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Fiscal Policy and Interest Rates: How Sustainable Is The "New Economy"?

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Abstract

This paper explores the determinants of long-term government bond yields in the Group of Seven (G-7) economies and analyzes the factors that could explain the conundrum of very low rates in the face of a variety of adverse factors in recent years. In particular, the paper focuses on the deteriorating fiscal position in the G-7 economies and enquires which factors could have offset their impact on long-term interest rates, and how sustainable they are likely to be. A model of interest rate determination is elaborated and estimated for the G-7, with explicit emphasis on capital flows and public savings. The results suggest a high likelihood of a substantial impact of the weaker budgetary positions in the G-7 on global interest rates when the offsetting unprecedented capital flows slow down.

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I. Introduction

In the recent literature on the evolution of global long-term real interest rates, the marked deterioration in the fiscal positions of the largest industrial economies has received scant attention. When that deterioration is analyzed, particularly in conjunction with the tightening stance of monetary policy in some of the largest economies, the conundrum of low rates emphasized by Greenspan (2005a) appears even more apt. Consider the facts: gross public debt in most of the Group of Seven (G-7) countries has been on the rise just as long-term bond yields have remained at very low levels. The increase in public debt has been particularly marked in Japan, with the ratio to GDP doubling over the past ten years. Increases elsewhere have also been far from negligible: in the United States, the general government debt ratio has risen by more than 4 percentage points of GDP since reaching its trough in 2001, and several of the largest European Union countries have seen their public indebtedness rise by between 5 and 10 percentage points.[2] Even the possibility of a further fiscal deterioration, particularly considering the fiscal implications of aging, appears not to have had an impact on the forward-looking fixed-income financial markets. Indeed, a complementary description of the low-rate phenomenon then might be "a riddle wrapped in a mystery inside an enigma."[3]

The low level of long-term rates has, in turn, led to a perceived lack of urgency in dealing with the budgetary imbalances. Specifically, despite the rising debt burdens, there does not appear to have been any marked increases in higher interest expenditures, arguably the most effective feedback policymakers often have to contend with for higher deficits and debt. Given that, it is not surprising that many policymakers continue to remain sanguine about the sustainability of their fiscal positions. Even more worrying, the subdued response of bond yields in the presence of not only fiscal imbalances but also the tightening stance of monetary policy, has prompted many observers to cast renewed doubts on the link between government deficits and debt and interest rates.[4] This view is often rationalized by the claim that the determinants of industrial country interest rates in an era of global capital mobility are not what they used to be: that there is indeed a "new economy" of interest rates that reflects a radically different relationship between the traditional variables including fiscal imbalances and interest rates.

In this paper, we explore to what extent this latest incarnation of the "new economy" will be sustained, or whether it will encounter limits, as did the earlier ones. The empirical analysis suggests that although some factors are likely to continue to depress real interest rates for the foreseeable future, other factors that have been at play in recent years are likely to prove transitory. The set of "permanent" factors could be labeled "globalization," and the set of

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[2] Data are from the IMF *World Economic Outlook database*, September 2005.

[3] This is a quote attributed to Winston Churchill on characterizing the position of the Soviet Union in 1939.

[4] See Gale and Orszag (2003, p. 466) for numerous references to such statements.

transitory factors “global imbalances.” The latter can be compared with the “Bretton Woods II” elaborated by Dooley and others (2004), but, unlike the former, we regard the current situation as a temporary state. As the transitory factors dissipate, the “old economy” drivers of interest rates are likely to manifest themselves—with the impact of fiscal imbalances again coming to the fore. It was after all, barely a decade ago when the Group of Ten (G-10) industrial countries’ finance ministers officially concluded that rising public debt was a “major cause of [then] high global interest rates” (G-10, 1995).

To examine whether the drivers of global interest rates have, indeed, changed, we have to account for the global nature of fixed-income markets and determination of long-term interest rates. As Greenspan (2005b) argued, “whatever those forces [underlying low U.S. long-term rates] are, they are surely global, because the decline in long-term interest rates in the past year is even more pronounced in major foreign financial markets than in the United States.” In order to do this, we extend the Modigliani-Jappelli (1988) interest rate model to account for the impact of foreign inflows related more to insurance than to investment motives to account for the impact of the large investment of foreign international reserves primarily in U.S. dollars but also in other G-7 financial assets. Based on this model, we examine the drivers of long-term interest rates for the G-7. We examine a long period (1960–2005), over which there have been significant structural changes in the world economy and financial markets to examine whether interest rate determinants have changed markedly.

We do not find evidence for a “new economy” of interest rates, particularly when it comes to the impact of fiscal policy on interest rates. Essentially, our results imply that reserve accumulation by non-G-7 central banks has substantially depressed long-term interest rates in the large industrial countries—despite the potentially offsetting effect of a worsening in the fiscal positions of most G-7 economies. This means that whenever the benign “new economy” impact of insurance-related capital flows begins to ease or comes to a halt, this will not only tend to push up long-term interest rates but also bring the interest-increasing impact of chronic fiscal imbalances in the G-7 to light.

In its conclusions, the paper argues that fiscal policy in several of the largest economies may be seen to have been inadequate. As we also discussed with regard to some emerging markets (Hauner and Kumar, 2005), headline fiscal performance of many industrial countries is likely to be appear less unfavorable (or even benign) thanks to the favorable capital market situation. This means that countries that have budgetary difficulties even in the current low-rate environment are likely to experience even greater difficulties when rates rise to “normal” levels. These difficulties are likely to be compounded by the imminent impact of aging.

The rest of the paper is organized as follows. We first discuss possible explanations for low global interest rates in recent years (Section II). This is followed by an elaboration of a model of interest rates: our main innovation here is the emphasis on insurance-related capital flows influencing interest rates (Section III). We then estimate the model for the period 1960–2005, explore the impact of various fiscal variables on the results, examine whether the drivers of interest rates have changed during this period, and disentangle the influences on interest rates (Section IV). The conclusions discuss the implications for fiscal policy (Section V).

II. Low Global Interest Rates: Possible Explanations

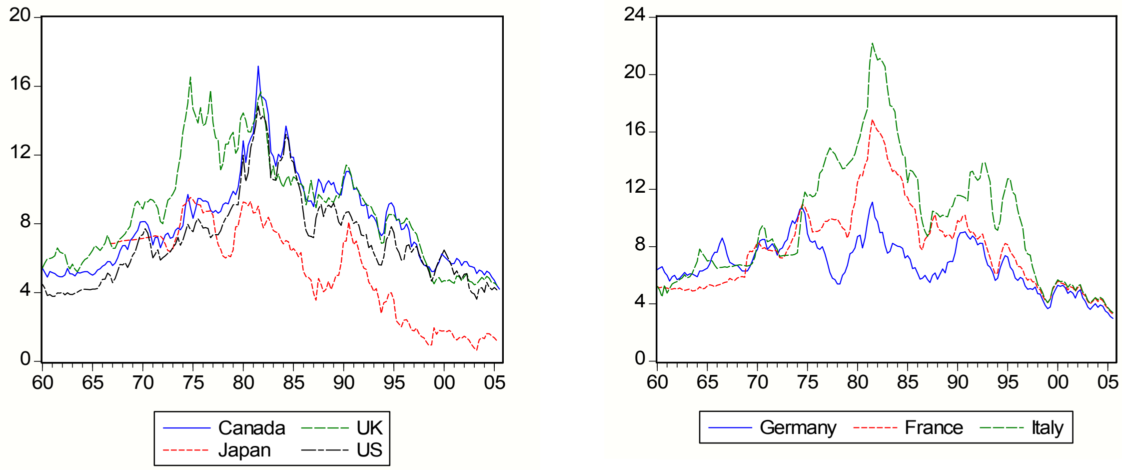
What determines the long-term real interest rate is one of the crucial questions of economics. There is a large theoretical and empirical literature on the determinants of real interest rates, but little consensus on their relative empirical importance. There is certainly little agreement on the variables underpinning the relatively low level of rates over the past four years. While it is clear that the long-run real interest rates should be determined by ex ante levels of saving and investment, empirical results on the specific drivers of both saving and investment and thereby of real interest rates vary significantly by country, time period, and the method used.

The role of fiscal policy has been a key issue in this debate. In theoretical terms, the extent to which fiscal policy affects rates depends on the degree to which consumers are Ricardian: if they are perfectly so, and changes in the fiscal deficit are fully offset by private saving, public sector deficits will not affect rates (Barro, 1974); if they are not, higher government deficits will lead to a rise in rates (e.g., Modigliani and Jappelli, 1988). While there is no evidence of perfectly Ricardian consumers, there is sufficient empirical heterogeneity for Bernheim (1989) to conclude that one can cite a "large number of studies that support any conceivable position." Gale and Orszag (2003) list 29 studies finding a "predominantly positive significant" effect of fiscal deficits on interest rates and 30 finding a "mixed" or "predominantly insignificant" effect, and conclude that an increase in the deficit by 1 percent of GDP raises interest rates by about 30–60 basis points. In another survey, the European Commission (2004, p. 150) concludes that the evidence points to a 15–80 basis points effect.

It is clear that during the past two decades, industrial country nominal rates have been on a downward trend. As Figure 1 illustrates, this has been a uniform development across the G-7. There is little disagreement that this reflects mostly lower inflation expectations, on the back of greater policy credibility and increasing competition. This, in turn, is in large part due to globalization and the increasing integration of developing countries into the world economy that, inter alia, is likely to have contributed to flatten industrial countries' Phillips curves.

There is less consensus, however, on why global long rates have continued to remain at levels that are considered unusually low, given the state of cycle: from the end of 2001 (when world economic activity reached its last cyclical trough) to the end of September 2005, nominal 10-year government bond yields fell by about 60 basis points in the U.S. and about 140 basis points in Germany, and despite a catch-up in late 2005, they recovered only to their end of 2001 level by the end of 2005. Some observers also attributed this more recent behavior at least partially to lower inflation expectations. However, empirically measured long-term inflation expectations have not actually declined in recent years, at least in the United States (the country with the widest range of available measures of long-term inflation expectations), whether measured by the spread between regular treasury bonds and Treasury Inflation Protected Securities (TIPS) (Figure 2) or inflation expectation polls (Figure 3). It thus seems that, although there could be some reduction in the inflation *risk premium* owing to more stable inflation expectations, a decline in the *level* of expected inflation is unlikely to have been the main driver behind the decline in nominal long-term interest rates during 2001 to mid-2005.

Figure 1. Nominal Ten-Year Government Bond Yields in the G-7 Countries, 1960–2005
(in percent)



Source: IMF, *International Financial Statistics*.

If the decline in nominal rates did not reflect a decline in inflation expectations, real interest rates must have declined. At the long end of the yield curve, this could to some extent reflect the impact of liability-driven investment by pensions funds and insurance companies; this effect, however, is unlikely to last, as supply has already started to react (witness the reintroduction of the 30-year U.S. treasury bond). More fundamentally, low real rates reflect a net shortfall of planned investment over planned saving. What is unclear is whether this is driven by an excess of savings or a shortfall in investment. On the one hand, large current account surpluses of developing countries are frequently cited to support the "saving glut" hypothesis (Bernanke, 2005); there is certainly some empirical evidence to support this view. Moreover, it is the savings not only by the emerging markets but also by the corporates in industrial as well as emerging market countries—which extraordinarily, have become net savers—that could be contributing to the glut. On the other hand, there is also substantial empirical evidence in favor of the "weak investment" view (IMF, 2005; JP Morgan, 2005). The two hypotheses may be difficult to disentangle: corporations in the industrial countries have been repairing their balance sheets after the excesses in the 1990s, and in emerging Asia investment fell appreciably after the Asian crisis. It is not implausible that these effects have more than offset the impact of rising fiscal deficits in many large industrial countries.

This is where the notion of a "new economy" of interest rates comes into play; the argument being that the integration of emerging markets in the world economy depresses not only inflation expectations but also real interest rates: one plausible variant of this reasoning is that fast-growing developing countries have a high propensity to save owing to capital market imperfections, but are unable to store their wealth domestically and thus channel it to industrial countries (Caballero and others, 2005). So is there a "new economy" of interest rates where domestic factors, particularly fiscal policy, are mitigated by global forces? The answer to this question requires a better understanding of which of the drivers of interest rates in recent years are likely to be permanent and which are likely to be transitory.

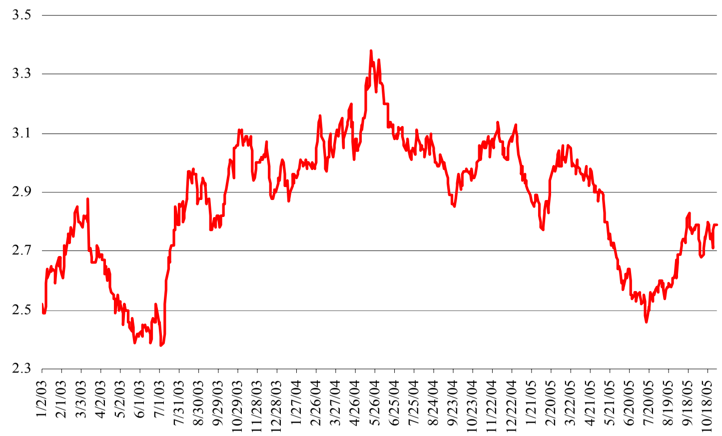
One indication that there have been forces at work that go beyond the global saving-investment balance as such is the unusual phenomenon that global long-term yields fell in 2004–05 despite US monetary tightening. While the U.S. federal funds rate rose by about 3 percentage points from June 2004 to November 2005, the yield on ten-year U.S. treasury notes declined by about half a percentage point during this period. As Greenspan (2005b) concluded at that time, “The economic forces driving the global saving-investment balance have been unfolding over the course of the past decade, so the steepness of the recent decline in long-term dollar yields […] suggests that something more may have been at work […].”

In the search for these factors, the focus has turned to the unprecedented accumulation of international reserves that are typically held in industrial country government securities. It is thus not implausible that global reserve accumulation would be mirrored in the share of U.S. treasury securities held by foreign official institutions shown in Figure 4 which also indicates that the increase in foreign official holdings in U.S. treasuries in recent years was invested largely in maturities of one year or more. This seems at odds with the oft-quoted observation that most reserves are held in short-term debt and would thus be unlikely to materially affect long-term yields. Also, while a complete maturity split is made public only with a long lag, the latest observation for June 2004 in Figure 5 shows that, at least by that time, the increase of foreign official holdings must have been concentrated particularly in securities with maturities of one to ten years as the shares of those have increased relative to 12 months before. This suggests that in the face of the sufficiency of existing reserves for liquidity purposes, many central banks have allocated a large part of their new reserves to longer term securities in order to dampen the rising implied costs from holding reserves (Hauner, 2005).

Whatever the factors depressing real rates are, fiscal policy is certainly not among them, as Figure 6 shows. During the latter half of the 1990s, debt/GDP ratios had been falling or stable. Thereafter, however, the hard-won gains were quickly lost again: debt/GDP ratios are higher in 2005 than in 1991 in all G-7 countries except Canada and the United States, and in the latter the ratio has already risen substantially from it through at the end of the century. But while higher debt usually means a higher interest bill, governments were insulated from this effect this time: not only Canada and the United States but also Italy and the United Kingdom enjoyed much lower interest bills in percent of GDP in 2005 than during most of the 1990s. And France, Germany, and Japan still face the same interest burdens relative to GDP as they did 15 years ago—despite substantially higher debt. Although interest rates tend to affect governments’ interest bills only with a long lag, the absence of an obvious reaction of long-term expected interest rates is likely to have contributed to complacency among policymakers about the long-term macroeconomic cost of higher deficits.

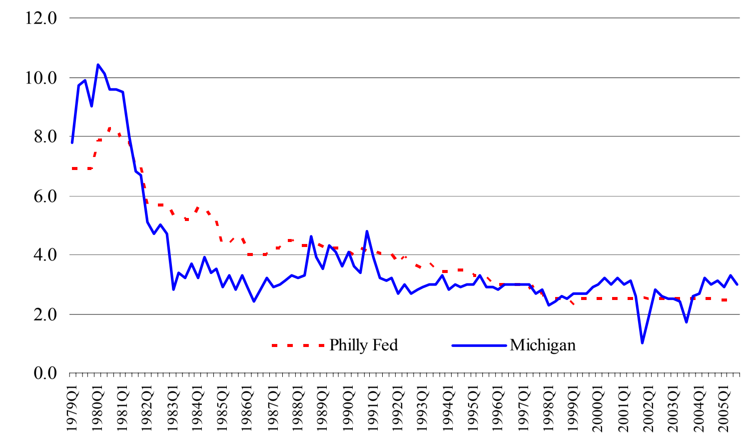
By implication, a reversal in the benign environment could bear risks for those countries that have enjoyed favorable borrowing conditions more due to the global conditions than the better underlying fundamentals, particularly as the market tends to react to rising debt in a discontinuous way (Balassone and others, 2004). To gauge the magnitude of the adverse effect on the G-7 economies of a rebound in interest rates, we first elaborate a model and then estimate it econometrically to obtain an indication of the likely transitory and permanent factors underlying dynamics of G-7 real interest rates in the “new economy.”

Figure 2. Long-Term Inflation Implied by U.S. TIPS
(in percent a year)



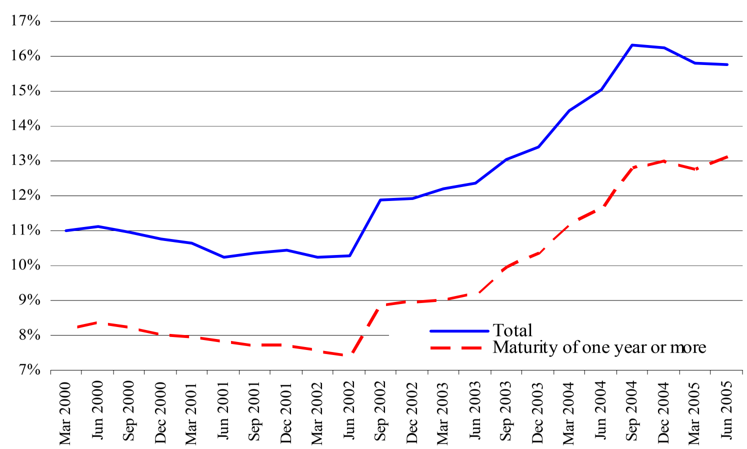
Source: US Department of the Treasury.

Figure 3. U.S. Inflation Expectations Measured by Surveys
(in percent a year)



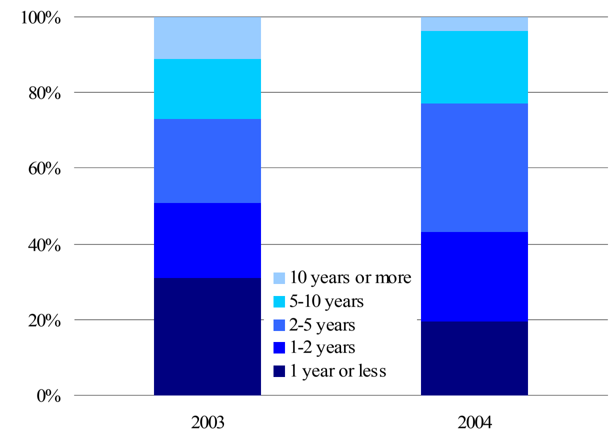
Sources: University of Michigan and Federal Reserve Bank of Philadelphia.

Figure 4. Share of Foreign Official Holdings in U.S. Treasuries



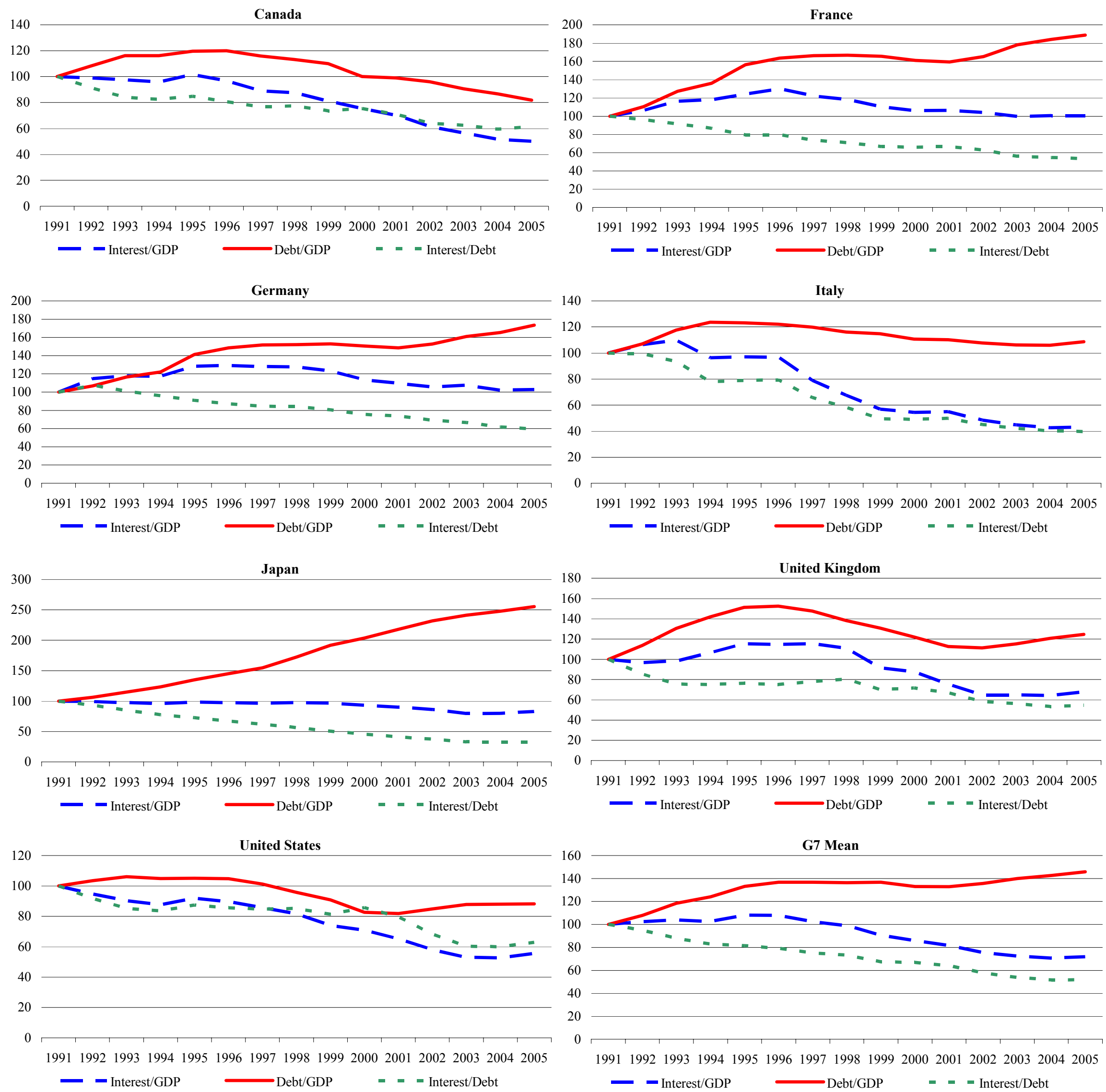
Source: U.S. Department of the Treasury.
Note: Series break between June and July 2002.

Figure 5. Maturity Structure of Foreign Official Holdings of U.S. Treasury Securities



Source: U.S. Department of the Treasury.
Note: As of June 30 of each year.

Figure 6. Fiscal Developments in G-7 Economies, 1991–2005
(1991=100, General Government)



Source: IMF, *World Economic Outlook* database.
Note: The 2005 estimates are as of September 2005.

III. A Model of Interest Rate Determination

In this section, we elaborate a structural model of interest rate determination in the G-7 economies. We refer explicitly to the G-7, because the model is intended to capture the fact that these countries over the period of estimation (1960–2005) have had largely open capital accounts that allow foreign savings to finance fiscal deficits, not least due to the fact that these economies united all the reserve currencies of the world. We build on the framework by Modigliani and Jappelli (1988) which models interest rates by expected inflation, the interaction of intended saving and investment of the domestic private sector, fiscal and monetary policy, and the foreign interest rate that comes into play as the respective country needs to attract sufficient net foreign inflows to cover its current account deficit. Capital mobility is not perfect and thus allows country-specific effects to have some persistence, reflecting factors that make domestic and foreign assets imperfect substitutes (e.g., exchange rate risk or tax treatment) and regulations that impede cross-border capital flows.

An important innovation is that we explicitly model capital flows that are not motivated primarily by an "investment motive," but rather an "insurance motive": the latter reflects the desire of the rest of the world to obtain insurance against adverse shocks by accumulating international reserves in relatively safe and liquid assets that only the small group of large open economies can provide. The key difference between capital flows under the investment motive and under the insurance motive is the sensitivity to the expected return: the sensitivity of insurance flows is expected, by definition, to be smaller than the one for investment flows, since insurance flows are undertaken by the official sector with the different objective than the private sector, as commented by a number of observers (e.g., Dooley and others, 2004).

Formally, assume that the world economy consists of economies $j = 1 \ldots J$, of which only $i = 1 \ldots 7$ are large open economies, each of which can be characterized by the following five structural equations:

$$C_{i,t} = a_i \left(1 - t_i\right) Y_{i,t} - b_i D_{i,t} + u_{1,i,t} \tag{1}$$

$$I_{i,t} = c_i K^e_{i,t} - e_i \left(R_{i,t} - P^e_{i,t}\right) + u_{2,i,t} \tag{2}$$

$$M_{i,t} = f_i Y_{i,t} - g_i R_{i,t} + u_{3,i,t} \tag{3}$$

$$F_{i,t} = h_i \left(R_{i,t} - d^e_{i,t} R^*_t\right) + k_i \sum_{j \neq i} A_{i,j,t} + u_{4,i,t} \tag{4}$$

$$S_{i,t} \equiv I_{i,t} - F_{i,t} \equiv Y_{i,t} - C_{i,t} - \underbrace{\left(D_{i,t} + t_i Y_{i,t}\right)}_{G_{i,t}} \tag{5}$$

All parameters are assumed to be positive, the subscript t denotes time, and the u's the error components. The equations imply the following: Private consumption (C_i) depends in each country i (we drop time t hereafter for exposition) on disposable income ($(1 - t_i)Y_i$) and the government deficit ($D_i = G_i - t_i Y_i$).

Net investment (I_i) depends on the expected real return on capital (K_i^e) and the expected average real interest rate ($R_i - P_i^e$) over the same future time horizon. This formulation is a linear approximation of the putty-clay model of investment, according to which current investment has a capital-labor ratio fixed throughout its life. Accordingly, new investment is proportional to the change in desired capacity (proxied by the expected return on capital), with the factor of proportionality a function of the cost of capital (proxied by the real rate). Money supply (M_i) is exogenous, with money demand depending on income and the interest rate. While monetary policy cannot influence the equilibrium (sustainable) real interest rate, it can do so temporarily through the liquidity effect, when an excess demand for real money balances results in a temporarily higher interest rate, and vice versa.

The net inflow of foreign capital (F_i) is the counterpart to the current account deficit and depends on two terms that reflect the inflows under the "investment" and the "insurance" motive, respectively. The investment-related inflows depend on the interest rate differential between economy *i* and the rest of the world ($R_i - R^*$) and the expected depreciation of *i*'s effective exchange rate ($d_{i,t}^e$) which also incorporates inflation differentials. The parameter *h* represents the degree of capital mobility, whose size reflects the importance of impediments to the free flow of capital and the degree of substitutability between domestic and foreign assets. An innovation is the inclusion of a separate term denoting the insurance-related net capital inflows, because the economies $j \neq i$ will always want to acquire some assets in economy *i* ($A_{i,j}$) as an insurance against shocks. The parameter *k* is a function of the drivers for the demand for assets of country *i* for insurance purposes, including the depth of *i*'s financial market and the expected exchange-rate corrected return on the (reserve) assets of country *i*; implicitly, it is also a function of the overall demand for insurance by the rest of the world. Equation (5) provides the identity that links savings, investment and capital flows.

The endogenous variables are C_i, I_i, R_i, Y_i, and F_i, while t_i, D_i, K_i^e, P_i^e, M_i, d_i^e, R^*, and A_j are taken as exogenous. Solving the model for the interest rate yields the reduced form

$$R_{i,t} = \alpha_{1,i} P_{i,t}^e + \alpha_{2,i} K_{i,t}^e + \alpha_{3,i} M_{i,t} + \alpha_{4,i} D_{i,t} + \alpha_{5,i} d_{i,t}^e R^* + \alpha_{6,i} \sum_{j \neq i} A_{i,j,t} + \upsilon_{i,t} \tag{6}$$

where υ_i is a composite error term. Table 1 shows the theoretical variables from the model (column 1) with their reduced form coefficients (column 2) and the corresponding parameters in the structural model (column 3).

What does equation (6) predict regarding the exogenous variables? The nominal interest rate is increasing in expected inflation ($\alpha_1 > 0$). Examining the parameter in Table 1 shows that α_1 can be expected to be <1, except in the unlikely cases of either a zero elasticity of money demand to interest rates ($g = 0$) combined with zero capital mobility ($h = 0$), or an infinite interest sensitivity of investment ($e \to \infty$); the reason for this departure from the

Fisher relationship is that a rise in the nominal interest rate increases velocity which, in turn, decreases the real interest rate. The interest rate is increasing in the expected return on investment ($\alpha_2 > 0$) and decreasing in the real money supply ($\alpha_3 < 0$). With regard to the impact of fiscal policy, a higher government deficit reduces national savings, and for given investment, increases the interest rate ($\alpha_4 > 0$), except in the Ricardian case ($\alpha_4 = 0$).

With regard to the external sector, the interest rate is an increasing function of the rest-of-the-world interest rate corrected for exchange rate expectations ($\alpha_5 > 0$). If we were applying the model to small economies, the extreme case of perfect capital mobility ($h \to \infty$) would imply that domestic interest rates follow rest-of-the-world rates one for one ($\alpha_5 \to 1$). In this case, all other coefficients would tend to zero, which also means that fiscal and monetary policy cannot affect the interest rate any more; however, the coefficients could remain larger than zero even in the case of perfect capital mobility if they are correlated with the expected change in the exchange rate. Finally, the interest rate is decreasing in the insurance-related capital inflows from the rest of the world ($\alpha_6 < 0$). Note the opposing signs of α_5 and α_6: on the one hand, given sufficient capital mobility, higher investment-related foreign inflows will require a higher domestic interest rate relative to the rest of the world. But on the other hand, insurance-related foreign inflows are essentially independent of the interest rate differential: the flows that occur end up decreasing the domestic interest rate because they reduce the need for interest-sensitive investment-related inflows to cover the current account deficits.

Here, we are testing six hypotheses for the G-7 countries: (1) Consumers are fully Ricardian and government deficits do not affect the interest rate: $\alpha_4 = 0$. The expectation is that this hypothesis would be rejected and that $\alpha_4 > 0$; (2) Capital mobility is not large enough to allow the rest-of-the-world interest rate to affect the domestic interest rate: $\alpha_5 = 0$. We expect this hypothesis to be rejected, with $\alpha_5 > 0$; (3) The demand for insurance-related reserve assets by the rest of the world does not affect the domestic interest rate: $\alpha_6 = 0$. We expect this to be rejected and $\alpha_6 < 0$. Hypotheses (4–6) are that there has been no structural change in the coefficients α_4, α_5, and α_6, respectively, over the sample period.

Table 1. Theoretical and Regression Variables

Theoretical Variable	Coefficient in Reduced Form	Parameter in Structural Form	Regression Variable(s) with Expected Signs	Description and Source of Regression Variables
$P^e_{i,t}$	α_1	$\frac{e}{\frac{g}{f}(1-t)(1-a)+e+h}$	$\overset{+}{P^e}$	10-year government bond yield in percent from IFS line 61.
$K^e_{i,t}$	α_2	$\frac{c}{\frac{g}{f}(1-t)(1-a)+e+h}$	$\overset{+}{K^e}$	Expected long-term inflation rate in percent, computed based on smoothed weights estimated for the U.S. Livingston Survey of inflation expectations (data: www.phil.frb.org/econ/liv/). Actual inflation is the CPI from IFS line 64.
$M_{i,t}$	α_3	$\frac{\frac{(1-a)(1-t)}{f}}{\frac{g}{f}(1-t)(1-a)+e+h}$	$\overset{-}{M}$	Annual growth rate of money and quasi-money in percent from IFS line 35L.
$D_{i,t}$	α_4	$\frac{1-b}{\frac{g}{f}(1-t)(1-a)+e+h}$	$\overset{+}{D}$	Government net borrowing in percent of GDP on average in the following eight quarters from ADB line NLGQ.
$d^e_{i,t}R^*_t$	α_5	$\frac{h}{\frac{g}{f}(1-t)(1-a)+e+h}$	$\overset{-}{U}, \overset{+}{R}*$	*U*: Current account balance in percent of GDP from IFS line 78ALD. *R**: U.S. federal funds rate from IFS line 60b.
$\sum_{j \neq i} A_{i,j,t}$	α_6	$\frac{k}{\frac{g}{f}(1-t)(1-a)+e+h}$	$\overset{-}{A}$	Reserve accumulation by the respective rest of the world in millions of SDR from IFS line 1.

Source: Authors.
Note: IFS…IMF *International Financial Statistics*; ADB…OECD Analytical Database.

IV. Empirical Evidence

This section estimates the above model for the G-7 economies over 1960–2005 with quarterly data. Given the development of the economic structure and financial markets over this period and the rapid pace of globalization in recent years, there would be a general expectation that at least some of the determinants of long-run interest rates would have changed, consistent with the aforementioned notion of a “new economy” of interest rates. The alternative hypothesis is that, despite the extraordinary changes, the fundamental determinants of interest rates have remained essentially the same. In this second case, it would be the specific evolution of some of the key underlying factors, rather than *changes in their relationship with interest rates*, that lead to the *semblance* of the new economy of interest rates. The latter would of course not preclude the possibility of only transitory structural breaks.

A. Data and Methodology

The regression variables corresponding to the analytical framework developed in the previous section are shown in Table 1 (column 4), together with their expected signs and sources (column 5). The dependent variable is the quarterly average of the daily observations of the nominal 10-year government bond yield. While several of the explanatory variables follow directly from the analytical framework, for others, where theory is not clear-cut or measurement is not straightforward, a variety of proxies were utilized. Consistent with a general-to-specific approach, the basic decision criterion was to retain the most significant measures for each variable. We proxy the expected return on capital (K^e), by the leading four-quarter average of returns on the domestic stock market, which is akin to a Tobin’s q type concept (Barro and Sala-i-Martin, 1990). We take the annual growth rate of M1 as a measure of money supply (M), after trying also different monetary aggregates and domestic credit. In addition, we explored the role variables as GDP growth, the dependency ratio, and disposable income may play as drivers of the private domestic sector’s saving-investment balance, but did not find any conclusive evidence that they influence long-term interest rates.

Consider some of the main explanatory variables, which also highlights some novel features of the analysis: P^e are the long-term (ten-year average) inflation expectations. While in most empirical work such expectations are obtained from a structural model or an autoregressive process of inflation, these approaches are restrictive as they presume a variant of rational expectations. Instead, we computed inflation expectations as the weighted average of past inflation, with the weights obtained by regressing survey data of U.S. inflation on lagged inflation rates. Given that surveys of this kind are available only in the United States for a sufficiently long time, the U.S. weights were then used to compute the inflation expectations for all the G-7 countries. This allows the weights to be determined by the inflation expectations process, which is more relevant for long rates, rather than the actual inflation process. We thus make the speed of the adjustment of inflation expectations endogenous.

The indicator of the government deficit (D) is at the heart of our analysis. Given the large heterogeneity in previous results on the impact of fiscal policy on interest rates (Section II), we employed numerous fiscal measures to shed new light on the differences in their relative impact. Among the flow measures, we found that government net lending yielded generally the strongest results, while the (cyclically adjusted or unadjusted) primary balance and net saving tended to turn out as insignificant. Given that expected may be more important than the actual deficits (see, e.g., the survey in Gale and Orszag, 2003), we use not only the current net lending, but also the average of its values in the four lagged quarters, four leading quarters, and eight leading quarters.[5] As there is an argument to be made that the debt stock matters as much as the flow, we also look at government gross and net debt.

Measuring the interest rate impact of developments in the external sector raises a number of conceptual and econometric issues. Most importantly, the external interest rate could be endogenous relative to the domestic interest rate, with the importance of this effect increasing with the relative size of the domestic economy; at the extreme, the interest rate could be determined entirely globally. To explore this possibility, we estimate our model also aggregating the respective seven country series into a single one. For the panel, we have taken a pragmatic approach to account for external influences: for investment-related flows, the US federal funds rate is our measure of R^*, because it is arguably the relatively most exogenous of the world's interest rates.[6] The current account balance (U) with the rest of the world is used as a gauge of exchange rate expectations: a surplus would be expected to lead to an appreciation, and vice versa. To account for insurance-related capital flows, we include the accumulation of international reserves by the rest of the world (A).

To examine the variables' time-series properties, we use two unit root tests appropriate for panel data. The Im-Pesaran-Shin test (Im and others, 2003) and the Fisher-ADF test (Maddala and Wu, 1999; Choi, 2001) allow for individual unit root processes that may vary across cross-sections. Given that the tests reject the null of no stationarity at least at the 10 percent significance level for all series except inflation expectations (Table 2), we estimate our model in equation (6) in levels. We run the panel with numerous econometric approaches to account for potential robustness issues: in addition to OLS (with and without cross-section fixed effects), we use feasible generalized least squares (FGLS) to account for cross-section and period heteroskedasticity and run the regressions without and with a trend and squared trend, and without and with an AR(1) term to improve the serial correlation properties (akin to regressing the change in the interest rate on the explanatory variables). While in theory there is feedback from domestic interest rates to the right-hand-side variables, the effects are likely to take considerable time to filter through, with little or no contemporaneous effect within one quarter. Given that, the right-hand-side variables are taken as exogenous. Obviously, as always in structural approaches to interest rate determination, the presumed causality has nevertheless to be taken with some grain of salt.

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[5] This assumes rational expectations. Ideally, planned or forecasted budgetary outcomes and not the actual outcomes should be used. However, only very limited data on expected outcomes is readily available.

[6] For the United States., this implies including the short-term rate as an explanatory variable, which is common in the literature (e.g., Ardagna and others, 2004).

Table 2. Unit Root Tests

	R	P^e	K^e	M	D	R*	U	A
Im, Pesaran and Shin W-stat	**-1.586**	-0.560	**-6.742**	**-3.763**	**-1.920**	**-2.807**	**-4.350**	**-7.437**
	0.06	*0.29*	*0.00*	*0.00*	*0.03*	*0.00*	*0.00*	*0.00*
ADF - Fisher Chi-square	**20.939**	12.726	**76.643**	**44.335**	**24.544**	**27.944**	**48.330**	**86.184**
	0.10	*0.55*	*0.00*	*0.00*	*0.04*	*0.01*	*0.00*	*0.00*

Source: Authors' calculations.
Notes: Im-Pesaran-Shin test according to Im and others (2003); Fisher-ADF test according to Maddala and Wu (1999) and Choi (2001). Test statistics and P-values (in italics) for rejecting the null hypothesis of a unit root. Bold test statistics indicate rejection of the null hypothesis at least at the 10 percent level.

B. Empirical Results

The results for the panel of G-7 countries for the entire period 1960–2005 are provided in Table 3. We start with the plain OLS estimator (column 1), add cross-section fixed effects (column 2), and then proceed with the FGLS estimator with cross-section weights (column 3) and cross-period weights (column 4); all these are then redone including a trend and squared trend (columns 5–8), and all these in turn including an AR(1) term (columns 9–16). Most of the coefficients are significant at least at the 10 percent level, and many of them at the 1 percent level, and have the expected sign. And, despite some variation between the approaches, overall most of the coefficients are quite robust. The coefficient of determination is 0.69 in the "plain" regression and increases to 0.97 when the AR term is included.

With regard to the hypotheses developed above, the estimated coefficients on *D*, *R**, and *A* are particularly worthy of note. The coefficients have all the expected signs, and are significant, and indicate that we can clearly reject each of the first three hypotheses: (1) no impact of the government balance ($\alpha_4 = 0$), (2) no impact of interest rate differential ($\alpha_5 = 0$), and (3) no impact of insurance-motive related transfers of foreign savings ($\alpha_6 = 0$). For this long period, there is thus substantial evidence that government deficits and the interest-rate differential vis-à-vis the rest of the world have contributed to higher interest rates in the G7 economies, while insurance-related net foreign capital inflows have contributed to lower interest rates in the G7 economies.

On the variable we are most interested in, the results uniformly suggest a statistically and economically significant impact of the fiscal deficit on interest rates. Table 3 shows the regressions including the deficit in the leading eight quarters, the most forward-looking of our fiscal measures. The coefficient on *D* is consistently significant at the 1 percent level and varies in size between 0.13 and 0.24, suggesting that an increase in the deficit by 1 percent of GDP raises the long-term interest rate by 13 to 24 basis points. While results are difficult to compare across studies, our results of the fiscal impact are consistent with those in a number of other studies that find a significant but relatively small effect.[7] One reason for the relatively small effect we find might be that our model includes the current account and thus distributes the interest-increasing effects of "twin deficits" across these two coefficients.[8]

Note, however, that there is some instability in the results on U and A when the AR term is included: for the former, the coefficient becomes insignificant; for the latter, the coefficient size drops markedly; in both cases, this could suggest that these variables have a loose common trend with the interest rate that, despite evidence against a unit root in U and A (see Table 2), exerts some bias when the AR term is not included. In sum, the results suggest that an improvement in the current account by 1 percent of GDP reduces long rates by about 10–30 basis points, and that reserve accumulation of SDR 100 billion by the rest of the world reduces them by 25–90 basis point. For the other variables, the results suggest that inflation expectations and the expected return on capital increase rates; the results are uniform in the first, but somewhat more heterogeneous in the second instance. The results for the money supply are mixed, with the effect significantly negative (as expected) only in some cases.

To shed some light on the heterogeneity found in the literature on fiscal policy and interest rates, we replicated all these regressions for each of five alternative fiscal indicators. The results in Table 4 (showing only the coefficients on the fiscal indicators) unsurprisingly show that the empirical effect of fiscal policy on interest rates very much depend on the fiscal indicators used. The regressions excluding the AR term (column 1–8) generally show the expected results—with similar sizes of the effects as the one in the baseline specification—for the government net lending of the current quarter, of the mean of the past four quarters, and of the mean of the next four quarters. The facts that the coefficient is largest for the forward-looking indicator, and that its coefficient is the only one remaining robust when the AR term is included (columns 9–16) is a further indication that expected deficits matter more than current actual ones, in line with what Gale and Orszag (2003) read from the literature. The coefficients on gross and net debt are mostly insignificant, and often even have negative signs, a counterintuitive result also found elsewhere (e.g., Ardagna and others, 2004).

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[7] Also Orr and others (1995), Reinhart and Sack (2000), Helbling and Westcott (1995), and Ford and Laxton (1995) find an impact of about 20 basis points of an increase in deficits or debt by 1 percent of GDP. Several studies found an impact of 40–60 basis points (e.g., Catao and Mackenzie, 2006), and a few one of up to 100 basis points, while others, such as Ardagna and others (2004), Engen and Hubbard (2004), and Kinoshita (2005) found results of only about 5–10 basis points.

[8] Orr and others (1995) also find that about half of the effect of fiscal deficits on interest rates stems from a corresponding deterioration in the current account.

Table 3. Baseline Panel Regressions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
C	**3.170**	**3.550**	**3.075**	**3.330**	**2.660**	**2.290**	**2.967**	**2.626**
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
P^e	**0.440**	**0.399**	**0.430**	**0.471**	**0.378**	**0.308**	**0.388**	**0.396**
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
K^e	**0.035**	0.013	**0.040**	**0.030**	**0.034**	0.008	**0.044**	**0.019**
	0.008	*0.261*	*0.002*	*0.002*	*0.010*	*0.493*	*0.001*	*0.030*
M	0.013	-0.010	0.018	0.018	0.008	**-0.017**	0.016	0.014
	0.059	*0.124*	*0.000*	*0.001*	*0.261*	*0.009*	*0.001*	*0.013*
D	**0.168**	**0.140**	**0.208**	**0.132**	**0.182**	**0.133**	**0.208**	**0.134**
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
R*	**0.336**	**0.378**	**0.344**	**0.302**	**0.267**	**0.309**	**0.316**	**0.213**
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
U	**-0.283**	**-0.136**	**-0.151**	**-0.240**	**-0.272**	**-0.113**	**-0.164**	**-0.242**
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
A	**-7.6E-06**	**-9.1E-06**	**-5.4E-06**	**-8.1E-06**	3.0E-06	2.0E-06	-3.0E-07	4.3E-06
	0.009	*0.000*	*0.026*	*0.000*	*0.353*	*0.412*	*0.910*	*0.113*
AR(1) term	No	No	No	No	No	No	No	No
Cross-section fixed eff.	No	Yes	No	No	No	Yes	No	No
Cross-section weights	No	No	Yes	No	No	No	Yes	No
Period weights	No	No	No	Yes	No	No	No	Yes
Trend and Trend^2	No	No	No	No	Yes	Yes	Yes	Yes
Adjusted R^2	0.693	0.806	0.879	0.974	0.705	0.822	0.868	0.966
Number of obs.	876	876	876	876	876	876	876	876

Continued…

Table 3. Baseline Panel Regressions (*concluded*)

	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
C	**3.960**	**4.201**	**3.658**	…	8.482	3.640	8.622	…
	0.000	*0.000*	*0.000*	…	*0.279*	*0.214*	*0.304*	…
P^e	**0.252**	**0.274**	**0.210**	…	**0.203**	**0.201**	**0.161**	…
	0.001	*0.000*	*0.006*	…	*0.011*	*0.006*	*0.042*	…
K^e	**0.017**	**0.017**	0.010	…	**0.017**	**0.017**	0.011	…
	0.047	*0.046*	*0.144*	…	*0.050*	*0.051*	*0.136*	…
M	**-0.006**	**-0.006**	-0.006	…	**-0.006**	**-0.006**	-0.006	…
	0.096	*0.103*	*0.120*	…	*0.084*	*0.088*	*0.110*	…
D	**0.220**	**0.222**	**0.240**	…	**0.210**	**0.211**	**0.237**	…
	0.001	*0.000*	*0.000*	…	*0.001*	*0.000*	*0.000*	…
R*	**0.250**	**0.256**	**0.267**	…	**0.245**	**0.248**	**0.262**	…
	0.000	*0.000*	*0.000*	…	*0.000*	*0.000*	*0.000*	…
U	0.010	0.010	0.003	…	0.010	0.011	0.003	…
	0.524	*0.514*	*0.846*	…	*0.516*	*0.489*	*0.852*	…
A	**-2.5E-06**	**-2.5E-06**	**-2.4E-06**	…	**-2.4E-06**	**-2.4E-06**	**-2.4E-06**	…
	0.000	*0.000*	*0.000*	…	*0.000*	*0.000*	*0.000*	…
AR(1) term	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Inv. AR root	0.98	0.95	0.98	…	0.97	0.94	0.97	…
Cross-section fixed eff.	No	Yes	No	No	No	Yes	No	No
Cross-section weights	No	No	Yes	No	No	No	Yes	No
Period weights	No	No	No	Yes	No	No	No	Yes
Trend and $Trend^2$	No	No	No	No	Yes	Yes	Yes	No
Adjusted R^2	0.977	0.977	0.974	…	0.977	0.977	0.974	…
Number of obs.	869	869	869	…	869	869	869	…

Source: Authors’ calculations.
Notes: Estimated with OLS and FGLS (cross-section weights and period weights). Bold coefficients are significant at least at the 1 percent level and have the expected sign; P-values (based on White diagonal robust standard errors) in italics. The statistics of the FGLS regressions are based on the weighted data.

Table 4. Panel Regressions with Alternative Fiscal Indicators

(Fiscal indicator is net lending unless specified otherwise)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Current quarter	**0.130**	**0.087**	**0.154**	**0.091**	**0.142**	**0.075**	**0.149**	**0.099**
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.001*	*0.000*	*0.000*
Adjusted R^2	0.689	0.803	0.870	0.803	0.699	0.818	0.861	0.827
Number of obs.	869	869	869	869	869	869	869	869
Mean past 4 quarters	**0.158**	**0.118**	**0.172**	**0.105**	**0.170**	**0.104**	**0.172**	**0.109**
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
Adjusted R^2	0.699	0.809	0.869	0.799	0.709	0.822	0.860	0.808
Number of obs.	871	871	871	871	871	871	871	871
Mean next 4 quarters	**0.170**	**0.140**	**0.198**	**0.123**	**0.183**	**0.131**	**0.199**	**0.129**
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
Adjusted R^2	0.694	0.807	0.875	0.917	0.706	0.822	0.864	0.999
Number of obs.	872	872	872	872	872	872	872	872
Current gross debt	-0.002	-0.012	**0.009**	-0.005	0.004	-0.007	**0.012**	-0.001
	0.607	*0.000*	*0.006*	*0.069*	*0.278*	*0.042*	*0.000*	*0.767*
Adjusted R^2	0.676	0.798	0.864	0.979	0.687	0.817	0.867	1.000
Number of obs.	884	884	884	884	884	884	884	884
Current net debt	0.005	-0.006	**0.010**	0.004	**0.010**	-0.004	**0.011**	**0.008**
	0.177	*0.087*	*0.000*	*0.107*	*0.008*	*0.208*	*0.000*	*0.002*
Adjusted R^2	0.677	0.796	0.868	0.995	0.690	0.816	0.864	0.997
Number of obs.	884	884	884	884	884	884	884	884
AR(1) term	No	No	No	No	No	No	No	No
Cross-section fixed eff.	No	Yes	No	No	No	Yes	No	No
Cross-section weights	No	No	Yes	No	No	No	Yes	No
Period weights	No	No	No	Yes	No	No	No	Yes
Trend and Trend^2	No	No	No	No	Yes	Yes	Yes	Yes

Continued…

Table 4. Panel Regressions with Alternative Fiscal Indicators (*concluded*)

(Fiscal indicator is net lending unless specified otherwise)

	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Current quarter	-0.018	-0.013	-0.024	…	-0.020	-0.013	-0.024	…
	0.556	*0.664*	*0.414*	…	*0.509*	*0.667*	*0.401*	…
Inv. AR root	0.980	0.960	0.980	…	0.970	0.940	0.970	…
Adjusted R^2	0.977	0.977	0.973	…	0.977	0.977	0.973	…
Number of obs.	862	862	862	…	862	862	862	…
Mean past 4 quarters	-0.003	0.009	-0.047	…	-0.011	0.005	-0.050	…
	0.948	*0.850*	*0.300*	…	*0.827*	*0.909*	*0.269*	…
Inv. AR root	0.980	0.960	0.980	…	0.970	0.940	0.970	…
Adjusted R^2	0.977	0.977	0.973	…	0.977	0.977	0.973	…
Number of obs.	864	864	864	…	864	864	864	…
Mean next 4 quarters	**0.110**	**0.117**	**0.130**	…	**0.109**	**0.119**	**0.131**	…
	0.033	*0.020*	*0.011*	…	*0.033*	*0.013*	*0.009*	…
Inv. AR root	0.980	0.950	0.980	…	0.970	0.940	0.970	…
Adjusted R^2	0.977	0.977	0.973	…	0.977	0.977	0.973	…
Number of obs.	865	865	865	…	865	865	865	…
Current gross debt	-0.112	-0.120	-0.100	…	-0.111	-0.118	-0.099	…
	0.000	*0.000*	*0.000*	…	*0.000*	*0.000*	*0.000*	…
Inv. AR root	0.990	0.970	0.990	…	0.990	0.970	0.990	…
Adjusted R^2	0.978	0.978	0.974	…	0.978	0.978	0.974	…
Number of obs.	877	877	877	…	877	877	877	…
Current net debt	-0.088	-0.088	-0.082	…	-0.087	-0.082	-0.081	…
	0.000	*0.000*	*0.000*	…	*0.000*	*0.000*	*0.000*	…
Inv. AR root	0.990	0.970	0.980	…	0.990	0.960	0.980	…
Adjusted R^2	0.977	0.978	0.974	…	0.978	0.978	0.974	…
Number of obs.	877	877	877	…	877	877	877	…
AR(1) term	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	No	Yes	No	No	No	Yes	No	No
Cross-section weights	No	No	Yes	No	No	No	Yes	No
Period weights	No	No	No	Yes	No	No	No	Yes
Trend and $Trend^2$	No	No	No	No	Yes	Yes	Yes	No

Source: Authors' calculations.
Notes: Estimated with OLS and FGLS (cross-section weights and period weights). Bold coefficients are significant at least at the 1 percent level and have the expected sign; P-values (based on White diagonal robust standard errors) in italics. The statistics of the FGLS regression are based on the weighted data. In each column, the regression is the same as in the respective column of Table 3. Only the coefficients on the fiscal variable and overall regression statistics are shown.

To examine whether results differ if interest rates are assumed to be determined entirely at the international level, we estimate the model also for the G-7 composite (Table 5). Similar to Barro and Sala-i-Martin (1990), we aggregate the country series by GDP weights; alternatively, we use the first principal component vectors (column 3); the external interest rate is always the first principal component of the national three-month rates which explains 83 percent of the variation. The model works generally quite well also for the G-7 composite.

Table 5. Regressions for G-7 Composite

	Baseline Deficit Measure			Alternative Fiscal Variables				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
C	**1.980**	**2.387**	-0.275	**2.828**	**2.868**	**2.748**	**15.136**	**11.464**
	0.000	*0.006*	*0.227*	*0.000*	*0.001*	*0.001*	*0.026*	*0.004*
P^e	**0.373**	**0.676**	**0.510**	**0.713**	**0.746**	**0.697**	0.523	**0.618**
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.132*	*0.070*
K^e	0.027	-0.008	-0.041	-0.011	-0.012	-0.013	-0.014	-0.012
	0.134	*0.587*	*0.478*	*0.460*	*0.421*	*0.388*	*0.385*	*0.473*
M	0.008	-0.019	-0.083	-0.026	-0.028	-0.023	-0.029	-0.026
	0.774	*0.467*	*0.256*	*0.306*	*0.288*	*0.380*	*0.369*	*0.393*
D	**0.576**	0.221	**0.201**	0.047	-0.010	0.096	**0.156**	**0.169**
	0.000	*0.124*	*0.048*	*0.493*	*0.910*	*0.326*	*0.051*	*0.017*
R*	**0.320**	**0.185**	**0.410**	**0.193**	**0.184**	**0.188**	**0.174**	**0.177**
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
U	0.603	**-0.193**	0.093	**-0.202**	-0.160	**-0.195**	**-0.213**	**-0.215**
	0.000	*0.099*	*0.176*	*0.078*	*0.138*	*0.093*	*0.081*	*0.084*
A	**-5.7E-06**	**-2.6E-06**	7.7E-01	**-2.7E-06**	**-2.4E-06**	**-2.7E-06**	-2.0E-06	**-2.4E-06**
	0.098	*0.075*	*0.140*	*0.082*	*0.022*	*0.087*	*0.148*	*0.082*
Aggregation by	GDP	GDP	PCA	GDP	GDP	GDP	GDP	GDP
AR(1) term	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Inv. AR root	…	0.93	0.79	0.94	0.93	0.96	0.95	0.93
Adjusted R^2	0.930	0.982	0.972	0.984	0.982	0.982	0.982	0.983
Number of obs.	123	122	92	127	122	103	103	123

Source: Authors' calculations.
Notes: Individual country data are aggregated by GDP weights or by the first principal component (PCA). Estimated with OLS. Bold coefficients are significant at least at the 10 percent level and have the expected sign; P-values (based on White robust standard errors) in italics.

Most interestingly, the effect of the fiscal deficit is the same as in the panel when comparing the results between the regressions based on the same estimators: for both the GDP-based (column 2) and principal-components-based composite (column 3), the coefficient on *D* is 0.2, as it is in the corresponding panel (column 9 in Table 3). However, it must be qualified that the effect is considerably larger when no AR term is included (column 1), and that the effect is not significant (or has the "wrong" sign) for some of the alternative fiscal indicators (columns 4–6). However, the effect of debt (columns 7–8) is significant now, and with about 16 basis points per 1 percent of GDP increase in the debt ratio its effect is similar to what we found for the deficit. Moreover, the effect of reserve accumulation (*A*) is, where significant, very similar to the panel (compare columns 1–2 in Table 5 to columns 1 and 9 in Table 3).

C. A New Economy of Interest Rates?

To answer our question to what extent there is a sustainable "new economy" of interest rates, it is essential to assess the stability of the model over the past five decades, and particularly whether the determinants of interest rates have changed in the more recent past. We first ran recursive estimates of the panel with fixed effects and the AR term, where each year's coefficient is based on the data up to that year. The results shown in Figure 7 suggest that in the cases of P^e, *M*, *R**, and *A*, while there was obviously a lot of instability in the early part of the sample period, there is little or no apparent evidence for a break in the coefficients since the late eighties. However, the coefficients on K^e and *U* exposed a continuous decline even recently, which could be seen as a consequence of financial globalization during this period. Most interestingly, the coefficient on *D* showed most instability, with several marked ups and downs during the past decades; this instability could be yet another explanation for the puzzling heterogeneity in the empirical literature on deficits and interest rates.

For a more rigorous assessment of model stability, we computed Wald tests[9] comparing the overall 1960–2005 panel with subsamples ending earlier in five-year intervals. Table 6 shows the results, the bold coefficients being significant with the expected sign and not different from the coefficient for the entire period at least at the 10 percent level. For the government deficit, there is ultimately no evidence for a statistically significant structural break, as the null cannot be rejected at the 10 percent level for any of the subperiods (apart from the earliest one up to 1975). The coefficients on P^e, K^e, and $R*$ are also stable throughout. Even the coefficient on reserve accumulation (*A*), which we would have expected most to have a recent structural break, is stable back to 1990. However, the coefficient on the current account balance (*U*) is mostly not significant and unstable, consistent with the picture in Figure 7. In sum, we cannot reject the hypotheses (4), (5), and (6) spelt out in Section III.

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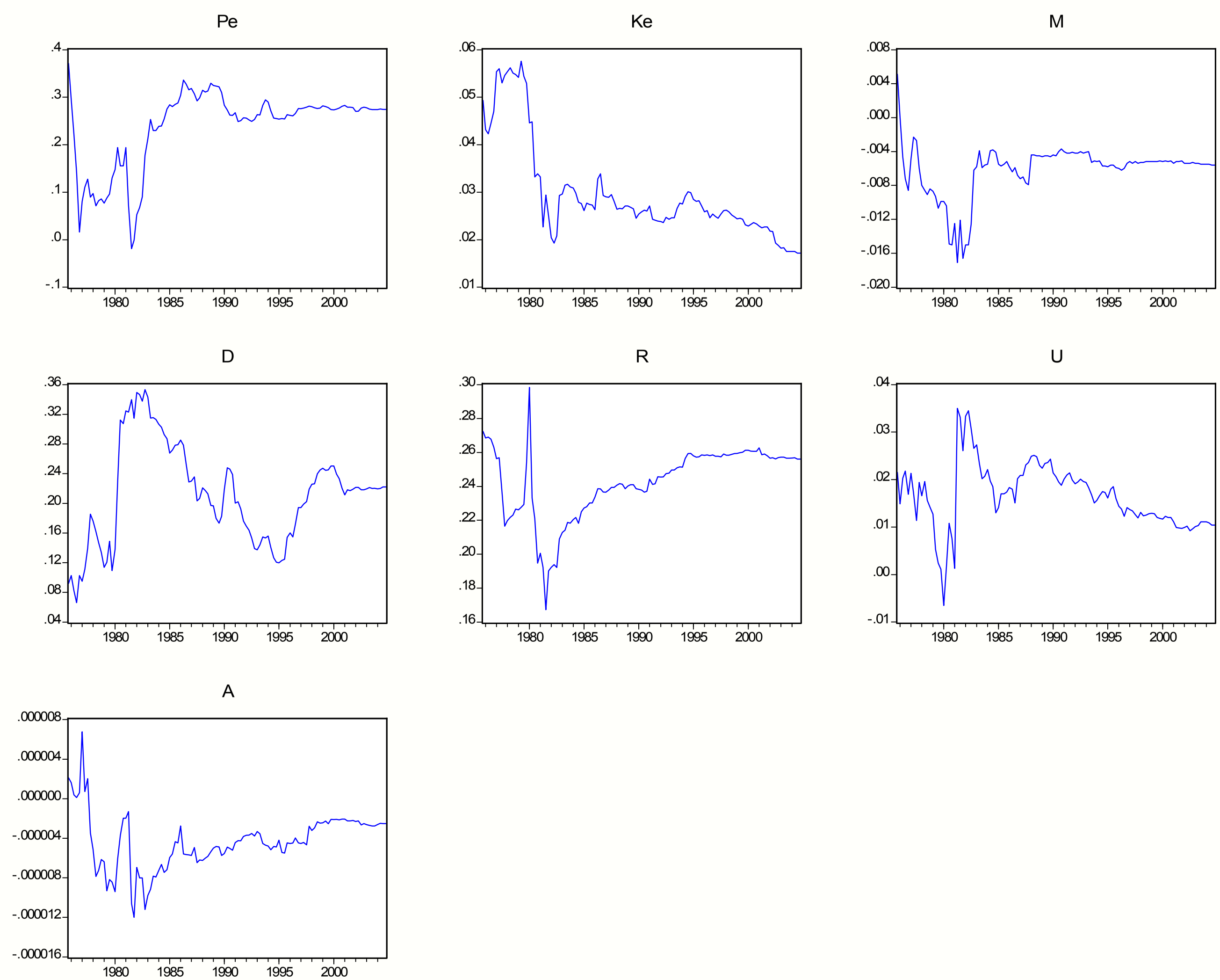
[9] We use the Wald test, because (in contrast to the Chow test) it does not require that the disturbance variance is the same in all regressions. The preferable Andrews and Ploberger (1994) test is precluded by the small sample. While the power of the Wald test is also affected by small sample size, the direction of the bias makes the test even stronger here because we would tend to reject the null of parameter stability too *frequently*. Given that the F-statistic of the Wald test is not valid under White-robust standard errors, we instead show the χ^2-statistics.

Figure 7. Recursive Coefficient Estimates of Panel with Fixed Effects and AR(1) Term



Source: Authors' calculations.
Note: Estimates of coefficients based on the sample from 1960 to the respective year.

Table 6. Panel: Recursive Estimates and Wald Tests

		1975	1980	1985	1990	1995	2000	2004
C	Coefficient	**4.887**	**6.654**	**5.102**	**5.476**	**5.298**	**4.249**	**3.960**
		0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
P^e	Coefficient	**0.371**	0.156	**0.288**	**0.262**	**0.263**	**0.281**	**0.252**
		0.004	*0.131*	*0.001*	*0.001*	*0.000*	*0.000*	*0.001*
	Wald χ2 stat.	0.883	0.872	0.167	0.017	0.026	0.158	…
		0.348	*0.351*	*0.683*	*0.895*	*0.872*	*0.691*	…
K^e	Coefficient	**0.049**	**0.034**	**0.027**	**0.026**	**0.027**	**0.023**	**0.017**
		0.024	*0.034*	*0.086*	*0.032*	*0.013*	*0.012*	*0.047*
	Wald χ2 stat.	2.253	1.143	0.426	0.558	0.867	0.466	…
		0.133	*0.285*	*0.514*	*0.455*	*0.352*	*0.495*	…
M	Coefficient	0.005	**-0.015**	-0.005	-0.004	-0.006	-0.005	**-0.006**
		0.770	*0.063*	*0.593*	*0.343*	*0.108*	*0.137*	*0.096*
	Wald χ2 stat.	0.378	1.375	0.001	0.247	0.008	0.016	…
		0.539	*0.241*	*0.971*	*0.619*	*0.928*	*0.899*	…
D	Coefficient	0.092	**0.307**	**0.279**	**0.239**	**0.154**	**0.220**	**0.220**
		0.601	*0.032*	*0.058*	*0.025*	*0.051*	*0.001*	*0.001*
	Wald χ2 stat.	0.532	0.379	0.164	0.034	0.688	0.000	…
		0.466	*0.538*	*0.685*	*0.855*	*0.407*	*0.991*	…
R*	Coefficient	**0.272**	0.195	**0.230**	**0.237**	**0.259**	**0.261**	**0.250**
		0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
	Wald χ2 stat.	0.128	2.856	0.484	0.223	0.098	0.155	…
		0.720	*0.091*	*0.487*	*0.637*	*0.754*	*0.694*	…
U	Coefficient	0.021	0.008	0.017	0.019	0.016	0.012	0.010
		0.504	*0.747*	*0.485*	*0.372*	*0.383*	*0.477*	*0.524*
	Wald χ2 stat.	0.125	0.012	0.084	0.168	0.102	0.012	…
		0.724	*0.913*	*0.772*	*0.682*	*0.750*	*0.912*	…
A	Coefficient	2.1E-06	-2.0E-06	-4.5E-06	**-5.2E-06**	**-4.5E-06**	**-2.1E-06**	**-2.5E-06**
		0.899	*0.761*	*0.211*	*0.034*	*0.002*	*0.012*	*0.000*
	Wald χ2 stat.	0.077	0.006	0.308	1.226	1.838	0.282	…
		0.782	*0.939*	*0.579*	*0.268*	*0.175*	*0.595*	…
Adjusted R^2		0.942	0.956	0.965	0.964	0.966	0.974	0.977
Number of obs.		110	245	385	525	665	794	869
Inv. AR root		0.88	0.93	0.93	0.93	0.93	0.95	0.98

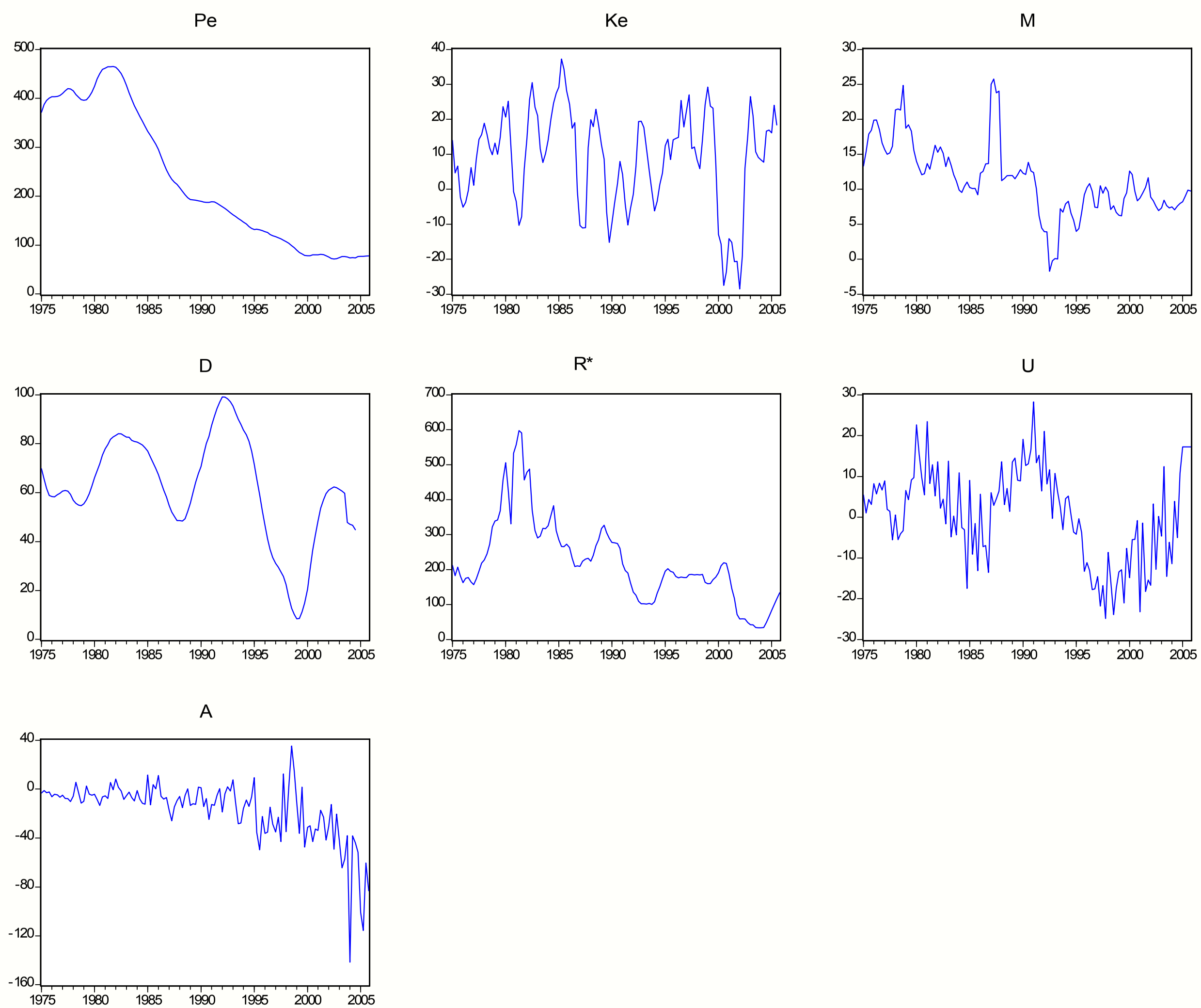
Source: Authors' calculations.
Notes: Rolling estimates for periods starting in 1960Q1 and ending in Q4 of the year shown in the table. For each variable, the table shows the coefficient and its P-value (in italics) and the χ^2-test statistics and P-value (in italics) of a Wald test with the null hypothesis that the coefficient estimated for the respective sub-period is the same as for the full period from 1960Q1 to 2004Q4. Bold coefficients are significant at least at the 10 percent level, have the expected sign, and are not significantly different from the coefficient estimate for the full panel (i.e., Wald test null cannot be rejected at least at the 10 percent level).

Thus, our findings suggest that the evolution of some of the key underlying factors, rather than changes in their relationship with interest rates (the idea of a new economy), seems to account for the relatively low interest rates in the latest period. These factors may reflect decisions by foreign central banks, with mounting reserves, to hold more of their funds in the longer maturity bonds, as indeed suggested by evidence presented in Figure 5. This then raises the question of how much did reserve accumulation, that is, more demand for insurance by the rest of the world, contribute to offset the interest rate impact of a loose fiscal policy and the widening current account deficit in the G-7 in recent years? To address this, Figure 8 shows the contributing factors implied by the regression in Table 3 (column 1).

According to our computations, the effect of reserve accumulation has been very substantial in recent years, amounting to a 2005 quarterly average of 90 basis points for the G-7 average long-term interest rate. This estimate is in line with "educated guesses" by prominent economists and fixed income market analysts who put the effect in 2005 at 100 basis points (see ECB, 2006, p. 24), as well as with two papers we are aware of that looked systematically at the impact of the activities of foreign central banks on U.S. interest rates: Bernanke and others (2004) suggest that Japanese intervention could have lowered five-year and ten-year U.S. treasury yields by about 50–100 basis points from early 2000 to early 2004, although they caution that the evidence is not conclusive. This compares to an average effect of 40 basis points of (not only Japanese) reserve accumulation during this period for the G-7 average (for which it is bound to be a little lower than for the United States alone, given that most reserves are in U.S.-dollars) according to our estimates. Warnock and Warnock (2005) estimate that purchases by foreign central banks depressed U.S. treasury yields by about 60 basis points in the twelve months up to May 2005. This compares to an average 80 basis points for this period according to our estimates.

Our estimates suggest that the unusually large impact of reserve accumulation has swamped a significant upward effect of government deficits on interest rates in recent years: since 2001, fiscal deficits have added an estimated average 50 basis points to long-term interest rates in the G-7, while fiscal consolidation in the United States and elsewhere had reduced this effect to a record low of 10 basis points only as recently as in 1999. Looking at the other contributors to interest rates, the remaining effect from the deterioration of the G-7 current account on interest rates is modest when the impact of the insurance-related inflows from the non-G-7 countries is controlled for. The expected long-term inflation rate and policy rates contributed about 100 basis points each at the end of 2005. The expected return on capital and money supply growth, in turn, accounted for an estimated 10–20 basis points each.

Figure 8. Implied Contributions to G-7 Average Long-Term Interest Rates



Source: Authors' calculations.

The preceding analysis allows us to address the question posed at the beginning of the paper: to what extent have long-term interest rates in the G-7 economies over 2000–2005 been driven by transitory, as opposed to permanent, factors? The evidence tends to suggest that the major downward influence on interest rates has been one that is believed by most observers to be transitory: the accumulation of unprecedented level of savings in foreign currency by developing country governments instigated by insurance, rather than investment motives, and the transference of these savings to G-7 fixed-income markets. Although there is a wide array of opinions on how long this phenomenon is likely to continue, the opportunity cost of accumulation of these reserves (Hauner, 2005) would militate against the process continuing at the pace of recent years. Moreover, the likelihood that there will be an adjustment in the global current account imbalances, a key element in the reserve accumulation, in the medium run or sooner, is likely to entail a slowdown in the transfer of savings from the developing world to the industrial world, reinforcing the process (see IMF, 2005). As these transitory factors wane in significance, the impact of other determinants of interest rates will again come to the fore; and among them, prominently, is likely to be fiscal policy.

V. Conclusions and Policy Implications

The key objective of this paper has been to examine whether the underlying determinants of long-term interest rates in the G-7 countries have changed in the face of financial globalization. This was motivated by the ongoing "conundrum" of relatively low long-term interest rates in the G-7 economies in the face of a variety of adverse factors. The paper has focused on the deteriorating fiscal positions in these economies and inquired which factors are likely to have offset their impacts on long-term interest rates, and how sustainable they are likely to be. A model of interest rate determination was elaborated and estimated for the G-7 economies for a panel and a composite, with explicit emphasis on capital flows influencing global interest rates. The results suggest a high likelihood of a substantial impact of the weakening of the budgetary position in the G-7 countries on global interest rates. In other words, the chronic fiscal imbalances of recent years did impart substantial upward pressures on interest rates. These pressures were, however, mitigated by the impact of large insurance-related foreign inflows that exerted a strong downward bias on interest rates in recent years. These flows, it is argued, are unlikely to be a permanent phenomenon.

The awakening from the friendly interest rate environment in recent years could be made all the more unpleasant by the consequences of recent chronic fiscal deficits. That is, if long-term interest rates rise to "normal" levels, the budgetary impact for most G-7 countries will be greater than what the interest rate effect alone would imply, simply because this effect would be compounded by the effect of increased debt. An illustrative calculation shows the substantial fiscal impact of a reversal in interest rates: looking at the G-7 average debt/GDP ratio, an increase in average interest rates on this debt by 50–200 basis points would raise the G-7 average interest burden by 0.4–1.7 percent of GDP. Of course, the impact of higher interest rates would filter down to the interest burden only gradually as debt matures. But even gradual increases in interest rates have a substantial long-term impact on debt developments: for example, Heller and Hauner (2005) calculate for the EU-15 that an average interest rate 0.5 percentage points higher than underlying the projections in European

Commission (2004) results in a 2050 median debt ratio 10 percentage points of GDP higher than in the baseline.

In the long run, a potential upward effect of aging populations on interest rates could further exacerbate the situation—which would be compounded if aging should also drive up public borrowing. There is no consensus regarding the net effect of aging populations on interest rates, and there is scope for intermediate patterns, where first the interest-decreasing and then the interest-increasing effects of aging dominate. However, the interest-increasing impact indicated by some of these studies could potentially be large. For example, Antolin and others (2005) find potential real interest rate increases in the 30–60 basis point range during the second quarter of the century, while Fehr and others (2003) find increases in the 400 basis point range. Aptly, they conclude, with regard to the impact of aging on fiscal sustainability, that "far from mitigating the developed world's fiscal problems, macroeconomic feedback effects make matters significantly worse." In such a scenario, and with the high likelihood of a reversal in the factors underlying global long-term interest rates, the recent budgetary developments in most of the G-7 countries assume an added significance. They also underline the need to take substantial measures toward budgetary consolidation in the near term.

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