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A Policy-Game Framework for the Dollar-Euro Exchange Rate

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by Philip Arestis and Elias Karakitsos

1 Introduction

Most dollar-euro models are unstable in the sense that the influence of variables such as (short- or long-term) interest rate differentials, change through time from, statistically significant, positive to negative, and sometimes to being insignificant. This instability inherent in all currency models based on the small open paradigm or the two-country model is due to a policy game framework, in which the equilibrium shifts from Stackelberg-leader to Stackelberg-follower.[1] Once account is taken of this game framework, and the shift of the equilibrium between Stackelberg-leader and Stackelberg-follower, the resulting dollar-euro model is stable. The US has a clear preference for the Stackelberg-leader equilibrium when the economy is overheated or cools down, but inflation continues to rise because of inertia. The US has a clear preference for the Stackelberg-follower equilibrium when the economy is in recession or on the recovery phase of the business cycle. In each case markets impose the relevant equilibrium because it is stable for the world economy and global financial markets, based on the premise that 'what is good for the US is also good for the rest of the world'. The question of stability/instability issue can only be answered when the business cycles of the US and euro area can be investigated in terms of them being synchronised or de-synchronised. Under synchronised circumstances, there is a conflict of interest in that both players want either a strong or weak currency, and the resulting equilibrium is unstable. When the business cycles de-synchronised the equilibrium is always stable because one player wants a strong currency while the other a weak one. We utilise such a framework in this paper in an attempt to study the dollar-euro exchange rate at the theoretical level without forgetting at the same time the realities of the wider real world.

We begin in section 2 where we pose the question of the relevance of the chronic US external current account imbalance. Section 3 examines the relationship between the dollar and the current account imbalance at the theoretical level, where a new way of looking at the determinants of the exchange rate is discussed; in doing so we make extensive use of the game theoretic approach as this is applied in the foreign exchange market. Finally, section 4 summarises and concludes.

2 The Relevance of the Chronic US Current Account Deficit

The deficit in the US current account, which records transactions in goods and services, has progressively widened since the recession in the early 1990s. In the 1980s it was also in deficit, but it narrowed with the dollar depreciation following the Plaza Accord in 1985. Under free floating, the capital account, which records transactions in assets and Foreign Direct Investment (FDI), is the mirror image of the current account and represents the financing of the current account deficit. The discrepancy, if any, between the current account and the capital account reflects changes in foreign exchange reserves, which on occasions may arise from central bank intervention in the foreign exchange market. The current account deficit (the external imbalance) stood at the historical record of 5.2% of nominal GDP in October 2003, and rising. It is, thus, bigger than the 3.3% recorded in the early 1990s, which was the previous record deficit in the last fifty years. The financing of the current account deficit, so far, has not been a problem since the

[1] We elaborate on the meaning of these terms below – see subsection 3.1; see, also, Arestis and Karakitsos (2004) where we elaborate further on a number of issues dealt with in this paper.

surplus in the capital account has exceeded the deficit in the current account. For example, in the second quarter of 2003 the surplus in the capital account was 6.2% of GDP, outstripping the deficit in the current account by 1%.

The financing of the huge US current account deficit has so far been met very easily, as the residents in the Rest of the World (ROW) have been willing to lend the US the necessary funds to cover this deficit. This process has turned the US into a serious net debtor to the ROW in the last twenty years. However, the debt is in US dollars and there are no immediate good reasons why residents in the ROW should lose their confidence in the ability of the US to service this debt. There is a risk, though, that ROW residents may lose their appetite to hold US assets, if they continue to suffer huge losses on their holdings of US assets. During September and October 2003 there was a temporary drop in the desire of foreign investors to accumulate US assets, but that was restored subsequently. The risk that foreigners may, at some point in time, lose their appetite implies that it would be better that the US should balance or, at least, reduce its current account deficit. The dollar has been on declining trend in the last two years and this would help the current account deficit. However, now that the economy is recovering there are serious doubts as to whether the deficit would continue to narrow and whether the dollar would continue to fall.

An interesting aspect of the chronic US current account deficit is that the dollar is a reserve currency, and the US debt is simply domestic rather than foreign. This means that any crisis in the US must come from lack of confidence in its ability to service its domestic debt. Although foreign residents hold more than half of the US general government debt, this is smaller than any other G7 economy. Moreover, although the US corporate debt is large (46% of US GDP), foreign residents hold only one quarter. Hence, there are no compelling reasons why foreign residents should lose their confidence in the ability of the US to service its debt. However, foreign residents may lose their appetite to lend the US, if they continuously suffer losses from their holdings of US assets. One factor that has contributed to such losses is the falling dollar exchange rate and the other is the bad timing of foreign residents in buying US assets. From this point of view the huge current account deficit (the external imbalance) is one of the problems that face the US economy. Figure 1 shows that as percent of GDP direct holdings of equities by the personal sector increased from 44% in 1952 to 87% in 1968, but then declined to just 20% in 1982 and then recovered to a peak of 98% in March 2000. In the last three years direct holdings fell to 39%, but have recovered recently (second quarter of 2003) to 46% of GDP. However, such large swings reflect changes in the value of equities, which can be seen if direct holdings are expressed as percent of the total. The proportion of equities held directly by the personal sector has been on long-term downtrend from 91% in 1952 to 38% lately (see Figure 1). This reflects a portfolio shift by the personal sector from direct to indirect holding through life insurance companies, pension funds and mutual funds. The proportion of total holdings of equities by the personal sector (both direct and indirect) declined by merely 5%, from 98% in 1952 to 93% in the mid 1990s (see Figure 2). However, since the burst of the bubble in March 2000 the proportion of total holdings by the personal sector has fallen by 5%, which was almost entirely bought by foreign residents.

Figure 1: STOCK OF DIRECT EQUITY HOLDINGS BY PERSONAL SECTOR

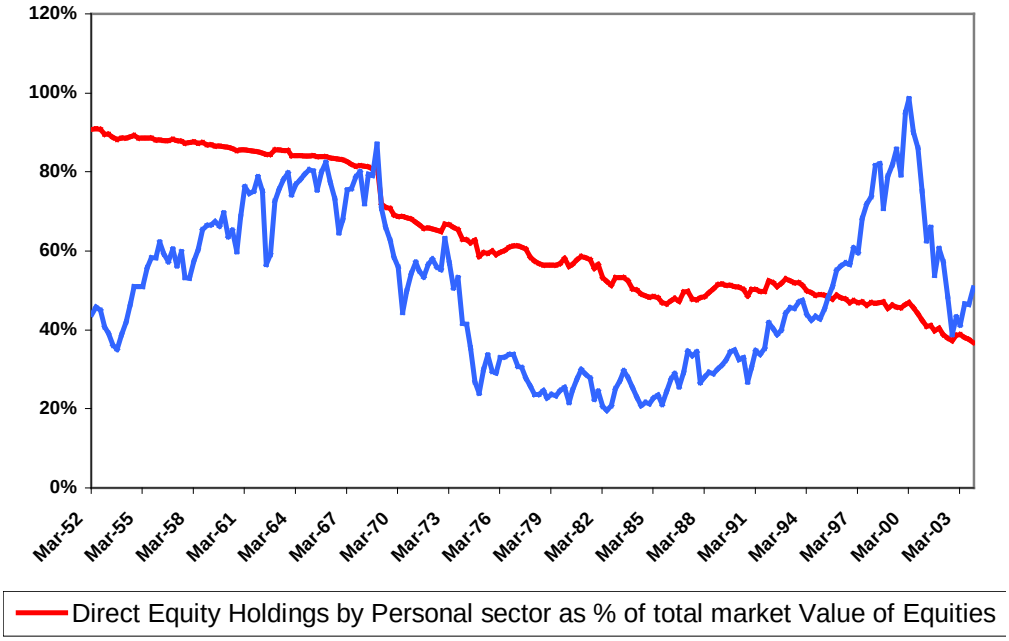


Figure 2: Total Holdings of Equities by the Personal Sector

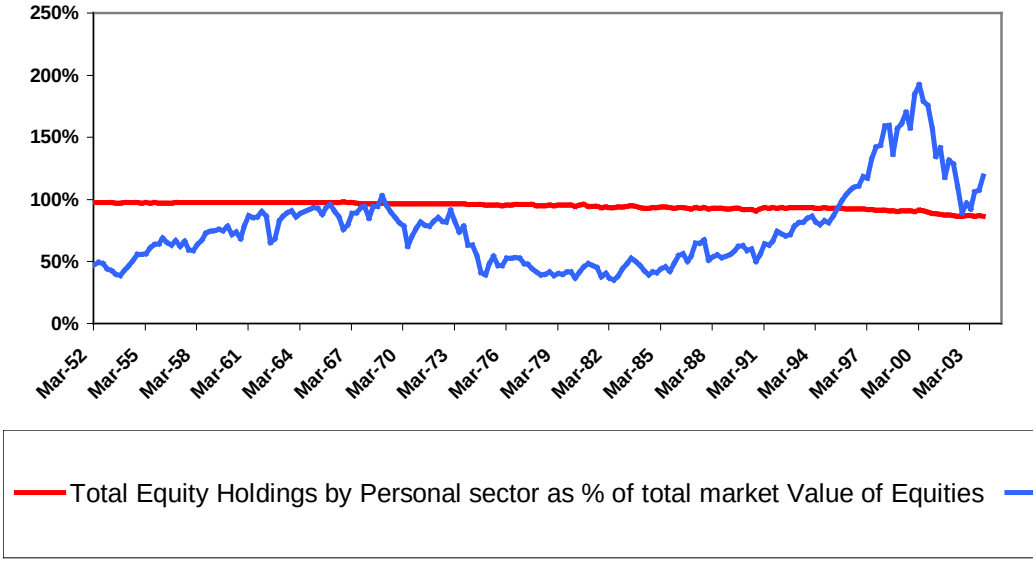


Figure 3: US STOCK EQUITY HOLDINGS BY FOREIGN RESIDENTS

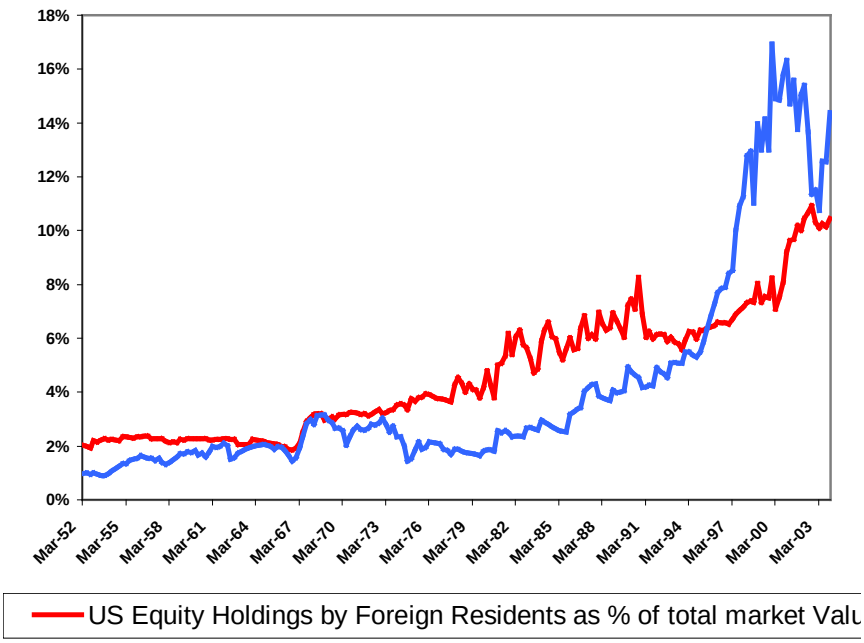


Figure 3 shows that the proportion of ROW holdings of US equities has increased from just 2% of US GDP in 1952 to just over 8% in September 1990, but it remained low throughout the major bull market of the 1990s. The proportion of ROW holdings of US equities increased during the bear market by 4% from March 2000 till September 2002. This means that foreign residents not only missed the major bull market of the 1990s, but also were net buyers during the bear market. During the bear market of 2000-03 the US personal sector sold its stock holdings to ROW residents who foolishly believed that this was simply an opportunity to buy US shares. In the second quarter of 2003 foreign residents bought aggressively the US bond market, which started one of its biggest collapse. Therefore, foreign residents have suffered capital losses in the past from holding US assets and the dollar has plunged in the last three years, which may have aggravated such losses. Sustained losses in US assets may dry the appetite of ROW to hold such assets. Hence, from this point of view the huge current account deficit is one of the problems that face the US economy. The current account deficit has persisted for far too long. This means that the US lacks the foundations for a sustainable new business cycle, since the current account deficit is bound to grow even bigger in the case of a recovery.

In theory, the current account can be corrected in one of two ways. The US economy should expand at a smaller rate of growth than the rest of the world for a considerable period of time, until the current account deficit shrinks to more sustainable level. Alternatively, the dollar should fall dramatically for US competitiveness to improve and close the current account deficit. In practice, however, the current account deficit usually shrinks by a combination of lower growth and dollar depreciation, as with the US deficit in the 1980s, since the one reinforces the other. The combination of lower growth and dollar depreciation would enable the US to buy back its assets from foreign residents at much lower prices without having to pay for its debts. Unfortunately for the US, despite the recession and the low growth of the last three years, the US fared better than its main competitors, so the current account deficit widened instead of narrowing. This means that the dollar fall, so far, is not enough. The dollar should fall much more if the current account deficit is

to shrink to a sustainable level. But, then, this need not be the case. We turn our attention next to examine these issues.

3 A Game-Theoretic Approach to the Dollar-Euro Exchange Rate

Although the dollar fall would help to correct the current account deficit there is no presumption that the ballooning current account deficit should lead to further dollar falls. If this were the case, then the dollar should have fallen anytime in the previous thirteen years. Unfortunately, and in spite of such a popular belief, the current account is not a dollar determinant. Neither is, for that matter, the capital account. Most dollar forecasts are systematically wrong because they are based on variables that are not the main determinants of the dollar exchange rate as they purport to be. Neither the small open economy paradigm nor the two-country model (see, for example, Dornbusch, 1976; Dornbusch and Fisher, 1980; Fleming, 1962; Mundell, 1960, 1963), have had much success in explaining dollar movements. In an attempt to offer an alternative to existing approaches, we put forward a game-theoretic framework to currency determination (see, also, Frowen and Karakitsos, 1998).

3.1 Exchange Rate Determination

The value of a currency depends on the policy actions of the two countries involved, which affect other economic fundamentals. This entails that a game theoretic framework is appropriate in which the equilibrium outcome depends on the policy decisions of both players and where the interactions of such decisions are explicitly modelled. In game theory there is the non-cooperative game, in which each player pursues its own objectives without caring for the objectives of the other, but where the decision of one player adversely affects the other. When the players agree to compromise in the pursuit of their objectives by taking into account also the objectives of the other player, we then have the co-operative game. In exchange rate analysis these considerations are paramount. This is so since policymakers in each country pursue policies that attempt to bring the best possible outcome (optimum) in terms of such target variables as inflation, growth and unemployment, through manipulating the level of interest rates, tax rates or discretionary government spending (in other words, monetary and fiscal policy). The exchange rate is a very important variable in the transmission of these policy actions on the target variables. For example, tight monetary policy with the objective of curbing inflation would be more effective if the currency appreciates, since it is expected to reduce imported inflation. On the other hand, easy monetary policy with the objective of promoting growth would be more effective if the currency depreciates because gains in competitiveness would boost exports and reduce imports. However, such policy decisions, to the extent that they are successful in affecting the value of the currency, would affect economic magnitudes in the other country involved. The policy decisions of one country may favourably or adversely affect economic magnitudes in the other country, where the outcome depends on the state of each economy in the business cycle. If the business cycles are synchronised then the policy decisions of one country will adversely affect the targets of the other. On the other hand, if the business cycles are not synchronised, then the policy decisions of one country will favourably affect the other country.

These considerations imply that a game theoretic framework is appropriate for foreign exchange rate analysis, where the interactions of the two players are explicitly modelled. Normally, the game is played non-cooperatively because each policymaker decides on monetary and fiscal policy with the objective of achieving the targets of its own country without consideration for the effect on the growth or inflation of the other country. When the business cycles of the two countries are not synchronised it does not really matter whether the game is played cooperatively or not. But it

does matter, when the business cycles are synchronised, because in such a case both countries need a strong currency if they wish to beat inflation or a weak currency if they opt to promote growth. If both players are of equal weight (symmetric game) and they do not cooperate, in the sense that each country pursues policies that maximise its own targets without due consideration for the targets of the other country, then the relevant equilibrium is Nash. The Nash equilibrium is always worse than a cooperative equilibrium, which is called Pareto, but it is stable, whereas the latter is unstable. Stability in this context means that once the equilibrium is achieved there is no incentive by either player to deviate from it. A simple example makes the difference between Nash and Pareto obvious. In a stadium with seats for all spectators, they prefer to stand up so that they can see better (Nash equilibrium). Once one-person stands up to see better, there is an incentive for everyone to stand up. In the Nash equilibrium all spectators stand up, whereas in Pareto equilibrium they all sit down. Clearly, the Nash equilibrium is worse than Pareto because all spectators are better off sitting than standing and, collectively, they see equally well whether sitting or standing. The Pareto equilibrium though is unstable, because a single (short) spectator has the incentive to stand up to see better, but its actions would trigger a process that would result in all spectators standing up. In the currency market there are few instances when the game is played cooperatively, such as the Plaza Accord of 1985 and the Louvre Accord of 1987. But most of the time the game is played non-cooperatively.

If one of the players is more powerful than the other (asymmetric game) then the relevant non-cooperative equilibrium is Stackelberg, whereas the Nash-equilibrium is relevant if both players carry equal weight. The strong player is called the ‘leader’, while the other the ‘follower’. In the context of the dollar-euro rate two characteristics suggest the asymmetric nature of the game and the prevalence of the Stackelberg-equilibrium. The effect of US monetary and fiscal policy on the euro area is bigger than the effect of the euro area policies on the US. Second, the euro area is more vulnerable than the US to supply shocks, such as the price of oil. Hence, the US can be considered as the leader, while the euro area as the follower. The leader can exploit its advantage over the follower to achieve an even better outcome. This is accomplished by taking into account the possible reaction of the follower in deciding about its own strategy. In this asymmetric game there are two possible equilibria: Stackelberg-leader and Stackelberg-follower. The first is achieved when the leader exercises its leadership role, while the second is achieved when the ‘leader’ deliberately lets the ‘follower’ lead the game. In what follows we show that the US has a clear preference for the Stackelberg-leader equilibrium, when the economy is either overheated or cools down, but inflation continues to rise because of inertia. On the other hand, the US has a clear preference for the Stackelberg-follower equilibrium when the economy is either in recession or in the recovery phase of the business cycle, when there is spare capacity.

3.2 A Policy Choice Model

This framework is a Stackelberg game with two players: the US as the leader and the euro area as the follower. Such a framework is more appropriate because of the US dominance in the world economy, and the US preference for a stable equilibrium for the world economy and global financial markets. The implication of this Stackelberg game is that what matters for the dollar is the US and not its relative position against its main trading partners. Hence, popular variables, like (short or long) interest rate differentials, growth differentials, money supply differentials, inflation differentials, which emanate from the small open economy or the two-country model, may lead to erroneous conclusions about dollar movements. The models that involve such variables are usually unstable, in the sense that the impact of these variables on the dollar-euro exchange rate changes through time from, statistically significant, to statistically insignificant and sometimes from

positive to negative. The model instability is due to a shift in the equilibrium from Stackelberg-leader to Stackelberg-follower. Once account is taken of this game framework and the shift of the equilibrium between Stackelberg-leader and Stackelberg-follower the resulting dollar-euro model is stable. Moreover, the Stackelberg game framework does not imply that the traditional variables should be used for the US only. Instead, what is important is that the dollar should move in such a way so that the US economy can benefit under all circumstances. If this is not so, then not only is the US, but also the rest of the world, at risk, as the economic and financial system would be unstable. Within this framework, the value of the currency is an equilibrium outcome within a policy game. In this game theoretic framework there are two equilibria, but only one of them is stable and most of the time investors enforce the stable equilibrium. The stable equilibrium reflects the best possible outcome from the US point of view, given the state of the economy in the business cycle and the time varying priorities of the US policymakers, among the main targets of economic policy. We explore this theoretical premise, in the case of the dollar-euro exchange rate, in what follows.[2]

We begin by assuming that each policymaker chooses its monetary policy by optimising an objective function that is penalising deviations of actual inflation from its desired level and deviations of actual growth from its desired level. The utility function *U* for each country may be specified as follows:

$$U_i = \tfrac{1}{2}[q_{ip} (p_i - p_i^d)^2 + q_{iy} (y_i - y_i^d)^2] \qquad (1)$$

where q_{ip} is the penalty weight that the policymakers in country i=1,2 are attaching to inflation and q_{iy} is the penalty weight on growth; p_i and y_i are actual inflation and growth respectively, and p_i^d and y_i^d are desired inflation and growth respectively. Country 1 is the US and country 2 is the euro area. The bliss point is taken as the rate of growth of desired output and as inflation the rate that corresponds to desired output.

The US central bank is assumed to adopt a 'balanced' approach to monetary policy between the two conflicting targets of inflation and growth. It is, thus, assumed that the US central bank pursues monetary policy in a more 'symmetrical' manner than the ECB, and attaches equal degree of importance to the two conflicting targets of inflation and growth. On the other hand, the ECB is assumed to attach greater weight on inflation than on growth. This implies that while for the US it is assumed that $q_{1p} = q_{1y}$, for the euro area it is assumed that $q_{2p} > q_{2y}$., that is for the US the degree of priority on growth is equal to that on inflation, while for the euro area it is assumed that the priority on inflation exceeds that on growth. Each policymaker optimises its own objective function subject to the economic model that defines the feasible combinations of inflation and growth, given the choice of the monetary policy instrument. The model allows for the spill over effects of monetary policy from one country to the other. Thus, growth in each country is affected by the monetary policy of the two countries. Inflation depends on the output gap and imported inflation. The latter is influenced by monetary policy as a rise/fall in the domestic interest rate appreciates/depreciates the domestic currency and depreciates/appreciates the foreign currency. We may, therefore, describe the US model by equations (2) and (3), while that of the euro area by equations (4) and (5):

[2] Game theory has been used extensively in micro-economics, but not to the same extent in macroeconomics. In the latter case, applications in the area of macro policies in an interdependent world is probably one exception. The contributions by Cooper (1985) and Hamada (1974), (1976), (1979) and applications by Canzoneri and Gray (1983), and Sachs (1983), utilise game theory and deal with the behaviour of the exchange rate.

$$\Delta p_1 = p_1 - \bar{p}_1 = \alpha_1 \Delta y_1 + \beta_1 (\Delta r_2 - \Delta r_1) + \beta_1 \Delta pm \qquad (2)$$

$$\Delta y_1 = y_1 - \bar{y}_1 = \lambda_1 \, \Delta r_1 + \mu_1 \, \Delta r_2 \qquad (3)$$

$$\Delta p_2 = p_2 - \bar{p}_2 = \alpha_2 \Delta y_2 + \beta_2 (\Delta r_1 - \Delta r_2) + \beta_2 \Delta pm \qquad (4)$$

$$\Delta y_2 = y_2 - \bar{y}_2 = \lambda_2 \, \Delta r_2 + \mu_2 \, \Delta r_1 \qquad (5)$$

The symbols are as above, with the exception of r_i which is the short-term interest rate (i.e. the instrument of monetary policy), and *pm* which is the price of imported raw materials (e.g. oil) expressed in foreign currency. In each model the following restrictions apply:

$$\alpha_i > 0, \quad \beta_i > 0, \quad \lambda_i < 0, \quad \mu_i < 0, \quad |\mu_1| < |\mu_2|, \quad |\lambda_i| > |\mu_i| \qquad (6)$$

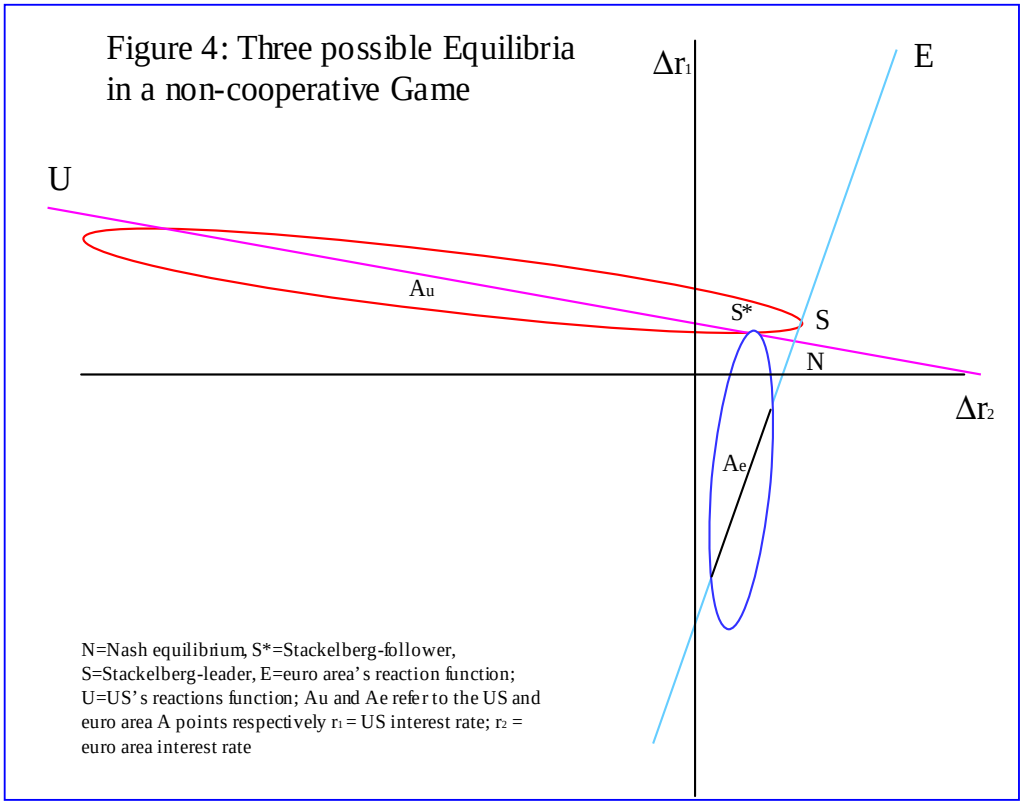
A number of characteristics are embedded in the model, which differentiate the US from the euro area. The coefficient β, which measures the degree of supply-side openness, assumes that the euro area is more open than the US, i.e. $\beta_2 > \beta_1$. Consequently, the euro area relies much more than the US on imported raw materials. The penultimate inequality in (6) implies that the spill-over effect of US monetary policy on the euro area is bigger than the spill-over effect of the euro area on the US. Thus, the euro area is both more susceptible to imported inflation and it is also more vulnerable to 'a beggar-thy-neighbour' policy than the US. The last inequality in (6) implies that domestic monetary policy has a bigger effect on domestic growth than the foreign one. The US is 'stronger' than the euro area in the sense elaborated above. Therefore, in a game framework the US can be considered as the leader, while the euro area as the follower. The indifference curves drawn in Figures 4, 5 and 6 reflect these assumptions.

With these assumptions we draw in Figure 4 the indifference curves for both the US and the euro area, which take the form of ellipses. Ellipses further away from the bliss point represent lower utility and are therefore less desirable. The US indifference curves have as their centre the bliss point A_u. The US ellipses are very flat. The indifference curves for the euro area, on the other hand, are very steep. The US bliss point lies in the second quadrant of Figure 4. On the other hand, the bliss-point for the euro area, denoted by A_e, lies in the fourth quadrant in the same figure. The optimal policy for each country is obtained by minimising the objective function (1) above, subject to the economic model as summarised in equations (2) and (3) for the US and Equations (4) and (5) for the euro area. Each central bank is choosing its monetary policy by taking as given the monetary policy of the other. The optimal monetary policy for each country is described by its reaction function. In Figure 4 the US reaction function is denoted by U, while that of the euro area is denoted by E. These two reaction functions take this shape in view of the two assumptions that the euro area is more vulnerable to imported inflation and to 'beggar-thy-neighbour' policies than the US, and that the euro area cares more about inflation than the US. The US reaction function is almost flat and the reaction function of the euro area is very steep.

The intersection of the two reaction functions determines the Nash equilibrium, denoted by N, which is attained in quadrant 1 under the assumptions made earlier. This implies that as a result of

a surge, say, in imported raw material prices the euro area is forced into tighter monetary policy than the US. This appreciates the euro against the dollar and introduces a deflationary effect in the euro area with higher unemployment than in the US. The Stackelberg-leader equilibrium with the US as the leader is defined as that point on the reaction function of the euro area that is tangential on the US indifference curves. In Figure 4 the Stackelberg equilibrium is attained at point S. Clearly, this is a better solution for the US because it lies on a lower indifference curve than the one that passes through point N. This implies that the Stackelberg equilibrium with the US as the leader is Pareto efficient for the US, but not for the euro area, since its equilibrium lies on a higher indifference curve for the euro area. The Stackelberg-follower equilibrium in which the US lets the euro area act as a leader is defined as a point on the US reaction function that is tangential to the euro area's indifference curves. In Figure 4 the Stackelberg equilibrium with the euro area, as the leader, is attained at point-S*. This is a better outcome for the euro area, since it lies on a lower indifference curve. But it is also optimal for the US. Hence, the Stackelberg-follower equilibrium is Pareto-efficient for both the US and the euro area.

Figure 4: Three possible Equilibria in a non-cooperative Game

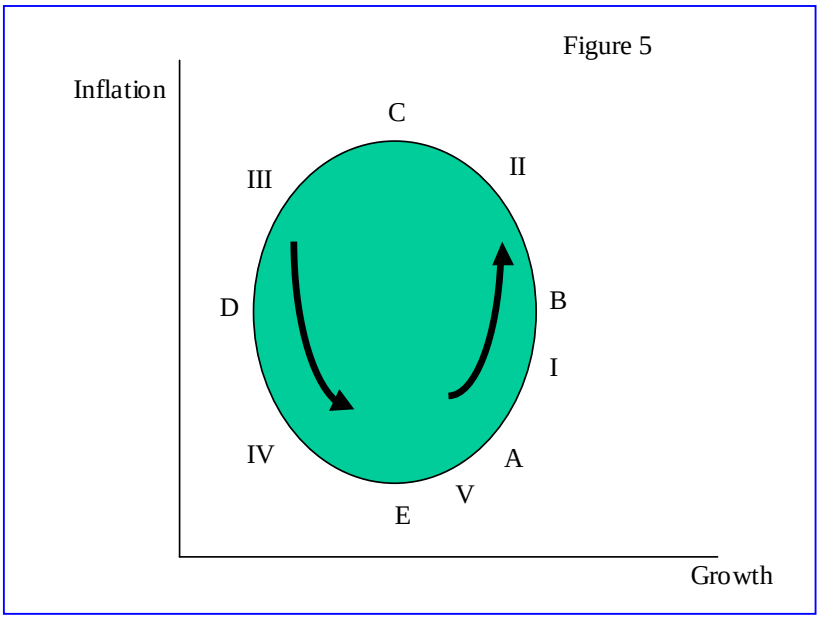


N=Nash equilibrium, S*=Stackelberg-follower, S=Stackelberg-leader, E=euro area's reaction function; U=US's reactions function; Au and Ae refer to the US and euro area A points respectively r_1 = US interest rate; r_2 = euro area interest rate

3.3 The Choice of Equilibrium

Figure 5 illustrates the way in which the objective function of a central bank changes in the course of the business cycle. Point A represents the bliss point, defined as the rate of growth of potential output. The inflation rate that corresponds to the rate of growth of potential output is the steady state rate of inflation. Points B and D represent the peak and the trough of the business cycle in terms of growth rates, respectively. Points C and E represent the maximum and minimum rates of inflation in the business cycle, respectively. These points divide the business cycle into five phases.

Figure 5

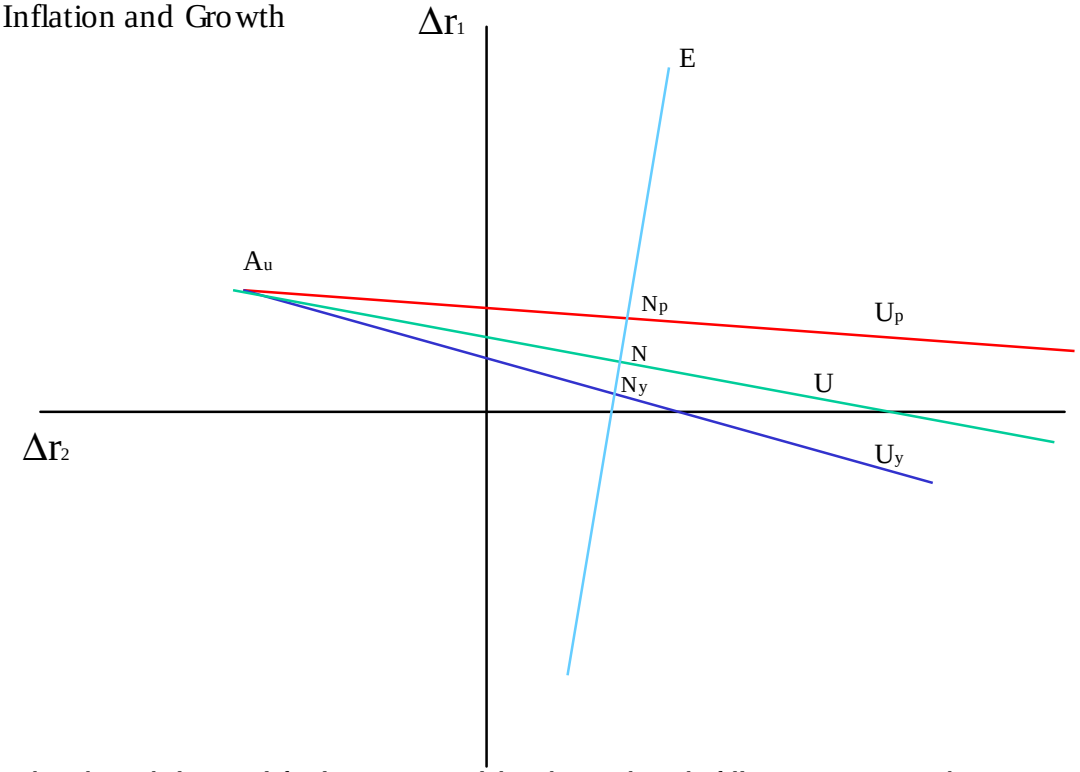


Phase I, where growth is rising above potential, with inflation increasing usually with a lag. Phase II, where the economy decelerates, but inflation continues to rise in view of unit labour cost increasing for two reasons. The first is due to wage-inflation rising, and the second to labour productivity growth falling. In the initial part of phase II wages are increasing as fast as inflation as employees try to protect the purchasing power of their wages. Immediately after point B is reached, employees are in a position to protect their real wages since their bargaining power is strong (unemployment is low and few jobs are lost). However, as the economy moves towards point C the bargaining power of employees weakens (unemployment is rising and the number of jobs lost increases). Consequently, employees find it more and more difficult to protect the purchasing power of their wages; the real wage rate declines. Labour productivity growth declines as firms lag behind in adjusting their labour force to declining demand for their products, for two reasons. The first is due to uncertainty as to whether the drop in the demand for goods is temporary or permanent. The second reason is that costs of adjustment in hiring and firing and training costs are forcing firms to cope with reduced working hours and smaller temporary staff before they start making permanent staff redundant. However, as the fall in demand gathers pace, and the economy approaches point C, falling profitability is forcing firms to absorb into their profit margins the higher cost and decrease their labour force. Phase III, where the economy moves into recession and inflation falls fast, as unit labour cost declines rapidly. Unemployment rises fast, with the number of jobs lost increasing rapidly. Productivity rises as firms shed their labour force faster than the drop in demand. Profit margins are squeezed further as demand is extremely weak in the recession. Phase IV, where the economy recovers, but inflation continues to fall, as unit

labour cost rises at a decreasing rate. This is the inverse of phase II; the correlation between inflation and growth is negative in this phase.

It is now possible to show how a central bank changes its priorities in the course of the business cycle. In phases I and II where priority on inflation increases, central banks follow tight monetary policy. In phases III and IV where priority on growth increases and that on inflation recedes, central banks follow easy monetary policy. Hence, in general, interest rates rise from E to C and fall from C to E. Central banks are given certain characteristics, depending on the values they attach to the penalty weights on inflation and growth at the steady state, i.e. point A. A central bank can be characterised as balanced, when the penalty weight on inflation is equal to the penalty weight on growth. A central bank is wet (or dove) when the penalty weight on growth exceeds that on inflation. A central bank is tough (or anti-inflation hawk) when the penalty weight on inflation exceeds that on growth. It is, therefore, evident that when a central bank is balanced, interest rates would start falling at point C and rising at point E. When a central bank is wet or dove, interest rates would start falling just before point C and rising after point E. When a central bank is anti-inflation hawk, interest rates would start falling after point C and rising before point E. Now when central banks change their priorities in terms of their targets, reaction functions inevitably rotate. This is shown in Figure 6.

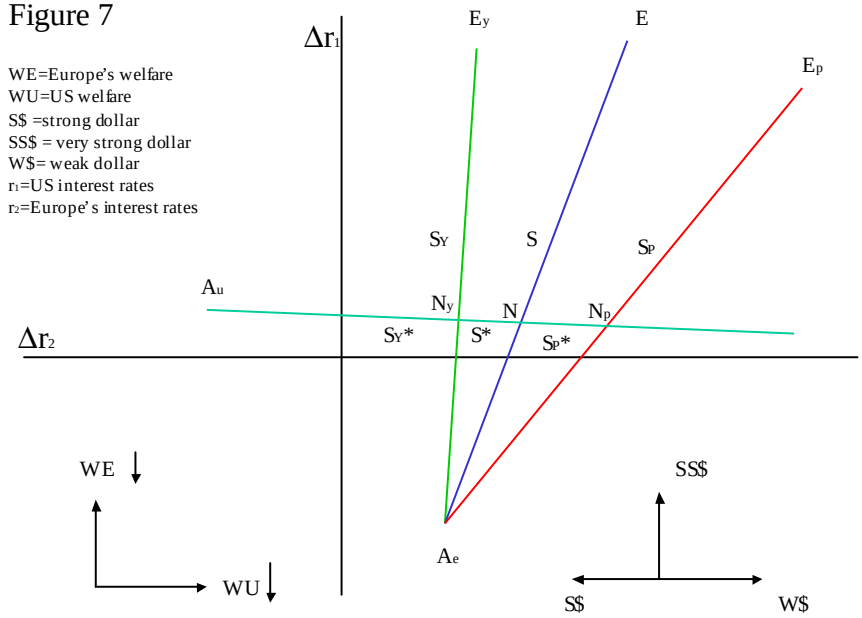
Figure 6: Sensitivity of Equilibrium with respect to varying Priorities on Inflation and Growth



Where the symbols are as defined in Figure 4, and the subscripts have the following meaning: y-subscript = priority on growth, p-subscript = priority on inflation, No-subscript = neutral position

We may now consider the equilibrium positions that both the US and the euro area would prefer. When both the US and the euro area are in phase I or II, then the reaction function of the euro area would be flatter and point N would be further to the right to N_p in Figure 7.

Figure 7



N=Nash equilibrium, S*=Stackelberg-follower, S=Stackelberg-leader, E=Europe's reaction function; A=bliss point, Y-subscript=priority on growth, P-subscript=Priority on inflation, No-subscript=neutral position

Both the US and the euro area welfare is smaller in the new Nash equilibrium N_p, relative to N. If the US chooses the Stackelberg-leader equilibrium S_p, its welfare is even worse. Given the anti-inflation bias of the ECB, the euro area is bound to choose the S_p equilibrium, and for the US the choice of the Stackelberg-leader equilibrium is self-enforceable. Inevitably an interest-rate war ensues. This is precisely what happened in the first half of the 1980s, and also between the Asian-Russian crisis and the burst of the 'new economy' bubble in the late 1990s. We may note the obvious, but pertinent point, that so long as the business cycles are synchronised this would always be the case. The point can be strengthened by assuming that the euro area is in phase III or IV when the US is in phase I or II, i.e. when the business cycles are not synchronised. The euro area reaction function is now at E_y, steeper than E and E_p with point N shifting now to N_y. The US can improve its welfare by choosing the Stackelberg-leader equilibrium (S_Y), while the euro area welfare is somewhat reduced. However, improvement in the euro area welfare is still possible, but only if the ECB is prepared to accept both a weaker euro and higher inflation. If the ECB is unwilling to pursue such policy, its reaction function would then rotate clockwise (i.e. it would become flatter). Inflation would still rise and the currency would become weaker, but by less than the original equilibrium. Consequently, for both the US and the euro area, de-synchronisation of the business cycles is preferable than synchronisation. Consider next the opposite case. Both US and the euro area are in phases III and IV, i.e. in recession and recovery respectively. The Stackelberg-follower equilibrium, which the euro area may adopt namely point S*, is by far a better outcome for the US irrespective of the position of the euro area in the business cycle. Such

equilibrium is Pareto efficient for the euro area, as it lies on a lower indifference curve than the one that passes through point N, the Nash equilibrium.

We may consider next the case where the US is in phase III or IV and the euro are is in phase I or II. The euro area's reaction function would be even flatter than previously. The choice of equilibrium now lies on E_p and therefore point N would lie, almost horizontally, further to the right to N_p in Figure 7. In this case there is room for welfare improvement for both the US and the euro area. The US would choose the Stackelberg-follower equilibrium at S_p*; for the US the smaller the dollar appreciation the better, so that the ECB tightens less than otherwise. Such an outcome is optimal for the euro area. Hence, de-synchronisation of business cycles is preferable from the euro area's point of view, but not from the US, since S_p* is further away from the bliss point than S*. If, on the other hand, the business cycle of the euro area is synchronised with ththat of the US and both are in phase III or IV, the US would still choose the Stackelberg-follower equilibrium. The dollar would appreciate compared to the new Nash-equilibrium at N_y, since the euro area interest rates rise only slightly. The dollar would be even stronger compared to the original Nash-equilibrium N. Synchronisation is preferable from the US point of view because the euro area growth is higher at S_y* than at N_y and hence US exports are more buoyant, in spite of the stronger dollar. The choice of Stackelberg-follower equilibrium is Pareto efficient also for the euro area as the stronger dollar results in smaller degree of tightening by the ECB.

In summary, the Stackelberg-leader equilibrium is a better outcome for the US when the economy is either overheating or is cooling down (i.e. in phases I and II). The Stackelberg-follower equilibrium is a better outcome for the US when the economy is either in recession or in the recovery phase (i.e. in phases III and IV). The next question is to inquire how the US enforces its choice of equilibrium, whether this is a Stackelberg-leader or a Stackelberg-follower outcome. In each case markets impose such equilibrium because, usually, this is the only stable equilibrium in the absence of foreign exchange intervention. A market economy relies upon market discipline for the stability of the system. Investors, in trying to protect the value of their portfolios usually enforce a stable equilibrium. Whenever the US business cycle is not synchronised with that of the euro area, the resulting equilibrium is stable, simply because there is no conflict: one player's interest dictates a strong currency, while the other's dictates a weak currency. By contrast, whenever there is synchronisation of the business cycles, there is conflict in that it is in both players interest to have either a weak or strong currency. In the latter case, investors impose the equilibrium that enhances US welfare even if that is detrimental to the euro area in the short run, since it is stable. Thus, in phases I and II when the Stackelberg-leader equilibrium is prevalent and the US budget deficit is shrinking, investors buy dollars, as this helps the US to fight inflation and provide finance to a widening current account deficit. The alternative would imply instability for the US and, consequently, for the world economy and its financial system. In phases III and IV, when the Stackelberg-follower equilibrium is prevalent and the US budget deficit is widening, investors sell dollars, as this helps the US economy to recover, which in time will revive the rest of the world, and helps to close the current account deficit. The alternative would again imply instability for the US and the world financial system. One important qualification to this thesis is the possibility of 'irrational exuberance'. Investors in their monolithic pursuit of profit can choose an unstable equilibrium.

The stability issue clarifies why the ECB in some periods is unable either to stem the euro plight or the euro rise. In the post-bubble environment a rate cut by the ECB does not have the desired effect of restraining the euro rise, in view of the euro area's business cycle being synchronised

with that of the US. Since the burst of the bubble in 2000 both the US and the euro area are struggling to recover and a weak currency is desirable by both. In the absence of intervention the only stable equilibrium is the one that favours dollar weakness, and this is the one that markets impose. The equilibrium with weak dollar is stable because it would lead to a US-led world recovery, whereas a dollar rise (and consequently a euro fall) would not help the rest of the world to recover and, perhaps, not even the euro area itself. In this respect, the experience of France in the early 1980s is pertinent. At the time, the rest of G-7 pursued deflationary policies to fend the inflation effect of the second oil shock, while the socialist French government pursued expansionary policies to fight the recession. In the event, France was forced in a short time to reverse its policies, as it led to instability through a currency crisis. In the period between the end of the Asian-Russian crisis (1998) and the burst of the equity bubble (2000) the ECB, and prior to it the Bundesbank, was again unable to stem the euro plight, in spite of tight monetary policy because its business cycle was again synchronised with that of the US. By contrast, whenever the US business cycle is not synchronised with that of the euro area, the resulting equilibrium is stable, simply because there is no conflict – one player's interest dictates a strong currency, while the other's dictates a weak currency. This was the case between 1994-98, when the US was overheated, but the euro area was operating with spare capacity.

It follows from this analysis that the dollar is strong when the US wants to cap inflationary pressures and it is weak when the US wants to promote growth through exports. In the last three years the dollar has been weak because the US wants to have an export-led recovery. In the second half of the 1990s the dollar was strong because the US was growing faster than its potential, thereby creating inflationary pressures. The strong economy helped to reduce the budget deficit and general government debt and bond yields fell, while monetary and fiscal policy was tight. In the last three years the economy has been weak, monetary policy is easy, fiscal policy is also easy and both the budget deficit and general government debt are soaring. The overall effect of these factors has contributed to the dollar fall and would continue to cause a fall in the future.

4 Summary and Conclusions

The huge US current account deficit (the external imbalance) has persisted for far too long, although, so far, it has been financed very easily. The accumulation of those deficits has turned the US into a net debtor to the ROW of the order of 23% of its GDP. This external debt has been used, for a long time, mainly to sustain the US excess expenditure over its income, but also to buy ROW companies. Compared to other countries the external debt of the US is large, but it is in US dollars. Hence, traditional insolvency problems that are created by debt to ROW in ROW currency do not arise in the case of the US. Although foreign residents hold more than half of US government debt, the debt is smaller than any other G7 country. Moreover, although US corporate debt is 46% of GDP, foreign residents hold only one quarter. Hence, there is no compelling reason why foreign residents should lose confidence in the ability of the US to service its debt.

However, foreign residents may lose their appetite to lend the US, if they continuously suffer losses from their holdings of US assets. Foreign residents have not only missed the major US bull equity market in the 1990s, but they have also suffered losses during the bear equity market of 2000-03. Moreover, foreign residents have recently suffered heavy losses on their holdings of US bonds. The dollar has plunged in the last three years, which may have aggravated such losses. From this point of view the external imbalance is one of the problems that face the US economy. Unless the current account deficit is balanced in the long run or at least narrowed down, the US

lacks the foundations for a sustainable new business cycle, since the current account deficit is bound to grow even bigger in the case of a recovery.

The US will be able to get rid of its debt not by paying it back, but by buying it back at lower prices once foreign residents have suffered huge losses on their holdings of US assets. During the bear market of the last three years the US sold its stock holdings to the ROW. Slower growth and sharp dollar depreciation would enable the US to buy back its assets from the ROW. Unfortunately for the US, despite the recession and the low growth of the last three years, the US fared better than its main competitors, so the current account deficit widened instead of narrowing. This means that the dollar fall, so far, is not enough. The dollar should fall much more if the current account deficit is to shrink to a sustainable level. But even a bigger current account deficit will not cause a dollar fall, since, despite popular belief, it does not affect it. The opposite is true. The current account deficit is affected by the real value of the dollar.

Our game theoretic approach to dollar determination reveals that the currency is strong when the economy is growing faster than its potential, fiscal policy is easy and monetary policy is tight, the government debt is falling and bond yields are declining.[3] All these factors point to a stronger dollar in the future. In essence, the dollar would begin to rise because the US economy is becoming overheated and the authorities would be concerned to curb inflation.

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[3] There seems to be a contradiction between the effects of fiscal policy and government debt, but this is not so. In the short run easy fiscal policy (widening budget deficit) boosts the dollar, but in the long run the higher government debt that results from such policy, weakens the currency.

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