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Author: Aart Kraay, Jaume Ventura

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The Dot-Com Bubble, the Bush Deficits, and the U.S. Current Account

Aart Kraay and Jaume Ventura

11.1 Introduction

Since the early 1990s, the United States has experienced steadily widening current account deficits, reaching 5.7 percent of gross national product (GNP) in 2004 (see top panel of figure 11.1). These deficits are large relative to the postwar U.S. historical experience. With the exception of a brief period in the mid-1980s where current account deficits reached 3.3 percent of GNP, the U.S. current account has typically registered small surpluses or deficits averaging around 1 percent of GNP. As a consequence of the recent deficits, the U.S. net foreign asset position has declined sharply from –5 percent of GNP in 1995 to about –26 percent by the end of 2004 (see bottom panel of figure 11.5). The goal of this paper is to provide an account of this decline that relates it to other major macroeconomic events and helps us to grasp its implications for welfare and policy.

Any attempt to do this must take into consideration a major change in the pattern of asset trade between the United States and the rest of the world (see figure 11.2). During the second half of the 1990s, the United States accumulated foreign assets and liabilities at the rate of $765 billion and $965 billion per year. About two-thirds of this consisted of increases in the volume and value of equity holdings. This pattern reversed sharply

Aart Kraay is a lead economist in the Development Research Group at the World Bank. Jaume Ventura is a senior researcher at the Centre de Recerca en Economia Internacional (CREI), a professor at the Universitat Pompeu Fabra, and a research associate of the National Bureau of Economic Research.

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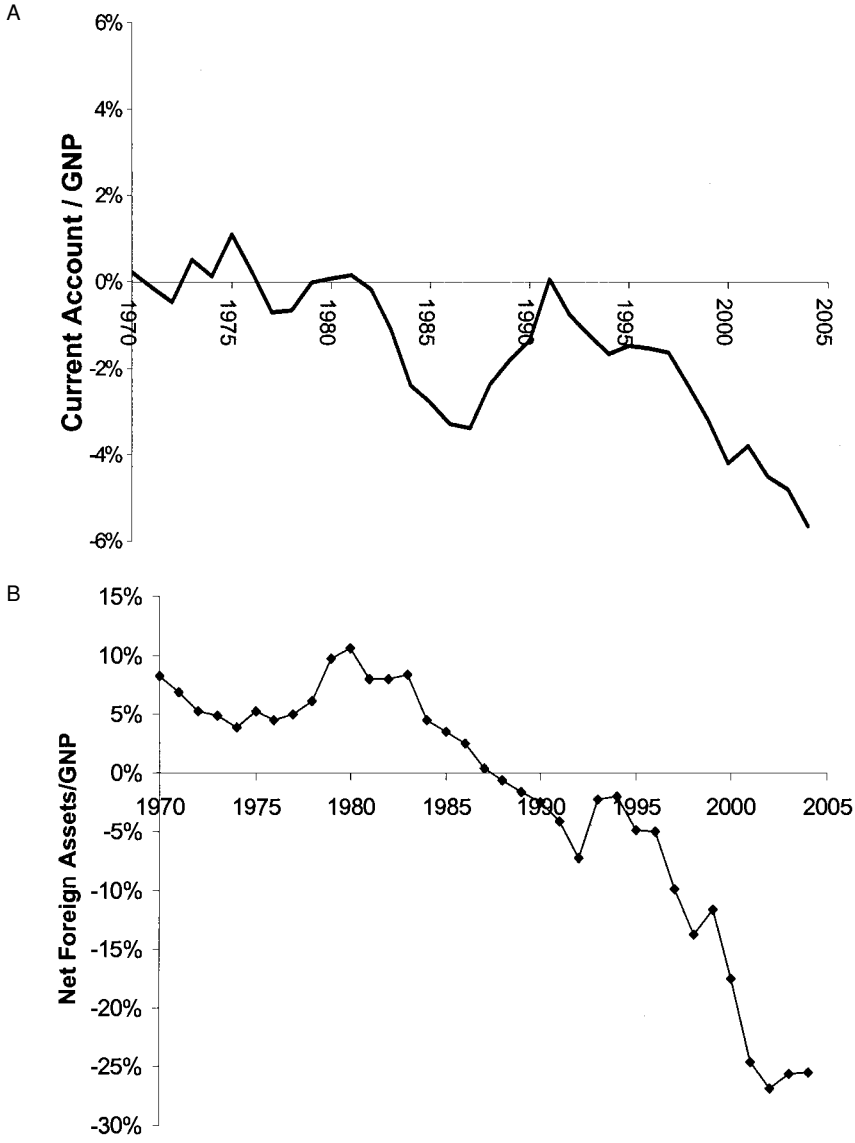

Fig. 11.1 U.S. current account and net foreign assets: *A,* Current account; *B,* Net foreign assets

Sources: Current account data are from U.S. Bureau of Economic Analysis. NFA data are from Gourinchas and Rey (chap. 1 in this volume).

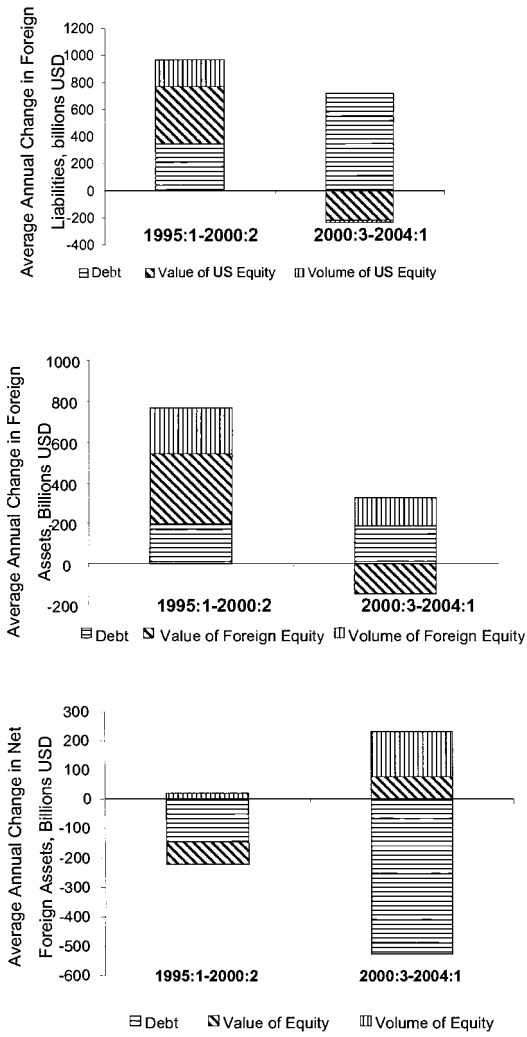

Fig. 11.2 Average annual changes in U.S. foreign assets and liabilities

Source: Gourinchas and Rey (chap. 1 in this volume).

Note: Change in value of equity estimated as sum over all quarters of difference between quarterly change in stocks and corresponding quarterly flows.

in the first half of the 2000s. The worldwide collapse in equity prices erased a substantial fraction of the assets and liabilities that the United States had accumulated during the 1990s, resulting in an increase of U.S. net holdings of equity of about $232 billion per year. Despite this, the U.S. net foreign asset position declined at the rate of $296 billion per year as U.S. net holdings of debt (both public and private) declined at the rate of $528 billion per year. While in the second half of the 1990s equity was driving most of the

changes in U.S. foreign assets and liabilities, in the first half of the 2000s, these changes were mainly driven by debt.

This change in the composition of the U.S. current account is a natural reflection of the two major macroeconomic events of this period. The first one is the dot-com bubble of the 1990s. Between 1990 and the peak in mid-2000, U.S. equity prices increased nearly fivefold, and the growth rate of equity prices accelerated from 10.4 percent per year between 1990 and 1995 to 21.2 percent per year between 1995 and 2000 (see panel A of figure 11.3).

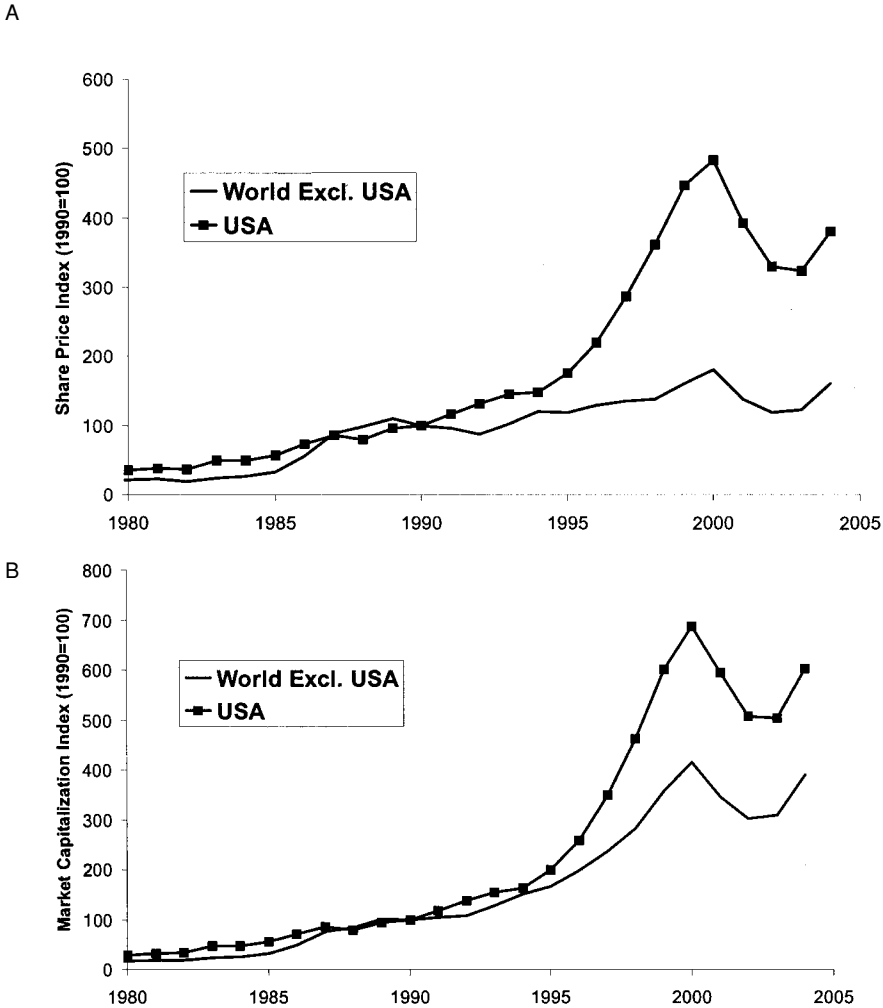

Fig. 11.3 Stock market boom of the 1990s: *A*, Share prices; *B*, Market capitalization

Source: Datastream.

The value of U.S. stock market capitalization grew even faster, doubling between 1990 and 1995, and then tripling between 1995 and the peak in 2000 (see panel B of figure 11.3). The stock market boom in the rest of the world was less spectacular but still quite impressive by historical standards. Equity prices in the major foreign markets grew 7.9 percent per year during the second half of the 1990s. As is well known, this episode ended with a sharp downward adjustment that started in 2000. By 2003, equity prices in the United States and abroad had fallen by 30 percent, and stock market capitalization had fallen by about 25 percent. Because these changes in equity prices have taken place against a background of relatively low interest rates and low inflation, being in the stock market surely was a good idea in the second half of the 1990s but a lousy one in the first half of the 2000s.

The second major macroeconomic event was the reemergence of large fiscal deficits in the United States after the Bush administration took over in 2001 (see figure 11.4). Unlike the 1980s, the 1990s were a period of declining budget deficits and small surpluses. After 2000, budget deficits reappeared with a vengeance, however, reaching 4.8 percent of GNP in 2004. As a result, U.S. public debt has increased from 33 to 37 percent of GNP between 2001 and 2004. An intriguing feature of this recent period is that large budget deficits have not been accompanied by any significant increase in the cost of borrowing for the federal government (see figure 11.4).

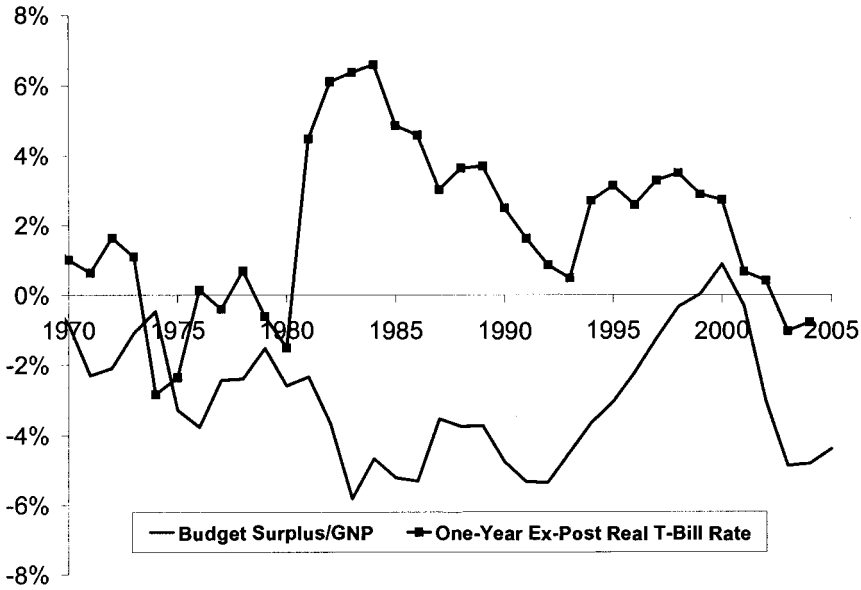

Fig. 11.4 Budget deficits and interest rates

Sources: Congressional Budget Office and Board of Governors of the Federal Reserve System.

Roughly speaking, the 1970s were characterized by low budget deficits and low interest rates, while the period 1980 to 1995 featured high budget deficits and high interest rates. But over the past ten years this pattern has unraveled, with fairly high interest rates and low deficits during the second half of the 1990s, followed by low interest rates and large budget deficits since 2000.

What are the links between the stock market bubbles, budget deficits, and current accounts? As a first cut at this question, we develop in sections 11.2 and 11.3 a conventional macroeconomic model that crudely, but effectively, encapsulates conventional views of the U.S. current account deficit. According to these views, its appearance in the second half of the 1990s reflected an increase in U.S. productivity relative to the rest of the world that led investors all over the world to place their savings in the U.S. stock market. The situation reversed, and U.S. productivity declined in 2000, leading to the stock market collapse. But the current account deficit continued despite this, now fueled by the drastic change in fiscal policy implemented by the Bush administration. This change is usually attributed to purely exogenous factors such as the cost of the wars in Afghanistan and Iraq as well as a desire to cut taxes. This policy is, however, unsustainable and something must eventually give. Most observers think that this episode will end with a painful fiscal adjustment although there are also those who argue that the resolution will entail some default on the part of the U.S. government.[1]

Although the conventional view is coherent and well grounded in theory, it has difficulty accounting for two aspects of the data. The first is observed movements in the stock market. If the stock market only contains productive firms, its value should reflect that of the price and quantity of capital they hold. But it is hard to find evidence of increases in either of these variables that would justify the more than threefold increase in U.S. stock market capitalization that occurred during the second half of the 1990s. And it is even harder to find evidence that would justify a one-quarter decline in the first few years of the 2000s.[2] The second aspect of the data is the behavior of interest rates. The model predicts that the U.S. fiscal expansion should increase the interest rate as government debt crowds out capital from the portfolios of investors. But the evidence shows exactly the oppo-

1. Few would argue that the U.S. government will fail to make stipulated payments, but still some think that there is some probability that the U.S. government effectively defaults on its obligations by engineering a high and unexpected inflation that reduces the real value of these payments.

2. Hall (2000, 2001) has argued that in fact such a large increase in the capital stock did occur during the 1990s. In particular, he argues that this increase took the form of intangible capital such as brand loyalty as well as unique organizational structures based on efficient use of information technology. While this view might have seemed reasonable in the late 1990s before the stock market declined, it is far less appealing today as it is difficult to explain why so much of this intangible capital abruptly vanished in the second half of 2000.

site. The real interest rate fell from above 3 percent in the second half of the 1990s to almost 0 percent in the early 2000s.[3]

What has been driving the stock market during the last decade? Why did the interest rate fall in the midst of one of the largest fiscal expansions in U.S. history? We argue in section 11.4 that the difficulties of the conventional view are closely linked to its underlying assumption that all savings are channeled into efficient investments. If financial markets do not work as well, the economy might contain investments that deliver a rate of return that is below the growth rate of the economy. These investments are inefficient as they absorb on average more resources than they produce.[4] It is well known that in this situation both stock market bubbles and government debt can play the useful role of displacing inefficient investments, raising the interest rate and hence the consumption and welfare of all. Moreover, those who create the bubbles or issue the debt receive rents that can be interpreted as a fee for providing this service.[5] A crucial and novel aspect of the model presented here is that it provides a formal description of how bubbles and debt interact with each other as they compete for a fixed pool of savings.

In sections 11.5 and 11.6 we show that these interactions provide a new perspective on recent macroeconomic events. In section 11.5 we construct an equilibrium in which the stock market initially creates a bubble that eliminates inefficient investments. The world economy operates efficiently, and the interest rate and welfare are both high. But sustaining a bubble requires that current investors believe that future investors will buy it from them. At some point, there will be a self-validating change in investor expectations about what other investors will do and this triggers the collapse of the bubble. As a result, inefficient investments reappear and the interest rate declines. The government reacts to this by running large budget deficits and expanding public debt sufficiently to crowd out these inefficient investments. According to this "benevolent" view, budget deficits constitute a welfare-improving policy response to the collapse of the bubble.

3. A popular explanation for the decline in interest rates is that a global glut of saving has appeared coincidentally at the same time as the fiscal deficits (see, for example, Bernanke 2005). According to this view, government debt need not displace capital from the portfolio of investors. As we shall see later, our story is consistent with this observation. In fact, we provide a novel explanation of the glut of saving based on the collapse of the bubble.

4. The resources devoted to keep these investments are roughly equal to the growth rate times the capital stock. The resources obtained from such investments are roughly equal to the rate of return times the capital stock. If the growth rate exceeds the rate of return, the economy obtains additional resources by eliminating these inefficient investments. See Abel et al. (1989).

5. The paper that discovered dynamic inefficiency is Samuelson (1958). See also Shell (1971) for a revealing discussion of this problem. For the analysis of government debt, see Diamond (1965), Woodford (1990), and Hellwig and Lorenzoni (2003). For the analysis of stock market bubbles, see Tirole (1985), Grossman and Yanagawa (1993), King and Ferguson (1993), Olivier (2000), and Ventura (2002, 2003).

Moreover, they also provide a windfall for the U.S. government as it allows it to appropriate the value of the bubble.

Section 11.6 constructs an alternative equilibrium that again begins with the stock market creating a bubble that eliminates inefficient investments. The government initially refrains from running budget deficits, and this creates space for the bubble to grow. At some point, investors revise upwards their expectations of the likelihood that there is a change in government, and the new government would use fiscal policy to appropriate the windfall associated with replacing the bubble with government debt. This change in investor expectations leads to the collapse of the bubble. There is then a change in government, and the new government starts a fiscal expansion that validates the expectations of investors. The interest rate need not increase because the collapse of the bubble forces savers to seek alternative investments, and this raises the demand for government debt. This fiscal policy implements a transfer from the owners of the bubble at home and abroad to the U.S. government. In this "cynical" view, budget deficits constitute a beggar-thy-neighbor policy that is responsible for the collapse of the bubble.

Interestingly, the benevolent and cynical views are observationally equivalent. In both of them, the collapse of the bubble is accompanied by a decline in the interest rate and a large fiscal expansion that leads to a high but stable level of debt. In both views, this high level of debt is compatible with the U.S. running budget deficits forever (although smaller than the current ones). In both of them, the U.S. net foreign asset position can remain negative forever. In both views, the collapse of the bubble generates a loss for shareholders at home and abroad and a windfall for the U.S. government. The only difference between the two views lies in the shock that caused this chain of events. While in the benevolent view this shock is a change in investor expectations about other investors, in the cynical view this shock is a change in investor expectations about the government. In both interpretations, subsequent events corroborated the corresponding change in investors' expectations.

Of course, this is not the first paper to be written on the U.S. current account deficit. A substantial literature in the past few years has studied the determinants and sustainability of the U.S. current account deficit. Much of this literature has adopted what we have termed as conventional views without much discussion and has instead focused on determining its implications. Most notably, Obstfeld and Rogoff (2000, 2004, and 2005), Blanchard, Giavazzi, and Sa (2005), and Roubini and Setser (2004) have all argued a large current account reversal is inevitable and will likely be accompanied by a large and disruptive depreciation in the dollar.[6]

6. We do not analyze the implications of our scenarios for the real exchange rate although it would be straightforward to do it. The results would also be straightforward and standard. The real exchange rate would move in opposite direction to the current account and the magnitude of the change would depend on the usual parameters, that is, the elasticity of substitution between traded and nontraded goods and the elasticity of substitution between traded goods produced at home and abroad.

The two papers that are perhaps closer to this one are Ventura (2001) and Caballero, Farhi, and Hammour (2005). Both of these papers challenge conventional views and stress instead the effects of an expectations-driven stock market bubble on the U.S. net foreign asset position. Ventura emphasized the role of the dot-com bubble as the main driver of the current account deficits during the second half of the 1990s and argued that those deficits would be sustainable in the absence of a bubble collapse. Unlike this paper, Ventura did not offer a formal model connecting stock market bubbles and the net foreign asset position, nor did he analyze the potential interactions between bubbles and fiscal deficits. Caballero, Farhi, and Hammour study a one-country model in which high expectations about the future create sufficient savings to fund the investment necessary to validate these expectations. In contrast, we work with a world equilibrium model in which there is a fixed pool of world savings, and the stock market bubble, capital, and public debt compete for it. While Caballero, Farhi, and Hammour place the savings decision and adjustment costs in investment at center stage of their story, we instead emphasize the portfolio decision and financial market imperfections.

11.2 A Model of Crowding-Out with Debt and Capital

This section presents a stylized model of productivity, debt, and deficits. It depicts a world where young individuals save to provide for their old age consumption. These savings are used to finance both productive investments and government deficits. Fiscal policy is used to redistribute consumption across different generations. In particular, deficits finance additional present consumption by crowding out productive investments and lowering future consumption. This model constitutes a useful starting point for our argument as it neatly encapsulates conventional views on the effects and the sustainability of fiscal deficits.

Consider a world with two regions: the United States (U.S.) and the rest of the world (ROW). This world is populated by overlapping generations of young and old. Each generation contains a continuum of members with aggregate size one that are evenly distributed across the two regions. Let I and I^* be the sets of U.S. and ROW residents, respectively. As usual, use an asterisk to denote ROW variables and omit the asterisk to denote U.S. variables. There is a single good that can be used for consumption and investment. Each generation receives an endowment of this good during youth, which is evenly distributed among all its members. The endowment grows from one generation to the next at a (gross) rate γ. We normalize units so that the endowment of generation t is equal to γ^t, and we express all quantity variables as a share of this endowment.

The young are patient and risk-neutral, and they maximize expected old age consumption. Given this objective, the young save all their income, and the old consume all of theirs. Because the income of the young consists

only of the endowment mentioned above, our normalization implies that all the quantity variables are to be interpreted as a share of world savings. The income of the old consists of the return to their savings plus a transfer from the government which could be positive or negative. We shall assume throughout that this transfer is independent of an individual's actions. Therefore, the only important decision in any individual's life is how to invest his or her savings so as to maximize its expected return. This portfolio choice is at the heart of the story we want to tell here.

The menu of investment options available to the young consists of government debt and firms. Government debt consists of one-period bonds. We assume that fiscal policies are consistent in the sense that, if the market decided not to roll over the debt, the government would be able (and willing) to generate enough of a surplus so as to redeem all the bonds issued. This ensures that debt payments are made with probability one. It also implies that debt issued by U.S. and ROW governments must offer the same interest rate. Let r_{t+1} be this common (gross) interest rate for holding government debt from date t to date $t + 1$.

Firms are investment projects run by entrepreneurs. A fraction κ_t of these projects is located in the United States (although some of these projects might be managed by ROW entrepreneurs). We assume that this share can vary stochastically over time within the unit interval. Firms purchase capital during the entrepreneur's youth, produce during the entrepreneur's old age, and then distribute a single dividend per unit of capital before breaking up. This dividend or production is random and has a mean π. To finance the purchase of capital, firms can use private or internal funds (i.e., the entrepreneur's own savings) or they can go public and raise external funds in the stock market (i.e., the savings of young other than the entrepreneur). Firms that are financed by internal funds offer an expected gross return equal to π. Firms that are financed by external funds are subject to agency costs equal to α and offer an expected gross return $\pi - \alpha$.[7] Therefore, investing in self-financed firms is preferred to holding stocks of traded firms.

Throughout the paper, we assume that the economy is sufficiently productive, that is, $\pi > \gamma$. This ensures that the expected return to capital exceeds the growth rate of savings. For the next couple of sections, we further assume that agency costs are not too severe, that is, $\alpha < \pi - \gamma$. This is equivalent to saying that financial frictions are small, and the stock market is close enough to the frictionless paradigm. This assumption turns out to be crucial and will be removed in section 11.4.

7. Agency costs arise from incentive problems that are created by the separation between ownership and control. One example is the cost of monitoring the manager to ensure that he or she does not embezzle funds from the firm. Another example is the efficiency loss due to less than optimal effort in situations where shareholders imperfectly observe the manager's actions or information set.

Each generation contains two types of young: entrepreneurs and shareholders. The former have good investment projects that they can convert into a firm, while the latter do not. We assume the measure of the set of entrepreneurs is ε. For simplicity, assume both regions have the same distribution of types. It follows from our assumptions that entrepreneurs either invest in their own self-financed firms or buy government debt, while shareholders are forced to choose between holding stocks of publicly traded firms and government debt.[8] Therefore, we can write the expected consumption of the different individuals as follows:

$$(1) \qquad E_t C_{i,t+1} = \begin{cases} \max(\pi, r_{t+1}) + E_t T_{i,t+1} & \text{if } i \text{ is an entrepreneur,} \\ \max(\pi - \alpha, r_{t+1}) + E_t T_{i,t+1} & \text{if } i \text{ is a shareholder,} \end{cases}$$

where $T_{i,t+1}$ is the transfer that old individual i receives from its government[9] (remember that all quantity variables are expressed as a share of the world endowment). Unless $r_{t+1} \geq \pi$, entrepreneurs enjoy higher expected consumption and therefore higher welfare than shareholders because of their ability to manage firms.[10]

Let D_t be total (U.S. plus ROW) government debt, and let δ_t be the fraction of this total that has been issued by the United States. Then we can write debt dynamics as follows:

$$(2) \qquad D_{t+1} = \frac{r_{t+1}}{\gamma} \cdot D_t + \sum_{i \in I \cup I^*} T_{i,t+1}$$

$$(3) \qquad \delta_{t+1} \cdot D_{t+1} = \delta_t \cdot (D_{t+1} - \sum_{i \in I \cup I^*} T_{i,t+1}) + \sum_{i \in I} T_{i,t+1}$$

Equation (2) shows that debt equals to debt payments plus the primary deficit. The latter is nothing but the sum of all the transfers received by the old. Equation (3) shows how the U.S. share evolves, for given primary deficits of the two regions. We assume that governments never default on their debts. This assumption will be removed later, but it turns out not to be crucial.

8. Who runs publicly traded firms? Remember each generation contains a continuum of individuals with aggregate income equal to γ^t. Assume each (infinitesimal) entrepreneur can run a (noninfinitesimal) firm of size υ. If this entrepreneur uses only internal funds, his or her expected utility is $\pi \cdot \gamma^t \cdot di$. If this entrepreneur uses external funds, his or her expected utility is old age consumption is $(\pi - \alpha) \cdot \gamma^t \cdot di + m$; where m is the manager's fee. Because there is free entry, the equilibrium manager's fee is $m = \alpha \cdot \gamma^t \cdot di$. Because this fee is infinitesimal, it constitutes a negligible cost for a noninfinitesimal firm of size υ, and we can disregard it. Therefore, the model depicts a world where a small subset of entrepreneurs use external funds to build large firms that are traded in the stock market, while a large subset of entrepreneurs runs small firms using internal funds.

9. We are assuming here that only the old receive transfers.

10. This comparison holds both the transfer and the date of birth constant. Remember that expected consumption is measured as a share of the endowment, and therefore welfare is given by $\gamma^t \cdot E_t C_{i,t+1}$. A shareholder of a future generation might enjoy more welfare than an entrepreneur of the present generation.

The interest rate depends on the amount of debt that the government is trying to place in the market. In particular, we have the following:

$$r_{t+1} = \begin{cases} \pi - \alpha & \text{if } D_t < 1 - \varepsilon, \\ [\pi - \alpha, \pi] & \text{if } D_t = 1 - \varepsilon, \\ \pi & \text{if } D_t > 1 - \varepsilon. \end{cases} \tag{4}$$

Equation (4) shows how the interest rate increases with debt. For low values of debt, the interest rate is $\pi - \alpha$ as the marginal buyer is a shareholder. For high values of debt, the interest rate increases to π as the marginal buyer of debt is now an entrepreneur. An important observation is that the assumption that financial frictions are small implies that the interest rate always exceeds the growth rate.

Let K_t denote the world capital stock, which is

$$K_t = 1 - D_t. \tag{5}$$

Equation (5) simply says that capital and debt must add to world savings as they are the only investment options available. Let NFA_t be the U.S. net foreign asset position, that is, the difference between U.S. wealth and the U.S. capital stock. This is a measure of U.S. capital exports to the rest of the world, and is given by

$$\text{NFA}_t = (0.5 - \delta_t) \cdot D_t + (0.5 - \kappa_t) \cdot K_t. \tag{6}$$

Equation (6) shows that the net foreign asset position of the United States contains two pieces. The first term is the difference between the debt held by U.S. residents and the debt issued by the U.S. government, that is, the first term is U.S. net borrowing. The second term is the difference between the capital stock owned by U.S. residents and the capital stock located within the United States, that is, the second term is U.S. net holdings of equity.[11]

The mechanics of this model are as follows: equations (2) to (4) jointly determine the dynamics of debt and the interest rate for a given sequence of primary deficits. With these dynamics at hand, equations (5) and (6) determine the world capital stock and the pattern of trade. With the help of an additional assumption on how these deficits are distributed among old individuals, equation (1) describes the welfare of different individuals. It is straightforward to see that this world economy has a unique equilibrium.

11. Note that U.S. residents own half of the world debt and half of the world capital stock. This only because we have assumed both regions have the same population size, the same distribution of types, and the same endowment. This is just a harmless simplification as it is straightforward to generalize the model to include asymmetries in these variables. Note also that since we have assumed that government debt consists of one-period bonds and firms last only one period, the current account is equal to the net foreign asset position and we can use equation (6) to talk about either concept. This is another simplification, of course, as the real world contains long-lived assets. But it will not play a role in what follows.

We use it next to interpret the evolution of the world economy during the last decade.

11.3 Conventional Views

Although stylized, this model captures well conventional views of the sources and effects of the large and persistent deterioration in the U.S. net foreign asset position during the last decade. According to these views, in the second half of the 1990s, the United States became a more attractive place to invest relative to the rest of the world. That is, the number of good investment projects in the United States grew relative to ROW (i.e., there was an increase in κ_t). Many have identified the boom in the information technology (IT) sector as a main reason for this. Although this sector grew rapidly worldwide in the second half of the 1990s, the United States benefited more from this growth due to its strong technological lead relative to Europe and Japan. Others have pointed to the flurry of currency and banking crises in emerging markets as the main reason for the United States becoming a more attractive place to invest relative to ROW. These crises, which started in Mexico and moved to East Asia and Russia, led to a downward reassessment of the expected return to emerging market projects.

For either or both of these reasons, the story goes, investors all over the world decided to put their savings into the U.S. stock market, and this is what generated the current account deficits of the second half of the 1990s. This is consistent with the evidence reported in figure 11.2 that, in the second half of the 1990s, a large component of the change in the U.S. net foreign asset position consisted of a decline in net holdings of equity. The story becomes a bit fuzzy when it comes to explaining the reversal in net holdings of equity that took place in the first half of the 2000s, also reported in figure 11.2. In the context of our model, this reversal could be seen as a decline in the number of good investment projects in the United States relative to ROW (i.e., there was a decrease in κ_t), although there is scant direct evidence supporting this view.

Although this account might sound reasonable at a superficial level, it should be met with a healthy dose of skepticism after looking at the actual numbers. Remember that the value of the stock market increased threefold from 1995 to 2000 and then declined by one-quarter from 2000 to 2003. If the stock market contains only productive firms, its value must reflect that of the stock of capital held by these firms. That is, the increase in stock market capitalization requires a comparable increase in the price of capital, in the quantity of capital or in both. To the extent that capital is reproducible, its price cannot exceed the cost of producing additional units. In the model, this cost is constant and equal to one. Naturally, we could extend the model to allow for congestion effects on the cost of capital as in the popular Q-theory of investment. But it seems unlikely that such an exten-

sion would be able to explain much of the rise in the value of the stock market.[12]

It also seems unlikely that this rise and fall can be explained by changes in the quantity of capital. In the model world savings grow at a constant rate γ, and so a large increase in the U.S. stock of capital would have to be associated with a decline in ROW's stock of capital. However, the increase in stock market capitalization took place all around the industrial world. Naturally, one could extend the model to allow for exogenous increases in savings and therefore the capital stock. But this would not get us very far quantitatively. Because the U.S. capital stock is about twice U.S. GNP, a threefold increase in the capital stock during the second half of the 1990s would have required astronomical investment rates!

Some have argued that the boom in the stock market in part reflected the accumulation of intangible capital, such as brand loyalty or unique organizational structures.[13] The accumulation of this kind of capital did not require investment as conventionally measured and therefore constituted a windfall to its owners. There was, in fact, some evidence in the 1990s pointing in this direction: for example, the emergence of business models built on the efficient use of information technology as a valuable form of intangible capital (most notably, various forms of e-commerce). However, while the accumulation of this intangible capital could in principle account for the run-up in the value of stockmarket during the 1990s, it seems much harder to argue that it was the decumulation of this form of capital that was behind the stock market decline in the second half of 2000. Why would the value of organizational forms based on the use of information technology such as e-commerce suddenly have vanished in the second half of 2000? The question thus remains: how did the value of the stock market grow so much in the second half of the 1990s and then drop in the first half of the 2000s?

Of course, there have also been many voices arguing that the U.S. stock market during this period was fueled by a bubble rather than by an increase in U.S. productivity relative to the rest of the world. According to this alternative view, foreign investors were not buying U.S. firms in the IT sector because of their high productivity. Instead, they were buying them because they were expecting to resell later at a higher price. The appearance of a bubble might bring huge capital gains to those that are able to create it, and this could explain the massive increases in equity prices during the second half of the 1990s. But to realize these capital gains, one must first find buy-

12. Hall (2001) estimates the price of installed capital in the United States since 1946, and finds that this price increased by only about 25 percent during the second half of the 1990s. See also Hall (2004) for an attempt to measure the cost of capital.

13. See Hall (2000, 2001). It could also be that this intangible capital already existed, and it was the demand for it that increased during this time. To the extent that intangible capital was irreproducible, its price could also have increased.

ers for the bubble, and this is only possible if the bubble promises a sufficiently attractive return. That is, a bubble can be created if and only if it is expected to grow fast enough so as to justify buying it.

It is possible to examine this alternative interpretation within our model. To do this, we formally define a stock market bubble as a situation in which firms without capital are valued and traded in the stock market. We refer to these firms as "bubbly" firms, as opposed to the "productive" firms that own the capital stock. The question is whether bubbly firms can survive in a stock market that also contains productive firms. Let B_t be the asset bubble (or aggregate value of bubbly firms as a share of world savings). Because bubbly firms do not distribute dividends, the return to holding them consists only of their price appreciation. Therefore, the young will buy these firms if and only if the expected rate of price appreciation is high enough:

$$\gamma \cdot \frac{E_t B_{t+1}}{B_t} \geq r_{t+1} \text{ if } B_t > 0 \tag{7}$$

Otherwise, the young would prefer to hold shares in productive firms or government bonds. A bubble can therefore create its own demand only by growing on average as fast or faster than the interest rate. But the growth of the bubble cannot be so fast so as to outgrow world savings, that is, $B_t \leq 1$ must hold in all dates and states of nature. And this requirement is incompatible with equation (7) if the interest rate exceeds the growth rate. Therefore, we conclude that bubbly firms cannot survive in the stock market in this case. Our assumption that financial frictions are small implies that the interest rate always exceeds the growth rate and therefore rules out the possibility of stock market bubbles. This, we think, is the first serious shortcoming of the standard or conventional view.

This view also holds that the current account deficits continued after 2000 due to the sharp change in fiscal policy implemented by the Bush administration (i.e., an increase in the U.S. primary deficit that leads to an increase in δ_t). This fiscal policy consists of spending more, cutting taxes, and financing the resulting budget deficits by issuing government debt. Overwhelmingly, this change in policy has been interpreted as a political decision and not as an economic policy response to a specific macroeconomic disturbance. In other words, the U.S. fiscal expansion has been treated as an exogenous shock to the macroeconomic landscape. Much of the increment to public debt has been placed abroad. Between end-2000 and end-2003, U.S. public debt increased by $500 billion, while foreign holdings of U.S. Treasury bills increased by almost the same amount. And to the extent that public debt has been placed at home, it likely has crowded out U.S. corporate debt and forced firms to place an increasing fraction of their own debt abroad. Through these direct and indirect channels, the budget deficits of the Bush administration account for a substantial part of the

large increase in net borrowing from abroad shown in figure 11.2. The important question is whether this situation is sustainable and, if it is not, how the necessary adjustment will look.

To answer this question, we use the model to analyze the effects of a fiscal expansion in the United States. The experiment is as follows. Initially both regions have no debt and follow balanced-budget policies, that is, $D_t = 0$ and $\Sigma_{i \in I \cup I^*} T_{i,t} = 0$. At some date, the United States switches its policy for exogenous reasons and decides to increase spending, cut taxes, and finance the resulting deficit by going into debt, while ROW keeps its budget balanced, that is, $\Sigma_{i \in I} T_{i,t} = \overline{T} > 0$ and $\Sigma_{i \in I^*} T_{i,t} = 0$. The questions we address next are What are the possible endings for this fiscal episode? and What are its welfare consequences?

When the fiscal deficits appear, government debt starts growing at an accelerating rate, crowding out the investments of the shareholders. The growth of the debt is fueled directly by the deficits but also indirectly by unfavorable debt dynamics resulting from the interest rate exceeding the growth rate. In fact, it is this second component growing over time that leads to accelerating debt growth. If the fiscal expansion lasts long enough, the debt also starts crowding out the investments of the entrepreneurs. At this point the interest rate goes up, debt dynamics become more unfavorable and debt accumulation further accelerates. As debt accumulates, U.S. net borrowing abroad increases. Because the debt crowds out capital from the portfolios of investors worldwide, U.S. net holdings of equity decline in absolute value.

This situation is not sustainable as the accelerating growth rate of debt is incompatible with a fixed pool of savings, and the U.S. eventually must go through a period of fiscal adjustment. This essentially means that the U.S. must reverse its fiscal policy (as it does not want to default) and start running sufficiently large surpluses, that is, $\Sigma_{i \in I} T_{i,t} = T < (\gamma - r_t/\gamma) \cdot D_t$. Not surprisingly, the magnitude of the fiscal adjustment increases with the level of debt. When the debt is higher, the surpluses need to be larger, last longer, or both.

Assuming that the U.S. government only makes transfers to U.S. citizens, the fiscal expansion increases the welfare of current U.S. generations in detriment of future ones. After all, in this model a policy of budget deficits is nothing but a policy of passing the bill forward. When this policy is implemented, the old consume beyond the return to their savings and pass the bill to the next generation. This bill includes their extra consumption plus the interest. Rather than paying the bill, the next generation further increases it by also consuming more than the return to their savings and then passes the bill along to the following generation. This keeps going on for as long as the government follows a policy of running deficits and rolling over the debt. But the bill is growing too fast and must eventually be paid. This is what a fiscal adjustment is all about. The longer it takes for

this adjustment to happen, the larger is the final bill and the costlier will be for the United States to face it.

The welfare of present generations is also affected by the fiscal expansion indirectly through its effects on the interest rate. High interest rates raise the expected consumption of young shareholders both in the United States and ROW. Because interest rate costs are added to the bill, future generations of U.S. residents are also supporting higher consumption of current ROW generations. This constitutes a positive spillover of the U.S. fiscal expansion on ROW. The fiscal adjustment will eliminate it, and this is why ROW residents might prefer this to happen as late as possible.

Of course, one could argue that this scenario is unrealistic as it assumes that the U.S. government will honor its debt in all contingencies. But relaxing this assumption has only minor effects on the overall story. To see this, replace equations (2) and (4) for these straightforward generalizations:[14]

$$D_{t+1} = \begin{cases} \frac{r_{t+1}}{\gamma} \cdot D_t + \sum_{i \in I \cup I^*} T_{i,t+1} & \text{with probability } 1 - \mu_t, \\ 0 & \text{with probability } \mu_t. \end{cases} \tag{8}$$

$$r_{t+1} = \begin{cases} \pi - \alpha + \mu_t & \text{if } D_t < 1 - \varepsilon, \\ [\pi - \alpha + \mu_t, \pi + \mu_t] & \text{if } D_t = 1 - \varepsilon, \\ \pi + \mu_t & \text{if } D_t > 1 - \varepsilon, \end{cases} \tag{9}$$

where μ_t is the (exogenous) probability that the U.S. government defaults on its debt. A reasonable assumption is that this probability grows as the debt increases, but we need not make it here. Equation (8) recognizes that now debt can be defaulted upon, while equation (9) recognizes that the expected return on government debt includes the promised return minus the expected loss from default. Note that default risk makes debt dynamics even more unfavorable by raising the interest rate. In other words, default risk makes the current situation even more unsustainable.

With a positive default probability, the U.S. fiscal expansion might have a different ending. If the current deficit goes on long enough and the required fiscal adjustment becomes too large, the U.S. government might simply default on its debt. In this case, the adjustment takes place in a dramatic fashion. The generation of old (U.S. and ROW) shareholders that suffers the default pays the entire bill for the excess consumption of its U.S. predecessors. Because half of the shareholders are not U.S. residents, half

14. One can think of default as surprise inflation that erases the real value of the debt. Here we are also assuming that the ROW government keeps with its policy of having no debt. Otherwise, we should also break down equations (8) to (9) into their two regional components.

of the bill is therefore paid by ROW citizens. In this scenario, current U.S. economic policy is simply increasing consumption and welfare of current U.S. residents at the expense of future U.S. and ROW residents. This constitutes a negative spillover of the U.S. fiscal expansion on ROW. A fiscal adjustment would ensure that this scenario does not happen and, as a result, ROW residents might prefer the United States to reduce its budget deficits even if this lowers the interest rate.

Another problem with this standard story is the behavior of the interest rate. While the model predicts that the U.S. fiscal expansion will increase the interest rate, the evidence shows exactly the opposite. Figure 11.4 showed that, in the midst of one of the largest fiscal expansions in U.S. history, the interest rate fell from above 3 percent to close to 0 percent. The model can account for this observation if there is a decline in the expected return to capital (i.e., a decline in π or ε) or an increase in agency costs (i.e., an increase in α).[15] Given the magnitude of both the fall in interest rates and the increase in budget deficits, the decline in productivity or an increase in agency costs would have to be very large. There is scant evidence for a major decline in world productivity. And despite the intense media coverage of some financial scandals such as Enron or Parmalat, it also seems unlikely that frictions in financial markets increased dramatically overnight.

Another popular hypothesis for why interest rates have fallen is that a global "glut of saving" appeared (see Bernanke 2005). According to this hypothesis, the increase in saving exceeded the increase in public debt, leading to a decline in interest rates. There are various explanations for where these savings are coming from, including an increased appetite for reserves by Asian central bankers and a windfall of rising oil prices in the high-saving oil producing countries. While these stories about exogenous shocks are reasonable, we shall argue in the following that another explanation for the glut of saving is the collapse of the bubble itself. Once the bubble was no longer available, savers endogenously shifted to other assets, most notably, U.S. government debt.

To sum up, the model crudely but effectively encapsulates conventional views of the U.S. current account deficit. Its appearance in the second half of the 1990s reflects an increase in U.S. productivity relative to the rest of the world that led investors all over the world to place their savings in the U.S. stock market. This situation ended with the stock market collapse in 2000. But the current account deficits continued after this now fueled by the drastic change in fiscal policy implemented by the Bush administration. This policy is, however, unsustainable, and something must eventu-

15. We have assumed that π, α, and ε are constant. Note, however, that all the equations of the model still apply if we assume that these parameters vary stochastically over time.

ally give. Most observers think that this episode will end with a painful fiscal adjustment although there are also those who argue that the resolution will entail some default on the part of the U.S. government. The stylized model developed in the preceding shows how all of these observations fit together.

But the model is not free of problems, though. It cannot explain observed movements in equity prices, and it can only explain why the interest rate fell in the midst of one of the largest fiscal expansions in U.S. history by appealing to exogenous changes in saving or productivity. How can we come to grips with these observations? The preceding analysis relies to a large extent on the condition that the interest rate exceeds the growth rate. This condition rules out the existence of stock market bubbles and underlies the notion that a policy of continued fiscal deficits is unsustainable. But this condition is not satisfied in the data. Figure 11.5 plots the ex-post real one-year Treasury bill rate and the real GDP growth rate for the United States since 1970. With the exception of the 1980s, the interest rate has been consistently below the growth rate for almost all years during this period. More important for our purposes, since 1992 interest rates have averaged 1.7 percent while GDP growth has averaged 3.3 percent. As we shall show next, the behavior of the world economy is quite different when the growth rate exceeds the interest rate.

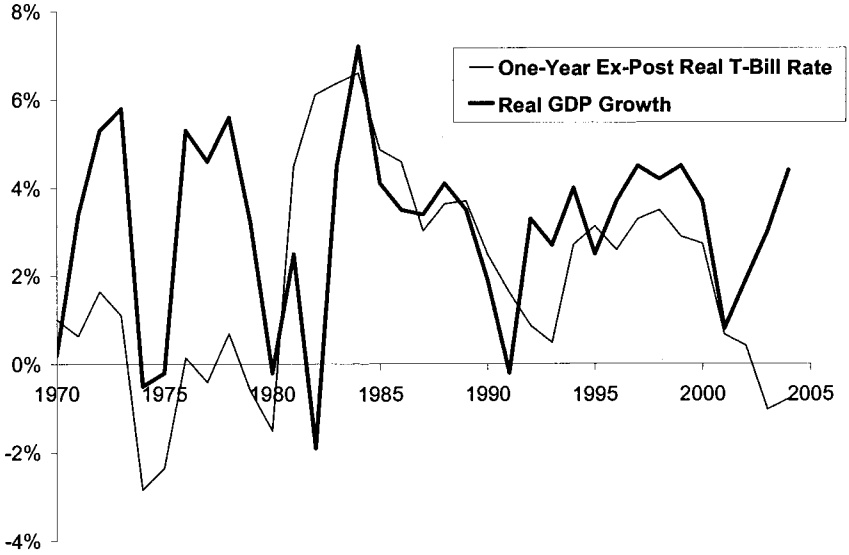

Fig. 11.5 Interest rates and growth rates

Sources: GDP growth is from U.S. Bureau of Economic Analysis, and interest rates are from the Board of Governors of the Federal Reserve System.

11.4 A Model of Crowding-Out with Debt, Bubbles, and Capital

Assume next that agency costs are severe, that is, $\alpha > \pi - \gamma$. This is equivalent to saying that financial frictions are large, and the stock market is far from the frictionless paradigm. In this case, the world economy can experience stock market bubbles, that is, the stock market might contain unproductive or bubbly firms that never deliver a dividend. The only reason to hold these firms is to realize capital gains. We assume that creating bubbly firms is simply a matter of luck and entails negligible costs. Naturally, all young try to create them and those that are successful obtain a rent by selling their bubbly firm during old age.[16] Let $N_{i,t}$ be the rent that individual i receives. We generalize equation (1) as follows:

$$(10)\quad E_t C_{i,t+1} = \begin{cases} \max\left[\pi, r_{t+1}, \gamma \cdot \dfrac{E_t(B_{t+1} - N_{t+1})}{B_t}\right] + E_t T_{i,t+1} + E_t N_{i,t+1} & \text{if } i \text{ is an entrepreneur,} \\ \max\left[\pi - \alpha, r_{t+1}, \gamma \cdot \dfrac{E_t(B_{t+1} - N_{t+1}}{B_t}\right] + E_t T_{i,t+1} + E_t N_{i,t+1} & \text{if } i \text{ is a shareholder,} \end{cases}$$

where $N_t = \Sigma_{i \in I \cup I^*} N_{i,t}$ is the total value of the bubbly firms that appear at date t. Note that the expected (gross) return on holding a bubbly firm is equal to the (gross) growth rate of its price. This growth rate is equal to the expected value of tomorrow's bubbly firms at date $t + 1$, $\gamma^{t+1} \cdot E_t(B_{t+1} - N_{t+1})$; divided by their value at date i, that is, $\gamma^t \cdot B_t$.[17] Equation (10) exhibits two differences with respect to equation (1). Bubbly firms are now included in the menu of assets, and this affects the expected return on the savings of the young. In addition, the creation of new bubbly firms generates rents for the old, and this constitutes an additional source of income.

Equations (2) and (3) describing debt dynamics still apply, but we must modify equation (4) describing the interest rate as follows:[18]

$$(11)\quad r_{t+1} = \begin{cases} \pi - \alpha & \text{if } D_t < 1 - \varepsilon - B_t, \\ [\pi - \alpha, \pi] & \text{if } D_t = 1 - \varepsilon - B_t, \\ \pi & \text{if } D_t > 1 - \varepsilon - B_t. \end{cases}$$

16. Success is nothing but a positive realization of an individual-specific sunspot.

17. Equation (6) implicitly assumed a fixed number of bubbly firms. In this case, the expected growth rate of the bubble equals the expected price appreciation of existing bubbly firms.

18. We assume again that governments never default on their debts. As shown before, it is straightforward to generalize the analysis to the case in which there is an exogenous probability that governments default on their debts.

Equation (11) recognizes that debt and the bubble both compete with capital for the savings of the young. In order to create its own demand, the bubble must grow sufficiently fast:

$$\frac{E_t(B_{t+1} - N_{t+1})}{B_t} = \frac{r_{t+1}}{\gamma} \quad \text{if } B_t > 0 \tag{12}$$

Equation (12) ensures that the young are willing to buy bubbly firms. It applies whenever bubbly firms have a positive value in equilibrium. We shall construct later equilibria in which bubbly firms not only survive in the stock market, but also drive all productive firms out of it. Finally, let β_t be the share of all bubbly firms created by U.S. residents. It then follows that

$$\beta_{t+1} \cdot B_{t+1} = \beta_t \cdot (B_{t+1} - \sum_{i \in I \cup I^*} N_{i,t+1}) + \sum_{i \in I} N_{i,t+1}. \tag{13}$$

The presence of a bubble naturally affects asset trade. The world capital stock is now given by

$$K_t = 1 - D_t - B_t, \tag{14}$$

and the capital stock of the United States is then $\kappa_t \cdot (1 - D_t - B_t)$. The U.S. net foreign asset position is now given as follows:

$$\text{NFA}_t = (0.5 - \delta_t) \cdot D_t + (0.5 - \beta_t) \cdot B_t + (0.5 - \kappa_t) \cdot (1 - D_t - B_t) \tag{15}$$

Equation (15) is a natural generalization of equation (6) and includes an additional piece of the net foreign asset position of the United States. This piece is the second term and consists of the difference between the share of the bubble held by U.S. residents and the share of the bubble created by them. Now the U.S. net holdings of equity are given by the sum of the second and third terms of equation (6).

The mechanics of this model are very close to those of the model in section 11.2. Equations (2), (11), (12), and (13) describe the dynamics of debt and the interest rate for a given sequence of bubbles and deficits. With these dynamics at hand, equations (14) and (15) determine the world capital stock and the pattern of trade. With the help of additional assumptions about the creation of new bubbly firms and the distribution of deficits among individuals, equation (10) describes the welfare of each individual. This world economy has many equilibria now, each of them corresponding to a different set of (consistent) assumptions about the behavior of bubbles and deficits. We shall later construct some of these equilibria and examine their implications.

This model allows us to study the large and persistent deterioration of the U.S. net foreign asset position under the more realistic assumption that the interest rate falls short of the growth rate. As is well known, this condition implies that the world economy contains pockets of dynamically in-

efficient investments.[19] The logic behind this inefficiency is disarmingly simple and well understood: every period young shareholders invest $\gamma^t \cdot (1 - \varepsilon)$ units of the single good, while old shareholders receive a return to their savings that on average equals $r_t \cdot \gamma^{t-1} \cdot (1 - \varepsilon)$. If $r_t < \gamma$, it is welfare-improving to implement a social contract whereby all young shareholders are forced to stop investing and instead give all of their income to the old shareholders. This social contract would liberate an amount of resources equal to $(\gamma - r_t) \cdot \gamma^{t-1} \cdot (1 - \varepsilon)$ per period, and these resources would go directly to the pockets of the future shareholders. Moreover, the generation that starts the social contract would get an upfront fee (for its service to society) that equals the endowment of the first generation of young that participate in the social contract, that is, $\gamma^t \cdot (1 - \varepsilon)$. This social contract therefore improves on the market and raises the consumption and welfare of all generations.[20]

At first sight, the practical difficulties in implementing this social contract appear overwhelming. But this is only a false appearance. It has been known for a long time that government debt and stock market bubbles can both crowd out inefficient investments and improve welfare. Complying with the social contract during youth and giving the endowment to the old can be seen as equivalent to purchasing the right to receive the endowment of the young during old age. But this is exactly what government debt or stock market bubbles are. When the young buy any of these assets from the old (and thus give the old their endowment), they are doing so in the expectation of reselling them to the young later during their old age (and therefore receiving the endowment of the young). In this way, government debt and stock market bubbles eliminate inefficient investments and liberate resources that increase the consumption of all future generations. Because issuing debt or creating bubbly firms has negligible costs, those that create them receive in addition an upfront fee or rent that equals the full value of the asset created. This upfront fee or pure rent is exactly what $T_{i,t}$ and $N_{i,t}$ are.

As the previous discussion hints, the presence of pockets of dynamically

19. In an influential paper, Abel et al. (1989) noticed that capital income exceeds investment in industrial countries and then argued that this observation is incompatible with the view that these countries contain dynamically inefficient investments. Their argument is misleading, however. To see this, note that in our world economy capital income is $[\pi - \alpha \cdot (1 - \varepsilon)] \cdot \gamma^{t-1}$, while investment is γ^t. The observation that capital income exceeds investment, that is, $\pi - \alpha \cdot (1 - \varepsilon) > \gamma$, does not rule out the possibility that there exist pockets of dynamic inefficiency, that is, $\gamma > \pi - \alpha$. The observation that capital income exceeds investment only implies that the average investment is dynamically efficient. But this is not incompatible with the statement that the marginal investment be dynamically inefficient. Abel et al. (1989) did not notice this because they assumed throughout that financial markets are frictionless and, as a result, all investments exhibit the same return. This corresponds to the special case of our model in which $\alpha = 0$. This is a crucial and yet unrealistic assumption. Once we remove it, the argument of Abel et al. does not go through.

20. Because entrepreneurs receive an expected gross return to their savings that exceeds the growth rate, their investments are dynamically efficient and the government should not try to eliminate them.

inefficient investments might lead to a substantial rethinking of the role of fiscal policy. Naturally, fiscal policy still redistributes consumption across generations. But now it also eliminates inefficient investments. Because bubbles are an alternative and market-generated solution to the same problem, this observation raises some interesting and still unanswered questions: under what conditions does fiscal policy complement stock market bubbles as a mechanism to eliminate inefficient investments? Under what conditions does fiscal policy compete with stock market bubbles for this role? What are the welfare implications of these interactions between bubbles and deficits? We next show that the answers to these questions lead to new and somewhat surprising views on U.S. economic policy.

11.5 A "Benevolent" View of U.S. Economic Policy

We next construct an equilibrium in which the stock market initially creates a bubble that is large enough to crowd out all inefficient investments. The world economy operates efficiently, and welfare is high. But there is a change in investor sentiment that triggers the collapse of the bubble. The result is that inefficient investments reappear. The U.S. government reacts to this by running large deficits that crowd out some of these investments and improve the functioning of the world economy. In this equilibrium, the U.S. fiscal expansion constitutes a welfare-improving policy response to the bubble collapse.

Consider the case of a world economy in which investor sentiment fluctuates between two states: $S_t \in \{L, H\}$. In the L (or low) state, investors are pessimistic, bubbly firms are not valued, and the stock market contains only productive firms. In the H (or high) state, investors are optimistic, bubbly firms are valued, and they completely crowd productive firms out of the stock market. That is, we assume that the bubble evolves as follows:

$$B_t = \begin{cases} 0 & \text{if } S_t = L, \\ 1 - \varepsilon - D_t & \text{if } S_t = H_t. \end{cases} \tag{16}$$

We shall assume also that $N_t = 0$ for all t, except for those dates in which the world economy transitions from L to H and $N_t = B_t$. That is, all bubbly firms appear at the onset of the bubble. After this, no more bubbly firms are created, and the stock market bubble contains only a fixed number of firms whose value fluctuates over time until the bubble bursts. After a period without bubble, the cycle starts again.

How do these changes in investor sentiment happen? We assume that individuals coordinate to an equilibrium using a sunspot variable that moves between the high and low states. We refer to this variable as "investor sentiment." Assume the transition probability or probability that there is a change in investor sentiment is λ. When a generation is optimistic, it be-

lieves that the probability the next generation will buy the bubble is $1 - \lambda$. When a generation is pessimistic, it believes that the probability the next generation will buy the bubble is λ. If λ is sufficiently small, optimistic generations buy the bubble, pessimistic generations do not, and the probabilities assigned by both types of generations are exactly the equilibrium ones. We assume from now on that $\gamma \cdot (1 - \lambda) > \pi - \alpha > \gamma \cdot \lambda$. This ensures that these changes in investor sentiment are an equilibrium. We shall see that a change in investor sentiment that moves the world economy from the high to the low state is nothing but a coordination failure as the low state provides less welfare than the high state.

The U.S. government recognizes the beneficial role that bubbly firms play in the world economy and avoids competing with them. When investor sentiment is high, the government refrains from running budget deficits and lets the (stock) market eliminate the inefficient investments on its own. When investor sentiment is low, the market cannot do this, and the government runs budget deficits in order to help. These deficits raise government debt and crowd out the inefficient investments that the market is unable to eliminate by itself. In particular, we assume the United States follows this fiscal policy:

$$\sum_{i \in I} T_{i,t} = \begin{cases} \dfrac{\gamma - r_t}{\gamma} \cdot (1 - \varepsilon) & \text{if } S_t = L, \\ 0 & \text{if } S_t = H. \end{cases} \tag{17}$$

This fiscal policy ensures that government debt eventually absorbs all inefficient investments if investor sentiment remains low indefinitely. However, consistent with the view that the government is trying to remedy market failures, debt will never crowd out the investments of entrepreneurs. Throughout, and only for simplicity, we assume that ROW has no debt and follows a balanced-budget policy, that is, $\delta_t = 1$ and $\Sigma_{i \in I^*} T_{i,t} = 0$.

The assumptions made allow us to determine the equilibrium interest rate as follows:[21]

$$r_{t+1} = \begin{cases} \pi - \alpha & \text{if } S_t = L, \\ \gamma \cdot \dfrac{(1 - \lambda) \cdot (1 - \varepsilon)}{1 - \varepsilon - \lambda \cdot D_t} & \text{if } S_t = H. \end{cases} \tag{18}$$

Equation (18) shows that the implications of increased government debt on the interest rate depend crucially on investor sentiment. Note that the assumptions made ensure that the interest rate is always higher when investor

21. To derive the interest rate when $S_t = H$, substitute equations (2), (16), and (17) into equation (12) and then solve for the interest rate. Note that when $S_t = L$ and $D_t = 1 - \varepsilon$, any $r_t \in [\pi - \alpha, \gamma]$ is also an equilibrium.

sentiment is high. When investor sentiment is low, the interest rate is low because debt competes with capital, and the latter offers a low expected return to shareholders. When investor sentiment is high, the interest rate is high because debt competes with the bubble, which is a better asset than capital. It follows from equation (15) and the assumption that $N_t = 0$ that the interest rate is nothing but the expected (gross) growth rate of the bubble.

To understand what is behind equation (18), assume first that there is no government debt. Then, the expected growth rate of the bubble is γ if there is no change in investor sentiment, but zero if there is a change in investor sentiment. Because the latter happens with probability λ, the expected growth rate of the bubble is $\gamma \cdot (1 - \lambda)$, and this is what the interest rate must be when $D_t = 0$. Assume instead that there is some debt in the world economy. Because debt dynamics are favorable, and both governments follow a policy of balanced budgets, we have that the debt is falling, and the bubble is replacing it. Therefore, the bubble grows faster than the world economy as it absorbs an increasing fraction of the shareholders' savings. The larger is the debt, the faster it falls and the faster is the growth of the bubble and the interest rate.

Under the assumptions made about bubbles and deficits, the dynamics of debt are given by equations (2) and (17) to (18). Substituting these dynamics into equation (16), we also obtain the dynamics of the bubble. It is straightforward to check that, under our parameter restrictions, the sequences of bubbles and debt generated by these equations constitute an equilibrium of the world economy. We use next this equilibrium to reinterpret the main macroeconomic developments of the last decade.

This equilibrium portrays an alternative and benevolent view of current U.S. economic policy. The story goes as follows. Initially, the world starts in the pessimistic state, with the United States having some intermediate level of debt and a low interest rate, that is, $0 < D_t < 1 - \varepsilon$ and $r_t = \pi - \alpha$. At some date, there is a change in investor sentiment, and a stock market bubble appears. The bulk of this bubble consists of U.S. bubbly firms, that is, $\Sigma_{i \in I} N_{i,t} > 0.5$. After a few periods, there is a new change in investor sentiment that moves the world economy back into the pessimistic state. This brings about a collapse in the bubble that forces savers to seek alternative assets. The questions we address next are what are the macroeconomic effects of the appearance and bursting of the bubble? What are the effects of U.S. fiscal policy?

Figure 11.6 illustrates the dynamics of debt by plotting D_{t+1} as a function of D_t. The convex upward-sloping line captures the dynamics of debt when investor sentiment is high, while the straight upward-sloping line shows the same when investor sentiment is low. The economy starts out with low investor sentiment and an initial level of debt D^*. Debt dynamics are favorable, and debt increases at a decreasing rate. Absent any further shocks, it

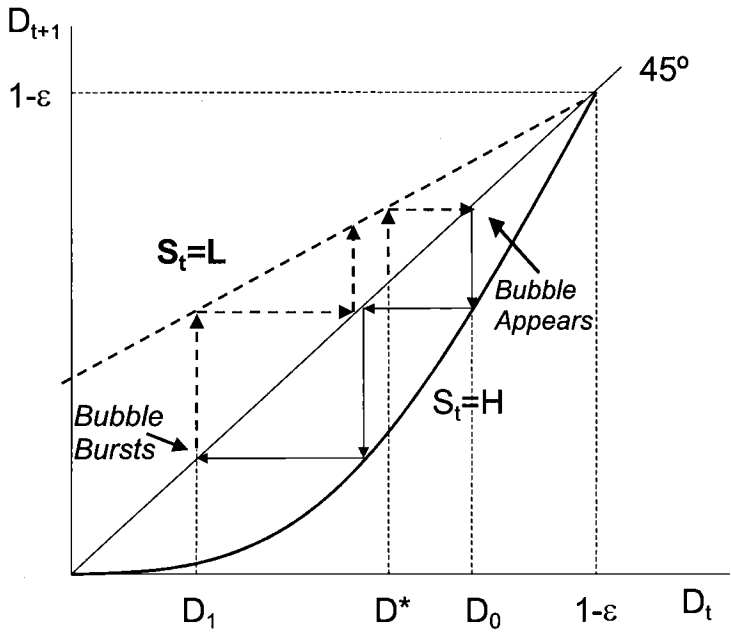

Fig. 11.6 Debt dynamics in the benevolent view

would asymptotically reach an upper bound of 1 – ε where it would fully crowd out all the inefficient investments of the shareholders. However, before this (when debt is equal to D_0), investor sentiment changes, and a bubble appears in the stock market. The government reacts to this by eliminating the budget deficit, and debt begins to fall. Absent any further shocks debt would asymptotically reach zero as it is no longer needed to crowd out inefficient investments. Before this happens, there is again a change in investor sentiment (when debt is equal to D_1), and the bubble collapses. The government responds with fiscal deficits that set debt on an upward trajectory again.

During the period before the bubble appears, U.S. debt accumulates gradually, and the net foreign asset position becomes more negative as some of this debt is held by foreigners. The government responds to the appearance of the bubble by eliminating the budget deficit, and debt accordingly begins to decline. The bubble provides shareholders with a more attractive investment option and therefore crowds out all productive firms from the stock market. As time passes, government debt declines, and the bubble keeps growing and absorbing an increasing fraction of the savings of the shareholders. Despite the elimination of the budget deficit, the interest rate jumps up as government debt must now compete with the bubble for the savings of shareholders. The interest rate then declines slowly as the

growth rate of the bubble also declines over time. The net foreign asset position jumps down as the U.S. old sell their bubbly firms to the ROW young, and the composition of the net foreign asset position of the United States shifts from debt to equity.

This rosy situation changes overnight as a result of a change in investor sentiment that brings about a collapse in the bubble. Suddenly, savers no longer have access to this asset and must seek alternative investments. This situation can be thought of as a glut of savings. Initially, the inefficient investments of shareholders return, but the U.S. government reacts to this situation by engineering a fiscal expansion that eliminates these inefficient investments over time. Unlike the analysis of section 11.3, debt dynamics are favorable, and the debt grows at a decelerating rate, eventually stabilizing without the need for a fiscal adjustment. Despite the appearance of budget deficits, the interest rate jumps down and stays low as debt no longer competes with the bubble. The collapse of the bubble erases a fraction of the negative U.S. net holdings of equity and leads to a sharp increase in net foreign assets. But this is quickly reversed as U.S. government debt accumulates.

This story is therefore broadly consistent with the evidence presented in the introduction. It can account for the boom in the stock market and the sharp decline in budget deficits during the second half of the 1990s as well as the collapse of the stock market and the reemergence of fiscal deficits during the early 2000s. It can explain why interest rates were high during a period of low budget deficits but fell when high budget deficits returned. It can account for the decline in the net foreign asset position associated with the appearance of the bubble. Moreover, by virtue of the assumption that the bubble was created primarily in the United States, it can account for the large expansion in foreign purchases of U.S. equity during the second half of the 1990s, followed by a sharp reversal. This reversal in U.S. net holdings of equity is offset by a decline in U.S. net holdings of debt as the U.S. government issues debt and sells part of it to foreigners.

The welfare implications of this scenario are easy to spot. The appearance of the bubble brings about an extraordinary bonanza for the current generation of old as they cash in the rents from bubble creation and enjoy an unexpectedly high level of consumption. This windfall is equivalent to the upfront fee of implementing the part of the social contract that the debt was not implementing, that is, $\gamma^t \cdot (1 - \varepsilon - D_t)$. This fee is unevenly distributed as we have assumed that most of the bubble was created by U.S. residents. The following generations of U.S. and ROW shareholders are not so well off as the previous one as there is no further creation of bubbly firms. But they still enjoy the benefit of a high interest rate, and this increases the consumption and welfare of shareholders all around the world. Through the high interest, shareholders receive all the gains from eliminating their inefficient investments just as in the social contract, that is (γ –

$\pi + \alpha) \cdot \gamma^{t-1} \cdot (1 - \varepsilon)$.[22] In this world economy, a stock market bubble is a very good thing as it implements the social contract and everybody benefits.

The collapse of the bubble brings substantial hardship to the contemporary generation of shareholders, who bought the bubble during their youth and find out in their old age that it is worthless. Somewhat unfairly, this generation of shareholders pays a dear price for the fact that the next generation of the young decides to break the social contract and not buy the bubble from them. This price can be understood as the devolution of the upfront fee for destroying the social contract, that is, $\gamma^t \cdot (1 - \varepsilon - D_t)$. Subsequent generations do not suffer as much although they still find that interest rates are low and, as a result, so are their consumption and welfare. The gains from eliminating the inefficient investments are lost. The bursting of the bubble is a coordination failure and everybody loses from it.

The U.S. fiscal expansion offsets part of this loss for U.S. residents. To see this, note that we can use equation (2) to decompose the revenues from the fiscal expansion, that is, $\gamma^t \cdot \Sigma_{i \in I} T_{i,t}$, into two components. The first one consists of the gains from eliminating inefficient investments, that is $(\gamma - r_t) \cdot \gamma^{t-1} \cdot D_t$. The second one consists of the upfront fee for creating debt, that is, $\gamma^t \cdot (D_{t+1} - D_t)$. That is, the U.S. government is gradually implementing the social contract and distributing the gains to the different U.S. generations in the form of transfers, that is, higher spending and lower taxes. The ROW residents do not benefit from this U.S. fiscal policy because they are assumed not to receive transfer from the U.S. government, and the interest rate remains low throughout.[23]

This analysis departs fundamentally from the conventional view in two important respects. The first one is that the fiscal expansion is now seen as sustainable, while in section 11.3 it was deemed unsustainable. The second difference is that the fiscal expansion is now seen as benefiting all generations, while in section 11.3 it was perceived as a means to redistribute consumption from future to present generations. Both of these differences, of course, are a direct consequence of removing the unrealistic assumption, which underlies conventional views, that the interest rate exceeds the growth rate.

How plausible is this benevolent view of U.S. economic policy? An immediate objection to it comes from a simple numerical observation. Favorable debt dynamics mean that debt accumulation decelerates and eventually stabilizes. But this requires that the deficits not be too large. To see

22. To understand the welfare implications for the subsequent generations, simply remember that trading the bubble essentially means that each generation of shareholders receives the endowment of the next one in exchange of its own.

23. They would benefit too though, if we had postulated a concave technology rather than a linear one as the debt would raise the interest rate. And this would be a positive spillover of the U.S. fiscal expansion abroad.

this, assume now that $\Sigma_{i\in I}\, T_{i,t} > \gamma - r_t/\gamma \cdot (1 - \varepsilon)$. In this case, government debt starts crowding out efficient investments before stabilizing and this turns favorable debt dynamics into unfavorable ones. If the deficits are too large, the situation is unsustainable even if the world economy contains pockets of dynamically inefficient investments. This seems to be the situation nowadays. The U.S. economy is about 40 percent of the world economy. Its (net) growth rate is about 3 percent, the (net) interest rate is about 1.5 percent, and the budget deficit remains at 5 percent of U.S. GNP. Under these assumptions, by the time U.S. government debt stabilizes it has already surpassed world savings by almost 40 percent! The current budget deficits are not sustainable, and this seems an unobjectionable conclusion to us.

But this does not mean, however, that the benevolent view is incorrect. The essence of this view is that the U.S. government is supplying an asset (government debt) that is useful to eliminate inefficient investments, and it is receiving payments (deficits) for this service. The time profile of deficits reflects how these payments are distributed across the different generations. We made the simple assumption in equation (16) that these benefits grew at the same rate as the world economy, that is, so that generation t obtained $\gamma^{t+1} \cdot T$. But this is obviously not the option that the current U.S. government has chosen. We get much closer to the actual behavior of the U.S. government if we replace equation (17) by the following one:

$$\sum_{i\in I} T_{i,t} = \begin{cases} \dfrac{\gamma - r_t}{\gamma} \cdot (1 - \varepsilon) & \text{if } S_t = S_{t-1} = L, \\ 1 - \varepsilon - \dfrac{r_t}{\gamma} \cdot D_{t-1} & \text{if } S_t = L \text{ and } S_{t-1} = H, \\ 0 & \text{if } S_t = H. \end{cases} \tag{19}$$

Under this new assumption on fiscal policy, equation (18) describing the interest rate still applies. The dynamics of debt under this fiscal policy are now however very different. When the bubble bursts, the United States responds by engineering a very large fiscal expansion. In particular, it immediately expands debt by exactly the amount required to absorb all of the savings of the shareholders and then stabilizes debt at this level by running much smaller deficits. The first generation after the bubble collapses receives the entire upfront fee. Future generations then simply receive the gains from eliminating inefficient investments. Whether this choice of distribution of gains corresponds to a preference for the current generation or, instead, to a desire to compensate the generation that lost the bubble is unclear. But to make the benevolent view consistent with observed policy, one must assume that the lion's share of the gains that accrue from supplying government debt are being reaped by the current generation.

This view comes surprisingly close to capturing actual U.S. fiscal policy.

Suppose that the decline in the value of the stock market between 2000 and 2003, equaling a bit more than $3 trillion, represents the elimination of the bubble. According to this benevolent view, the U.S. government should run large fiscal deficits to quickly expand public debt by about the same amount. Interestingly, according to the baseline projections of the U.S. Congressional Budget Office, public debt will expand by $2.6 trillion between 2000 and 2012 and then stabilize thanks to much smaller projected budget deficits of around 2 percent of GDP. This suggests that projected fiscal policy over the next several years will be successful in eliminating almost as many inefficient investments as the stock market bubble did in the 1990s.

Of course, it is possible that a bubble reappears in the stock market in the future, and this would require an adjustment in fiscal policy. According to the benevolent view, the government should respond to the reappearance of a stock market bubble by eliminating the fiscal deficits. In the context of our model, whether this fiscal adjustment will be painful depends on who issues the bubble. If the United States is lucky and the new bubble is mostly created by U.S. residents, then the rents from bubble creation will make for most of the lost budget deficits. And if this is the case, the U.S. net foreign asset position will remain negative as U.S. residents on net sell their bubbly firms to foreigners. If, instead, it is mostly ROW residents that issue the new bubble, then the fiscal adjustment would be costly as U.S. residents would not be compensated for the loss of the budget deficits. In this case, the U.S. net foreign asset position would turn positive as U.S. debt declines and ROW residents sell bubbly firms to U.S. ones.

Central to our model is the result that providing an asset that eliminates inefficient investments yields a benefit or fee to those that create it. According to the benevolent view, the government is altruistic: it lets the private sector appropriate this benefit (rents from bubbly creation) and only intervenes when the market is incapable of providing itself with the appropriate asset. When this is the case, the government also receives part of this benefit (the budget deficits). But why would the government not want to appropriate this benefit even when the market works? One can also imagine that the government could be opportunistic and try to displace an existing bubble in order to capture all the benefits from providing an asset that eliminates inefficient investments. These benefits can then be redistributed to its constituents. We examine next this possibility.

11.6 A "Cynical" View of U.S. Economic Policy

We consider next a situation in which there are two types of government, *altruistic* and *opportunistic.* The altruistic government acts as in the previous section, and allows the private sector to capture the rents from bubble creation. The opportunistic government expands public debt and crowds out the bubble in order to capture these rents and distribute them to its

constituents. We construct an equilibrium in which initially the altruistic government is in power, and the stock market creates a bubble that is large enough to crowd out all inefficient investments. The government responds by eliminating its budget deficits and making room for the bubble to grow. But there is a change in government, and this leads to a drastic change in fiscal policy. The opportunistic government starts a fiscal expansion whose objective is to crowd out the bubble and in this way appropriate its value. In this equilibrium, the U.S. fiscal expansion constitutes a beggar-thy-neighbor policy that is responsible for the collapse in the stock market.

Let $G_t \in \{A, O\}$ be a state variable indicating whether the altruistic ($G_t = A$) or the opportunistic ($G_t = O$) government is in power, and let ϕ be the probability the U.S. government changes type. As in the previous section, the altruistic government uses fiscal policy to immediately eliminate inefficient investments whenever the stock market fails to do so. Therefore equation (19) still applies when $G_t = A$. Instead, the opportunistic government uses fiscal policy to appropriate as many resources as possible and then distributes them as it sees fit. As a result, when $G_t = O$, we must replace equation (19) with the following:

$$\sum_{i \in I} T_{i,t} = \begin{cases} \chi \cdot \left(1 - \varepsilon - \dfrac{r_t}{\gamma} \cdot D_{t-1}\right) & \text{if } D_{t-1} < 1 - \varepsilon, \\ \dfrac{\gamma - r_t}{\gamma} \cdot (1 - \varepsilon) & \text{if } D_{t-1} = 1 - \varepsilon, \end{cases} \tag{20}$$

where $\chi \in (0, 1]$. Because $1 - \varepsilon - r_t/\gamma \cdot D_{t-1}$ is the value of productive and bubbly firms owned by shareholders, equation (20) is simply saying that the opportunistic government runs budgets deficits that crowd out a fraction χ of these firms. Note that this fiscal policy does not depend on investor sentiment. The government always expands debt when it arrives to power, regardless of whether this displaces inefficient investments or a stock market bubble.

Is the bubble in equation (16) consistent with the existence of the opportunistic government? Assume first that χ is small so that when investor sentiment is high the opportunistic government would displace bubble slowly and only in part. In this case, the expected growth rate of the bubble still exceeds the return to the inefficient investments. And, as a result, the bubble in equation (16) still constitutes an equilibrium. The interest rate (which can be obtained by the same procedure we obtained equation [18]) depends on which government is in power. In particular, when investor sentiment is high, the interest rate will be lower when the opportunistic government is in power. This reflects the effect of fiscal policy on the size of the bubble and therefore the return it offers. The opportunistic government makes the bubble a worse asset, and debt does not need to offer a high interest rate to compete with it.

Assume instead that χ is large so that when investor sentiment is high the opportunistic government would displace the bubble rapidly and completely. Anticipating this, the demand for the bubble drops to zero, and the bubble bursts, forcing holders of the bubble to find alternative investments. The arrival of an opportunistic government bursts the bubble on impact and leads to the reemergence of inefficient investments. As a result, equation (16) no longer constitutes an equilibrium and must be replaced by the following one:[24]

$$B_t = \begin{cases} 0 & \text{if } S_t = L \text{ or } G_t = O, \\ 1 - \varepsilon - D_t & \text{if } S_t = H \text{ and } G_t = A. \end{cases} \tag{21}$$

Equation (21) recognizes that, if χ is high enough, the bubble can only exist if investor sentiment is high and the government is altruistic. From now on, we shall assume that the opportunistic government crowds out the bubble immediately, that is, $\chi \to 1$, and we consider the bubble in equation (21). Note that in this case, there is a bubbly state where both the altruistic government is in power and investor sentiment is high and a nonbubbly state where either investor sentiment is low, the opportunistic government is in power, or both.

Given our assumptions, we have now that the equilibrium interest rate is given by[25]

$$r_{t+1} = \begin{cases} \pi - \alpha & \text{if } S_t = L \text{ or } G_t = O, \\ \dfrac{\gamma \cdot (1-\varepsilon) \cdot (1-\eta)}{1 - \varepsilon - \eta \cdot D_t} & \text{if } S_t = H \text{ and } G_t = A, \end{cases} \tag{22}$$

where $\eta = 1 - (1 - \lambda) \cdot (1 - \phi)$ is the probability that the economy transitions from the bubbly to the nonbubbly state. Note that the expression for the interest rate is identical to that in equation (18), with the exception that we must replace the transition probability λ with η. The intuitions are also identical: in the absence of a bubble, the interest rate is low because debt competes with capital, and the latter offers a low expected return to shareholders. When the bubble appears, the interest rate is high because debt competes with the bubble, which is a better asset than capital.

Interestingly, the equilibrium of this section is observationally equivalent to that of the previous section. In both equilibria, when the bubble exists, budget deficits are zero, and the bubble absorbs all of the inefficient in-

24. Can the bubble exist even if there is an altruistic government in power? The answer is positive if the transition probability ϕ is low enough (one example was the model of the previous section that is nothing but the limiting case where $\phi \to 0$). We assume this now, but we shall come back to this important point later.

25. Once again, note that when $S_t = L$ or $G_t = 0$ and $D_t = 1 - \varepsilon$, any $r_t \in (\pi - \alpha, \gamma)$ is also an equilibrium.

vestments of the shareholders. In both equilibria, the bursting of the bubble is accompanied by a glut of saving followed by a large fiscal expansion that ensures that debt now performs the same task of eliminating inefficient investments. The welfare consequences of these two equilibria are also the same. When the bubble collapses, both U.S. and ROW shareholders suffer large losses. The U.S. shareholders of the current generation are compensated for this loss by the large fiscal deficit that corresponds to the up-front fee for creating debt, but ROW shareholders receive none of this. The collapse of the bubble therefore implements a transfer from ROW to the United States.

The key difference between the two equilibria lies in the underlying shock that leads to the bursting of the bubble. The first possibility corresponds to the benevolent view that we have already discussed: investor sentiment changes exogenously, and an altruistic government responds by running large fiscal deficits. This policy reaction does not hurt ROW residents because the bubble bursts anyway but helps U.S. residents. The other possibility corresponds to a more cynical view: when the opportunistic government comes into power, it immediately crowds out the bubble in order to appropriate its value. This policy reaction hurts ROW residents as the bubble would not have burst without it. In this case, U.S. fiscal policy is a beggar-thy-neighbor type of policy.

Is this cynical view a good description of macroeconomic events over the past ten years? An immediate objection has to do with the timing of collapse of the bubble and the emergence of budget deficits. After all, in the United States the Nasdaq peaked in March of 2000, and the Standard & Poor's (S&P) 500 peaked in September of 2000, while the new administration took office in January of 2001. But this does not mean, however, that the cynical view is incorrect. Note that a bubble is not feasible if $\eta = 1 - (1 - \lambda) \cdot (1 - \phi)$ is high enough. At the cost of further notation, it is possible to make ϕ vary stochastically over time. In such a setup, an increase in the probability that the opportunistic government takes over is all that is needed to create the collapse of the bubble.

This immediately suggests a slightly modified version of the cynical view that can account for the timing of the bubble collapse and the appearance of the budget deficits. It goes as follows: as the elections approached, investors revised upwards their expectations of the arrival of an opportunistic government (Democrat or Republican, the theory has nothing to say about this). This leads to the collapse of the bubble. When the new administration arrived, it engineered a fiscal expansion, and this confirmed investor expectations. Or did it not? After all, a benevolent government would also have engineered a fiscal expansion in this situation. Because government intentions are not observable to us, we can only conclude that an increased probability of the appearance of an opportunistic government can break the bubble. Whether the subsequent government run large

budget deficits because it is opportunistic or benevolent is impossible to tell. But it does not really matter for the story.

11.7 Final Remarks

We have provided a joint account of some of the major U.S. macroeconomic events of the past decade: large current account deficits and a steady decline in the net foreign asset position, the large boom and subsequent crash in the stock market, and the emergence of large fiscal deficits. According to the conventional view, the evolution of the stock market and fiscal deficits are more or less unrelated events, with the former driven by sharp swings in U.S. productivity and the latter by shifting U.S. political considerations. Both of these in turn fueled current account deficits that must eventually be reversed as the accumulation of public debt becomes excessive.

We instead propose two alternative views in which the stock market and the fiscal deficits are closely linked. Central to our account is the notion that the world economy contains pockets of dynamically inefficient investments. This opens the possibility for asset bubbles to exist, which in turn provides a more plausible explanation for the large swings in equity values over the past decade. The appearance of a bubble in the U.S. stock market in the second half of the 1990s accounts for much of the decline in U.S. net foreign assets during this period. At the same time, the bubble raised welfare worldwide by eliminating inefficient investments.

According to the benevolent view, the collapse of the stock market in 2000 was the result of a coordination failure or change in investor sentiment, and the rapid expansion of public debt since then served to displace inefficient investments in the same way that the bubble did. Viewed in this light, the large budget deficits of the Bush administration can be interpreted as a welfare-improving response to this market failure. But there is also a more cynical interpretation that is observationally equivalent to the benevolent view. Under this interpretation, the increased probability of a fiscal expansion is what caused the collapse of the bubble. The subsequent budget deficits validated this change in expectations about government behavior. This view interprets the large budget deficits of the Bush administration as a successful attempt to appropriate the value of the bubble from its U.S. and foreign owners.

To explore these ideas, we have used a minimalist model that puts a large weight on theoretical clarity even at the cost of leaving out many important aspects of reality. The advantage of this approach is that, by clearly exposing the main mechanisms at work, it provides a simple but rigorous framework to think about the interactions between stock market bubbles, budget deficits, and the current account. This framework has been used to provide a *qualitative* account of the recent U.S. macroeconomic experi-

ence. But this can only be seen as a first step toward a fuller understanding of this period of U.S. economic history. The natural next step is to use the framework presented here to provide a *quantitative* account of the recent U.S. macroeconomic experience. This will no doubt require enriching the theory by bringing back some of those important aspects of reality that have been left out here.

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Comment

Joseph E. Gagnon

The paper by Kraay and Ventura provides an original and provocative interpretation of the forces behind the U.S. current account deficit. In one sense, however, this interpretation is conventional in that it focuses on developments in the United States rather than in the rest of the world. As an explanation of the past ten years, I find Kraay and Ventura unconvincing. I think that more persuasive explanations focus on developments in the rest of the world in an otherwise more conventional setting. However, over the past few years, the continued secular decline in private rates of return—despite the recovery from recession—raises the possibility that the nonconventional approach of Kraay and Ventura may have useful applications.

The critical assertion of Kraay and Ventura is that the global economy is dynamically inefficient because the marginal product of capital, net of agency costs, is less than the growth rate of the economy. In support of this assertion, Kraay and Ventura show that ex post real returns on one-year U.S. Treasury bills have rarely exceeded, and have often been far lower than, the growth rate of U.S. real GDP over the past thirty-five years.

Abel et al. (1989) argue that the riskless return on Treasury bills is not an appropriate measure of the marginal productivity of capital because investors are willing to forego a large risk premium to hold safe government bills. Abel et al. showed that an alternative gauge of dynamic efficiency on a steady-state growth path is whether the flow of income from private cap-

Joseph E. Gagnon is an assistant director of the division of international finance at the Federal Reserve Board.

ital exceeds the resources invested in private capital. Using national accounts data, they found that this condition was satisfied in the United States for every year since 1929 and in six other industrial countries for every year since 1960.

Kraay and Ventura point out that Abel et al. (1989) is based on the implicit assumption that the marginal returns to capital equal the average returns. In the model of Kraay and Ventura, nonentrepreneurs are the marginal investors in private capital and they must forego an agency cost that prevents them from earning the true marginal product of capital. Entrepreneurs, on the other hand, do reap the full returns from capital, but they are inframarginal. Kraay and Ventura argue that the capital income of entrepreneurs may be large enough to raise total capital income in the economy above total capital expenditures, and yet the marginal return to capital may be lower than the growth rate.

Careful consideration of the data for the United States does not support Kraay and Ventura's claim. Entrepreneurs are to be found among the proprietors of non-incorporated businesses, including landlords, and among the upper management of corporations. Thus, a conservative measure of capital returns to nonentrepreneurs would exclude proprietors' and rental income as well as employee salaries and benefits paid by corporations. Abel et al. (1989) anticipated these concerns, and they presented alternative calculations based on the profits and net interest paid of the U.S. nonfinancial corporate sector.[1] Extending their analysis to more recent years (for the total corporate sector) does not reverse the result.[2]

The second approach to measuring the marginal return on private capital is to use the yield on median-rated corporate bonds. Figure 11C.1 displays the Baa corporate bond yield and the nominal growth rate of U.S. GDP since 1975. Except for the unanticipated inflation of the late 1970s and the last two years, the corporate bond yield has comfortably exceeded the growth rate of GDP. Subtracting 30 to 40 basis points to correct for historical default losses on these bonds would not reverse this result.[3] Given that equities are even more risky than corporate bonds, it is plausible to suppose that much of the excess of capital income over capital expenditure documented by Abel et al. (1989) flows to equity holders, who are also marginal investors.

It may be argued that there are specific firms within the universe of bond and equity issuers that are bubbly, but there is no reason to believe that traditional efficient firms are not also borrowing at the margin. And, given that marginal returns on capital do exceed the growth rate, the coexistence

1. Despite the recent controversy over expensing of employee stock options in accounting statements, the Bureau of Economic Analysis has always subtracted the value of exercised options from corporate profits in the national income accounts.

2. To be specific, in 2004 corporate profits including capital consumption allowance plus net business interest equaled about 15 percent of GDP. Private nonresidential investment equaled less than 11 percent of GDP.

3. This is based on ten-year cumulative default and recovery rates from Hamilton, Varma, Ou, and Cantor (2005).

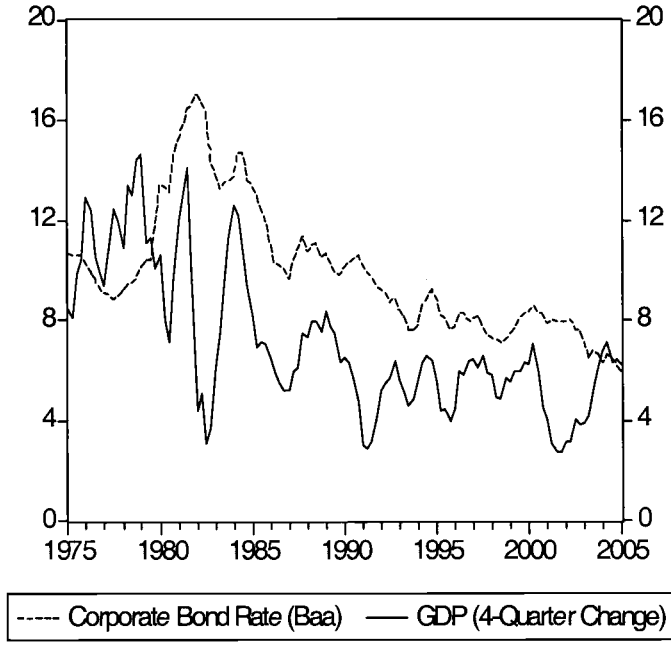

Fig. 11C.1 U.S. corporate bond yield and GDP growth (nominal, percent)

of efficient and bubbly firms relies on an element of market irrationality that Kraay and Ventura have sought to avoid.

Given the originality and simplicity of Kraay and Ventura's analysis, it would be churlish to criticize it too heavily for omitting real-world complications. Thus, I will simply point out a few issues that would benefit from further analysis in future work: (a) the model does not allow for diminishing returns to capital and there is no complementarity between labor and capital; (b) both goods and financial markets are perfectly integrated across countries; (c) prices are perfectly flexible, and there are no cyclical movements in output; thus there is no scope for countercyclical monetary or fiscal policy, despite the fact that fiscal policy is central to the paper; and (d) as already mentioned, there are no risk premiums in financial markets.

The following is one point on the benevolent versus the cynical view of U.S. fiscal policy: the benevolent view fits the timing of events much better than the cynical view. The stock market correction (at least in the tech-heavy Nasdaq where the bubble was concentrated) began a year before the Bush administration came to power. Kraay and Ventura argue that changing expectations about the election outcome and future fiscal policy could have been sufficient to prick the equity bubble far in advance of any legislated policy change. However, they present no evidence that the timing of the stock market correction had anything to do with expectations of future

fiscal policy. Indeed, most analysts continued to predict future fiscal surpluses for months *after* the Bush administration took office.[4] The fall in equity prices and the subsequent recession clearly have led to a larger and more persistent fiscal deficit than would have been likely had there been no crash and no recession.[5]

I think a more plausible story is that the equity boom and bust reflect the difficulty of evaluating the profit implications of the technology surge.[6] When dot-com firms proved less profitable than hoped, the market tanked.[7] The subsequent fiscal expansion may have had an exogenous political component, but it clearly was well timed as countercyclical policy. Together, these two factors supported the current account deficit. But other important factors were at work. The secular economic slowdowns in Europe and Japan led to an outflow of saving. The emerging market financial crises of the 1990s led to disillusionment about the ability of fast-growing developing countries to absorb more capital productively. The result has been a flood of capital into the United States and low worldwide interest rates.

The glut of foreign saving relative to foreign investment is likely responsible for the decline in corporate bond yields recently. The central assumption of Kraay and Ventura—that the world is dynamically inefficient because the return to capital is less than the economic growth rate—may hold true in the future even if it was not true in the 1990s. Thus, there may yet be a payoff to the nonconventional analysis of Kraay and Ventura.

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4. The September 2001 issue of *Consensus Forecasts* showed a mean forecast of the fiscal year 2002 budget balance of $168 billion, and not a single survey participant predicted a surplus less than $75 billion. In the event there was a deficit of $158 billion.

5. The recession directly increased the fiscal deficit through automatic stabilizers. It also indirectly increased the deficit through political pressure for countercyclical policy. This is not to deny that the election of George Bush had an independent influence on fiscal policy.

6. Note that the Kraay and Ventura model ignores the significant and sustained acceleration of productivity after 1995.

7. Kraay and Ventura view deviations in the market value of equity from the underlying replacement cost of capital as evidence of bubblelike behavior. Hall (2001) interprets these deviations as reflecting the value of intangible capital such as patents, brands, and business processes. Kraay and Ventura ask why this value declined sharply after 2000. In fact, as shown in Kraay and Ventura's figure 11.3, most of the run-up in share prices in the 1990s had not disappeared as of 2004. The stock market bubble is more appropriately described as a moderate and short-lived hump on the back of an enormous fundamental surge in valuations.