	1.22969E-17
Residual	35	16.09741828	0.459926237		
Total	38	169.3266027			

Equation 4T	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	12.84194622	1.121599946	11.44966729	2.18808E-13	10.56497727	15.11891516
Inflation Lagged	4.187551729	4.194896216	0.998249185	0.325010404	-4.328540337	12.70364379
Ratio	-20.89390004	2.552700162	-8.185019281	1.21123E-09	-26.07615688	-15.71164321

lending rate data from 1961 to 2010 and it is not very successful. Only 41 percent of the variation in the lending rate can be explained by the ratio and the lagged inflation rate, and in the effort only the inflation rate is statistically significant, though the ratio does at least have the correct sign.

Equation 6 is more successful at explaining the 10-year US government bond rate in that 65 percent of the variation is explained by the ratio and the lagged inflation rate with both variables being statistically significant. The inflation rate seems to be the more important explanatory variable.

It may not be surprising that US interest rates are seemingly less affected by the demographics they have thus far experienced since less of their historical experience is characterized by a sharply changing ratio between the savers and borrowers. The comparison of the lending rate equation and the bond rate equation lend further credence to this view since the bond rate equation is estimated on data that start in 1972, 10 years after the beginning of the lending rate equation data. During the period 1972 to 2010, the US had both reductions in the ratio and increases. When the lending rate equation is estimated over the 1972 to 2010 period, the explanatory power improves slightly and the asset ratio becomes statistically significant.

This equation explains variation in the Lending Rate published by the World Bank for the United States over the 49 years up to 2010

Regression Statistics

Multiple R	0.661298144
R Square	0.437315235
Adjusted R Square	0.412850681
Standard Error	0.024193036
Observations	49

ANOVA

	df	SS	MS	F	Significance F
Regression	2	0.020925123	0.010462562	17.87546252	1.80343E-06
Residual	46	0.026923938	0.000585303		
Total	48	0.047849061			

Equation 5	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	0.093308913	0.035969669	2.594099869	0.012679351	0.020905725	0.165712102	0.020905725	0.165712102
Inflation lagged	0.851164642	0.150416491	5.658718913	9.37484E-07	0.548391949	1.153937334	0.548391949	1.153937334
Saver/borrower ratio	-0.158764126	0.11956804	-1.327814067	0.19079114	-0.399442107	0.081913856	-0.399442107	0.081913856

It may also be that since the US is the world's reserve currency nation, it is the demographics of the entire world that are more relevant to the movements in US rates. For the US the difference between the domestic and the international flow of funds dynamic is less distinct as the portal to foreign funding of domestic imbalances has, in the period examined, been wide open for the US. The time series data to test the hypothesis that it is the world's demographics that are relevant for the US are unfortunately not available on the US Census Bureau website for the 29 countries comprising the "world" that we have been examining.

So what? Why should we care?

We should care about the key findings of this paper because the whole of the economic world is beginning to "look" demographically, like Japan. Table 2 records the demographic ratios for the 29 countries comprising almost 90 percent of the world's GDP. The figure is divided into two columns. The dividing line is the value of Japan's saver /borrower ratio, .4059, in 1993 as the economy of Japan began to change dramatically and very quickly.

This equation explains variation in the 10-year government bond rate for the United States over the 39 years up to 2010

Regression Statistics

Multiple R	0.820700827
R Square	0.673549848
Adjusted R Square	0.655413728
Standard Error	1.58890283
Observations	39

Equation 6

	df	SS	MS	F	Significance F
Regression	2	187.5210582	93.76052908	37.13858667	1.77298E-09
Residual	36	90.88603927	2.524612202		
Total	38	278.4070974			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	13.18843548	2.835691623	4.65087084	4.34399E-05	7.437386311	18.93948465
Inflation Lagged	0.69593577	0.106367854	6.542726435	1.31642E-07	0.480211764	0.911659777
Saver/Borrower Ratio	-29.27858208	8.985126748	-3.258560831	0.002447458	-47.50126373	-11.05590042

In his last presentation as the governor of the Bank of Japan, Masaaki Shirakawa chose the topic *Demographic Changes and Macroeconomic Performance: Japanese Experiences*. His talk is a catalogue of some of the changes that the other countries of the world can expect to experience as they approach Japanese demographic milestones. These changes include slowing economic growth, deflation, low rates of return on investment, contraction of industrial output, and loss of policy efficacy. Governor Shirakawa concluded his review of the Japanese experience with the following warning:

> The Japanese experience of a bubble-burst tended to be underestimated as an idiosyncratic episode.
>
> Likewise, bystanders' apprehension about the ongoing demographic changes in Japan may, I fear, be falling short of the mark. My sense is that full apprehension of the consequences of rapid population aging, coupled with the low birth rate, is yet to be seen in light of the importance of the issue.

Table 2 shows how close the rest of the world is to approaching the Japanese experience. In the first column, the 90 percent World Aggregate

Table 2: Country ranking by saver/borrower ratio, 2015

Countries below	Saver/borrower ratio	Countries above	Saver/borrower ratio
South Africa	0.1714	Japan in 1993	0.4059
India	0.1973		
		Australia	0.4106
Mexico	0.1998	Norway	0.4205
Indonesia	0.2218	United States	0.4305
Turkey	0.228	Agg. of 29 GDP WTD	0.4358
Brazil	0.2497	Spain	0.4408
Israel	0.2543	Russia	0.4436
Argentina	0.2759	Korea	0.4443
Aggregate of the 29	0.3039	Norway	0.4196
China	0.3431	United Kingdom	4479
Thailand	0.3455	France	0.4613
Agg. Of 29 in 2025	0.3891	Poland	0.4661
		Belgium	0.4701
		Switzerland	0.4743
		Sweden	0.4805
		Netherlands	0.5008
		Austria	0.505
		China 2025	0.5087
		Canada	0.5132
		Italy	0.5248
		Hong Kong SAR, China	0.5441
		Germany	0.5911
		Japan	0.6

Saver/Borrower ratio, calculated by aggregating the population of the 30 countries as though they were one country, is seen to be .3039, which is where Japan was in 1984. But when we weight the countries' demographic information by their share of world output, the average moves to .4358, which is well beyond the value of the ratio where Japan's fortunes began to deteriorate. While the main story at that time of Japanese decline was related to the shrinkage of the workforce following 1995, and the population contraction following 2007, Japan's central bank was roundly criticized by the US Federal Reserve and other central bankers for not doing enough to boost economic activity. Even Milton Friedman, when he was giving the

keynote remarks to a Bank of Canada conference in 2000, castigated the Japanese for allowing recession to develop owing to an inadequate growth of the Japanese money supply (Friedman, 2001).

Perhaps the Japanese economic experience was due to inactivity by the Bank of Japan. But the saver/borrower ratio we have been discussing in this paper provides an alternative explanation; that by the early 1990s Japan had entered the kind of asset markets where monetary policy was rendered powerless because of a comparative shortage of potential Japanese debtors to respond to the monetary easing which was being applied. (It was widely believed at the time that one of the effects of Japanese monetary policy easing was to provide/entice low-cost loans for developments in Thailand, Malaysia, Indonesia, and other parts of Asia, which contributed to the "Asian Flu" financial collapse of 1997. Lacking suitable clients in Japan, the banks had resorted to the foreign sector to try to take advantage of the lending opportunities provided by monetary policy.) That possible explanation for the Japanese difficulties also provides insight into the US housing-based asset bubble which burst in 2007-2008.

The reason for the bubble in the 2000s was the sudden discovery of a new group of debtors in the United States who were, it was alleged by the mortgage brokers, adequate security for an assortment of mortgage-backed securities. These securities and the mortgages which supported them were "gobbled up" by financial institutions around the world on the assurance by rating agencies that these were A-class risks. What has not been said is that the reason all markets were so eager to accept these new debtors was that they were not finding an adequate supply of suitably qualified debtors in their own bailiwicks.

The US Census Bureau databases allow users to project population estimates forward in time. In part that is because most of the relevant information about future population developments is already contained in the present population. Reasonable estimates of birth and death rates enable a complete articulation of the population structure. The population projection for the 29 countries that we have been using in this paper show that in 10 years' time, by 2025, the 29-county average saver/borrower ratio will have moved up to .3891. While that means the whole world will then be in the range of the values Japan had when it began to falter, a more contemporary issue is that when we weight the 2015 ratios of the 29 countries by their contribution to 2010 world GDP, we discover, as noted above, that the ratio is already .4359.

Owing to the fact that all countries with high asset ratios will be trying to use the foreign sector portal to find suitably qualified debtors, what is relevant for the evolution of interest rates globally is the GDP-weighted ratio because it will determine the volume of demand for assets in world

markets. This portends a future evolution of interest rates and the returns on other assets that will be similar to the recent past. It means that the attempt by national governments to avoid the "Japanese disease" will encounter the same obstacles encountered by the Bank of Japan in the late 1990s and the 2000s.

Conclusions

The reason we have been observing unusually low global interest rates and falling and low yields on other assets is that there is, in this historical period, a systemic tendency for the demand for income-producing assets to exceed the supply. This apparently out-of-equilibrium condition is a manifestation of the fact that the supply of debt instruments of a given quality is in relative contraction as the number of debtor households and associated firms seeking to borrow is growing much more slowly than the number of creditor households who are seeking to lend so as to acquire income streams for retirement. This global imbalance is not resolved by changes in interest rates because falling interest rates increase, rather than reduce, the extent of savings owing to the inelasticity of demand for future consumption and the negative impact that falling interest rates have on the expected future value of the income saved. Rising interest rates, on the other hand, reduce the qualified and willing debtor pool, which exacerbates the imbalance between the generations.

Some readers of earlier versions of this paper commented that "China is so populous that as it becomes wealthy it will overcome all of the above and get the world back into a more normal generational posture." In fact, the imbalance is going to materially increase as the relative shrinkage of debt suppliers in China associated with their population implosion approaches that of the current western industrialized world as 2025 approaches. A population projection for China shows that in 2025 China's saver/borrower ratio, at .5087, will be larger than the current ratios of all of the 29 most affluent countries except for Canada, Italy, Hong Kong, Japan, and Germany.

References

Brooks, Robin J. (2003). Population Aging and Global Capital Flows in a Parallel Universe. *IMF Staff Papers* 50, 2. International Monetary Fund: 200–221. <https://www.imf.org/External/Pubs/FT/staffp/2003/02/pdf/brooks.pdf>, as of January 13, 2016.

Dingle, James, Gordon Sparks, and Michael Walker (1972). Monetary Policy and the Adjustment of Chartered Bank Assets. *Canadian Journal of Economics* 5, 4: 494–514.

Friedman, Milton (2001). Keynote remarks. *Revisiting the Case for Flexible Exchange Rates*. Conference (November 2000). Bank of Canada. Summary of Proceedings in *Bank of Canada Review* (Autumn 2001): <http://www.bankofcanada.ca/wp-content/uploads/2010/06/schembrie.pdf>, as of January 13, 2016.

Japan, Statistics Bureau, Mininstry of Internal Affairs and Communications (2016). *Population and Households, Population Estimates.* Statistics Japan. <http://www.stat.go.jp/english/data/kokusei/>, as of February 1, 2016.

Keynes, John Maynard (1936). *General Theory of Employment, Interest and Money.* Palgrave Macmillan.

Nabar, Malhar (2011). *Targets, Interest Rates, and Household Saving in Urban China*. IMF Working Paper WP/11/223 (September). International Monetary Fund.

Ramsey, Frank P. (1928). A Mathematical Theory of Saving. *Economic Journal* 38, 152: 543–59. <http://darp.lse.ac.uk/papersdb/Ramsey_(EJ_28).pdf>, as of January 13, 2016.

Poghosyan, Tigran (2012). *Long-Run and Short-Run Determinants of Sovereign Bond Yields in Advanced Economies*. IMF Working Paper WP/12/271 (November). International Monetary Fund. <https://www.imf.org/external/pubs/ft/wp/2012/wp12271.pdf>, as of January 13, 2016.

United States Census Bureau (2016). International Data Base. I*nternational Programs*. Web page. United States Department of Commerce. <https://www.census.gov/population/international/data/idb/informationGateway.php>, as of February 1, 2016.

About the author

Michael Walker

Michael Walker was the executive director of the Fraser Institute from its inception in 1974 until September 2005. Before that he taught at the University of Western Ontario and Carleton and was employed at the Bank of Canada and the Federal Department of Finance. He received his Ph.D. at the University of Western Ontario and his B.A. at St. Francis Xavier University.

As an economist, he has written or edited 45 books on economic topics. His articles on technical economic subjects have appeared in professional journals in Canada, the United States, and Europe, including the *Canadian Journal of Economics*, the *American Economic Review*, the *Journal of Finance,* the *Canadian Tax Journal*, *Health Management Quarterly, Weltwertschaftliches Archiv,* and *Health Affairs*. His primary concern as the founding Executive Director of the Fraser Institute has been to promote the examination and use of competitive markets as a method for enhancing the lives of Canadians.

Acknowledgments

I am pleased to thank Dr. Jerry Jordan, Allan Meltzer, James Gwartney, William White, and several anonymous commentators for questions and comments which helped me to clarify and improve the discussion in this paper. That is not meant to imply that they endorsed the model or agree with anything in the paper. Any remaining errors or oversights are my sole responsibility. As I have worked independently, the views and conclusions expressed in this paper do not necessarily reflect those of the Board of Directors of the Fraser Institute, the staff, or supporters.

Publishing information

Distribution

These publications are available from <http://www.fraserinstitute.org> in Portable Document Format (PDF) and can be read with Adobe Acrobat® or Adobe Reader®, versions 7 or later. Adobe Reader® XI, the most recent version, is available free of charge from Adobe Systems Inc. at <http://get.adobe.com/reader/>. Readers having trouble viewing or printing our PDF files using applications from other manufacturers (e.g., Apple's Preview) should use Reader® or Acrobat®.

Ordering publications

To order printed publications from the Fraser Institute, please contact:

- e-mail: sales@fraserinstitute.org
- telephone: 604.688.0221 ext. 580 or, toll free, 1.800.665.3558 ext. 580
- fax: 604.688.8539.

Media

For media enquiries, please contact our Communications Department:

- 604.714.4582
- e-mail: communications@fraserinstitute.org.

Copyright

Date of issue

February 2016

ISBN

978-0-88975-387-7

Citation

Michael A. Walker (2016). *Why Are Interest Rates So Low? A Framework for Modeling Current Global Financial Developments*. The Fraser Institute. <http://www.fraserinstitute.org>.

Supporting the Fraser Institute

To learn how to support the Fraser Institute, please contact

- Development Department, Fraser Institute
  Fourth Floor, 1770 Burrard Street
  Vancouver, British Columbia, V6J 3G7 Canada
- telephone, toll-free: 1.800.665.3558 ext. 574
- e-mail: development@fraserinstitute.org
- website: <http://www.fraserinstitute.org/donate>

Purpose, funding, and independence

The Fraser Institute provides a useful public service. We report objective information about the economic and social effects of current public policies, and we offer evidence-based research and education about policy options that can improve the quality of life.

The Institute is a non-profit organization. Our activities are funded by charitable donations, unrestricted grants, ticket sales, and sponsorships from events, the licensing of products for public distribution, and the sale of publications.

All research is subject to rigorous review by external experts, and is conducted and published separately from the Institute's Board of Trustees and its donors.

The opinions expressed by authors are their own, and do not necessarily reflect those of the Institute, its Board of Trustees, its donors and supporters, or its staff. This publication in no way implies that the Fraser Institute, its trustees, or staff are in favour of, or oppose the passage of, any bill; or that they support or oppose any particular political party or candidate.

As a healthy part of public discussion among fellow citizens who desire to improve the lives of people through better public policy, the Institute welcomes evidence-focused scrutiny of the research we publish, including verification of data sources, replication of analytical methods, and intelligent debate about the practical effects of policy recommendations.

About the Fraser Institute

Our mission is to improve the quality of life for Canadians, their families, and future generations by studying, measuring, and broadly communicating the effects of government policies, entrepreneurship, and choice on their well-being.

Notre mission consiste à améliorer la qualité de vie des Canadiens et des générations à venir en étudiant, en mesurant et en diffusant les effets des politiques gouvernementales, de l'entrepreneuriat et des choix sur leur bien-être.

Peer review—validating the accuracy of our research

The Fraser Institute maintains a rigorous peer review process for its research. New research, major research projects, and substantively modified research conducted by the Fraser Institute are reviewed by experts with a recognized expertise in the topic area being addressed. Whenever possible, external review is a blind process. Updates to previously reviewed research or new editions of previously reviewed research are not reviewed unless the update includes substantive or material changes in the methodology.

The review process is overseen by the directors of the Institute's research departments who are responsible for ensuring all research published by the Institute passes through the appropriate peer review. If a dispute about the recommendations of the reviewers should arise during the Institute's peer review process, the Institute has an Editorial Advisory Board, a panel of scholars from Canada, the United States, and Europe to whom it can turn for help in resolving the dispute.

Editorial Advisory Board

Members

Past members