Policy Challenges in a Dual Exchange Rate Regime[*]

Sven W. Arndt[**]

It is known that the effectiveness of macro policies depends on the exchange-rate regime. Pertinent models have typically considered either fixed or floating rates rather than mixed regimes. In recent years, however, the dollar has floated against most currencies, while being fixed against the yuan. This paper argues that a flex-price, dual-rate model consisting of the U.S., China and the Eurozone, combined with distinct adjustment patterns in tradables and non-tradables sectors and a tendency for policy makers to treat inflation in housing as pure asset inflation, provides a plausible explanation of the great moderation and its aftermath.

JEL Classification: E58, F32, F41
Keywords: open-economy macro, mixed exchange rate regime, non-tradables, asset inflation

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[**] Claremont McKenna College, 500 E. Ninth Street, Claremont, CA 91711, U.S.A., Tel: +909-607-7571, Fax: +909-621-8249, E-mail: sarndt@cmc.edu

1. INTRODUCTION

The effectiveness of macro stabilization policies is known to depend on the exchange rate regime. Monetary policy, for example, is ineffective in a small open economy with fixed exchange rates and high capital mobility, but very potent under floating rates. In the IMF's classification of exchange-rate regimes, countries are either floaters of various types or peggers of various types. In that scheme, the U.S. is officially classified as an "independent floater" (IMF, 2008; Fischer, 2001).

In the Bretton-Woods system, a country's currency was fixed against all member currencies, which at the time typically meant all major trading partners. The European Monetary System (EMS), on the other hand, was more of a mixed regime, with each member's currency fixed against every other member, but with the bloc of EMS currencies floating against the U.S. dollar and other major currencies.

Over the years, many small countries have tied their currencies to the dollar. Their small size vis-à-vis the U.S. meant that their currencies floated against other currencies in patterns beyond their control. China also fixes its currency against the dollar, but China is not small. The implications of this difference have recently been explored in the context of a short-run, sticky-price, Mundell-Fleming-type of model (Arndt, 2011) and of a medium-term model in which prices are flexible (Arndt, 2012). There it has been shown that China's unilateral exchange market intervention has significant effects on adjustment of the U.S. economy to domestic and foreign shocks and disturbances. It has also been shown that, unlike small countries, Chinese intervention interferes with U.S. policy autonomy.

This paper amends the aforementioned flex-price, dual-rate model by specifying the real side of the U.S. economy as consisting of tradables and non-tradables sectors. It argues that economic developments beginning in the early nineties and ending in the latter part of the first decade of this century were materially influenced by the mixed-rate regime, but that other considerations also came into play. The two-sector structure of the market

for goods and services allows movements in relative prices to affect the allocation of labor and other scarce resources in the macro economy. In this model, price moderation due to foreign competition has larger effects on the tradables sector than on the non-tradables sector. The resulting relative price movements have important consequences.

A key component of the non-tradables sector is housing and in a high-employment economy, cost pressures arising in such an important sector are easily spread to the rest of the economy. At the time, however, the housing bubble was widely viewed as asset inflation and hence not as a sign of an overheating economy. In retrospect and with the benefit of hindsight, it would probably have been prudent to treat inflation in new housing, and in new structures more generally, as a sign of overheating.

The paper proceeds as follows. Section 2 outlines the basic model, focusing on the effects of a monetary expansion on economic activity when the output gap is large and when it is small. It assumes that capital mobility is high between the U.S. and Europe, but low with China. Section 3 takes a closer look at the interaction between tradables and non-tradables sectors as the economy moves toward and then surpasses the full employment level of output. It argues that high demand for non-tradables leads not only to price inflation in that sector, but to cost inflation throughout the economy. Section 4 summarizes the main elements and section 5 concludes.

2. THE THEORETICAL FRAMEWORK

The framework is an open-economy macro model in which prices are flexible and the economy is divided into tradables and non-tradables sectors. The focus economy is the U.S., whose currency fluctuates freely against the euro, but is fixed against the yuan.

The money market is modeled in the familiar manner, with real high-powered money, defined as nominal money supply (H) divided by the price level (P) equal to real money demand (L). The latter consists of transactions

demand, as a positive function of real income (y) and asset demand, as a negative function of the interest rate on non-monetary assets (i).

$$H / P = L(y, i). \tag{1}$$

Goods and services equilibrium is given by the following equation:

$$I(i) + T(y, y^*, y^c, e^*, e^c) - S(y) = -G, \tag{2}$$

where investment (I) is a negative function of the rate of interest (i); and the trade balance (or current account, (T) worsens with domestic output (y), improves with foreign incomes, and improves with a real depreciation of the dollar.   Real exchange rates e^* and e^c, against the euro and yuan, respectively, are defined as the respective nominal exchange rates adjusted by ratios of foreign to U.S. price indexes.   Domestic saving is a positive function of domestic income and G represents the government deficit.

As noted, an important difference between the Eurozone and China is the degree of capital mobility, which is assumed to be high with respect to the former and low with respect to the latter.   The dollar-euro relationship is represented by the uncovered interest parity condition,

$$i - i^* = \frac{(E^{\exp} - E^*)}{E^*}, \tag{3}$$

where $E^{\exp}$ and E^* are the expected future spot and the current spot rate between the dollar and the euro, respectively.   For present purposes, expectations are assumed to follow an AR process, so that a rise in the current spot rate unambiguously reduces the right-hand side of the equation.

Bilateral balance of payments equilibrium between the U.S. and China is represented by the following expression:

$$T^c(y, y^c, e^c) + K^c(i - i^c) + R^c = 0, \tag{4}$$

where K^c represents autonomous capital inflows from China in response to an increase in U.S. interest rates or a decline in Chinese interest rates and where R^c represents dollar accumulation by the central bank of China.

As noted above, prices are flexible and price movements involving tradable goods and services may differ from those occurring in non-tradables sectors.   The freedom of domestic firms to raise tradables prices is constrained by foreign competition.   Domestic import-competing firms cannot raise their prices without losing home market share, just as domestic exporting firms cannot raise prices without risking the loss of market share abroad.   Producers of non-tradable goods and services face much more limited pricing constraints.   Equilibrium prices in their markets are determined where domestic production satisfies domestic demand.

The overall price level is defined as follows:

$$P = \lambda p_t + (1 - \lambda) p_n = \lambda (E^* \cdot p_t^* + E^c \cdot p_t^c) + (1 - \lambda) p_n, \qquad (5)$$

where p_t and p_n are tradables and non-tradables prices, respectively; p_t^* and p_t^c are the euro and yuan prices of tradable imports from the Eurozone and China, respectively; and where λ is the share of tradables in U.S. GDP. With the nominal dollar-yuan rate fixed and assuming that tradables prices in foreign currency are given, the domestic price level will change for two reasons. First, a change in the dollar-euro rate will change it and, secondly, variations in non-tradables prices will do so as well.

Production costs and thus price pressures are assumed to rise throughout the economy as the output gap shrinks. In the non-tradables sector, this leads to actual price increases. If we assume that the level of potential output is given, then domestic non-tradables prices rise with actual GDP, that is,

$$p_n = p_n(y). \qquad (6)$$

In this model, a large output gap means that the main effect of monetary expansion is on output rather than prices. But as the output gap narrows,

Figure 1   Adjustment in a Dual Exchange Rate Regime
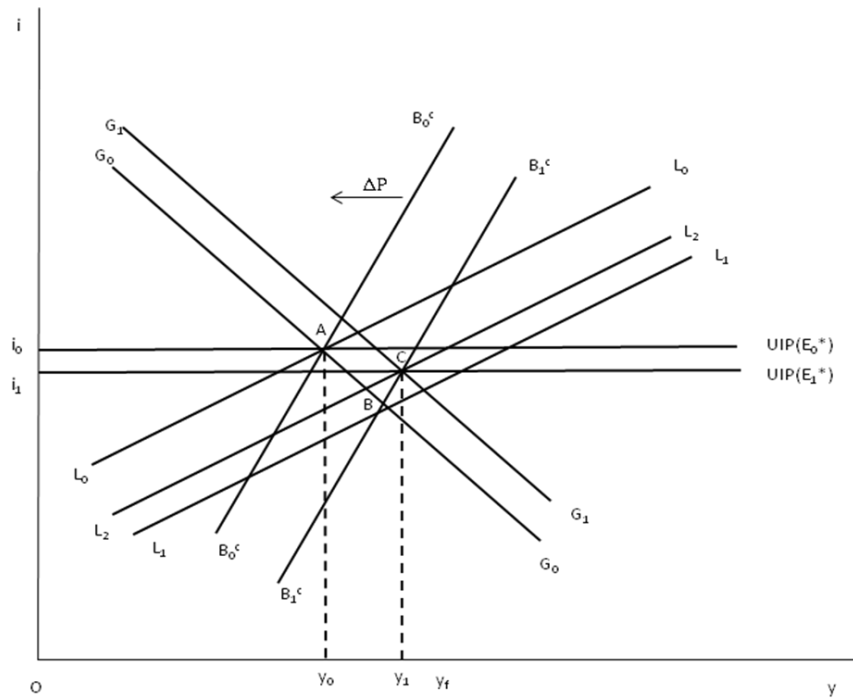
increasing portions of a liquidity injection will go into price increases rather than output expansion. In other words, the medium-run aggregate supply curve becomes steeper as the output gap falls. Thus, the coefficient p_{ny} rises as the output gap shrinks, meaning that non-tradables prices rise in a non-linear manner as the economy approaches full employment.

   Figure 1 summarizes the effects of an expansionary monetary policy in a dual-rate regime. We focus on monetary policy, because our main interest is in understanding and assessing the Fed's role in the great moderation and its aftermath. The curves in figure 1 represent the money market (LL), goods and services equilibrium (GG), uncovered interest parity between the dollar and the euro (UIP), and the bilateral balance of payments between the U.S. and China ($B^c B^c$), respectively. The last curve is steeply sloped in order to reflect low capital mobility between the U.S. and China.

A monetary expansion in the U.S. shifts the LL curve to the right. The new LL curve's intersection with the initial GG curve achieves internal balance, but leaves an external disequilibrium with respect to both China and the Eurozone. The rise in U.S. economic activity worsens both current accounts, while the decline in the U.S. interest rate causes both financial accounts to deteriorate as well. The dollar depreciates nominally against the euro, moving the UIP curve down and the GG curve out. The nominal depreciation raises the dollar prices of imports from the Eurozone, tending to switch expenditure to domestic substitutes and strengthening the effectiveness of the monetary expansion in its ability to reduce the output gap and raise employment.

The rise in the dollar prices of imports has a direct effect on the U.S. price level, as shown in equation (5). Further, unless supply conditions in U.S. tradables sectors are infinitely elastic, the demand shift toward U.S. goods and services provokes cost pressures throughout the economy. The effect of any price increase in figure 1 is to shift the LL, GG and B^cB^c curves to the left, thereby tending to weaken the effectiveness of the monetary expansion (Arndt, 2012). This is because it is movements in the real exchange rate that determine the extent of expenditure switching. Against the euro, the dollar's real depreciation declines for any given nominal depreciation as U.S. inflation heats up. Against the yuan, where the nominal rate is fixed, the rise in U.S. prices is equivalent to dollar appreciation. These pressures on domestic prices typically become stronger as the output gap narrows, thereby gradually weakening the efficacy of the monetary expansion. The system approaches monetary neutrality.

In the yuan/dollar market, the central bank of China intervenes to prevent the yuan from appreciating, mopping up excess dollars in the process. This situation is reflected in the figure by the difference between the two B^cB^c curves. Under floating rates, the dollar would depreciate against the yuan and the bilateral payments curve would shift to the right to pass through a point like C. It is not point C, because the GG curve through C does not reflect the yuan appreciation that would occur under floating rates. With the

rate fixed, the *autonomous* payments curve does not shift. The B^cB^c curve through point C represents the sum of autonomous and accommodating transactions. The gap between the two curves reflects the extent of Chinese dollar accumulation.[1]

In the "automatic" adjustment mechanism under fixed rates, the Chinese intervention that pulls U.S. money out of circulation weakens the stimulus generated by the initial money expansion. In the present case, however, this does not happen, because the Chinese authorities recycle their intervention dollars by purchasing U.S. Treasury securities from the public. Hence, the Chinese intervention not only annuls the price adjustment mechanism of floating rates by fixing the rate, but having fixed the rate, it short-circuits the adjustment mechanism of fixed-rate systems by sterilization and thus makes the bilateral payments imbalance "permanent."

It is in this sense that China would have to share the blame for the lack of adjustment in the U.S. economy, the persistence of current account imbalances, and the financial and economic upheavals that followed. It is also in this sense that China's exchange-rate policy is a beggar-thy-neighbor policy. For the rest of the world, meanwhile, the fundamental question is how to provide some degree of protection from and defense against risky and disruptive policies in large countries.

As noted earlier, stable foreign prices can be an important source of price moderation in the United States. Here, the size of the Chinese economy and the rapid emergence of China as a low-price supplier of a wide array of consumer goods played a key role. The ready availability of those goods was due in part to the wide gap between Chinese production and domestic absorption, a gap which has sometimes been described as a savings glut. When Chinese export prices are stable and the yuan is fixed to the dollar, equation (5) tells us that the main sources of price inflation are reduced to dollar depreciation against the euro and price inflation in the Eurozone, on

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[1] The rise in U.S. prices discussed above will actually shift the original B^cB^c curve to the left, as indicated by the horizontal arrow. The gap between this curve (not drawn) and the curve through point C represents the extent of intervention by the Chinese authorities. It also reflects the magnitude of the U.S. autonomous payments deficit with China.

the one hand, and inflation in non-tradables in the U.S., on the other hand.

## 3. THE REAL EXCHANGE RATE
IN A FULLY EMPLOYED ECONOMY

When the domestic output gap is large and the monetary expansion raises the demand for goods and services, the derived increase in demand for labor and other factors of production can be easily satisfied by drawing on unemployed resources. Any pressures on wages and other factor costs should thus be moderate. When the economy operates at high levels of employment, on the other hand, a rise in demand for non-tradables can only be satisfied by drawing productive resources away from tradables industries. A sustained rise in the demand for non-tradables, such as that seen in the years preceding the financial crisis, may be expected to raise wages and other factor prices, not only in non-tradables sectors but throughout the economy.

Since non-tradables producers face little or no foreign competition, they may pass on such cost increases to higher prices. Tradables producers, on the other hand, are limited by foreign competition in their ability to pass cost increases through to prices. Rising costs in the face of pricing constraints squeeze profits, forcing producers to limit production in both exportables and import-competing industries. Some firms deal with these pressures through offshore sourcing or even offshore production, while less competitive or agile firms leave the industry. Both types of actions tend to free up productive resources for transfer into non-tradables sectors.

Figure 2 provides a simple representation of the problem. The relative price of tradables is measured vertically as the ratio $p = p_t / p_n$, while the right and left panels represent demand/supply equilibrium in tradables and non-tradables sectors, respectively.   Note the important assumption embedded in the construction of tradables prices, namely, that the relative price between exports and imports — the terms of trade — remains constant.[2]

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[2] Under the circumstances prevailing in that period, we would expect U.S. export prices to

Figure 2   Policy Trade-Offs in a Two Sector Economy
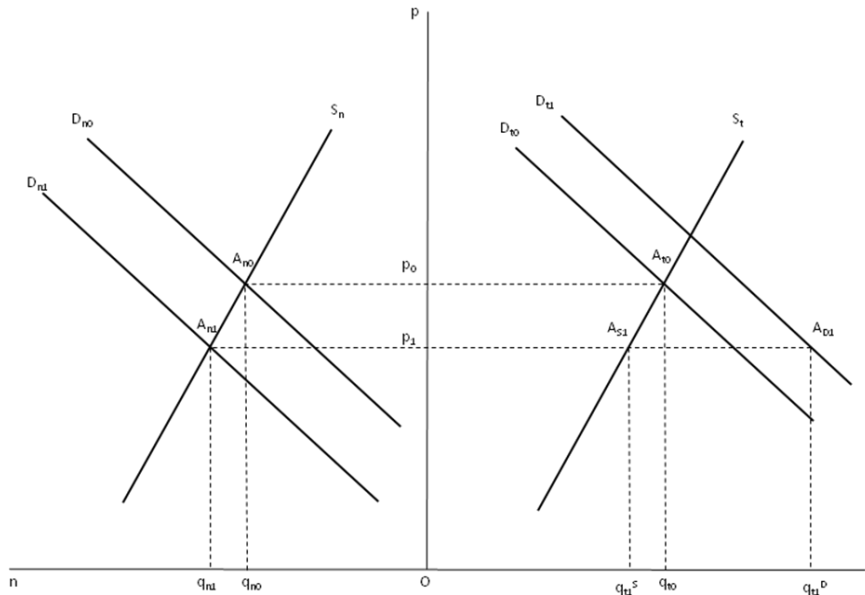
In the right panel, domestic demand falls with a rise in the relative price of tradables, while domestic supply rises. Since the price of non-tradables is in the denominator of the price ratio, the slopes of the two curves are reversed in the left panel in order to allow the demand for non-tradables to fall when the relative price of non-tradables rises and supply to rise. The horizontal axis measures quantity transactions in the two markets, respectively.

The figure represents a situation in which actual output is at or very near the full-employment level in this two-sector economy. Output combinations depicted in the figure, therefore, represent combinations that lie on or near the economy's production possibility curve (not drawn). Hence, any increase of output in one sector must be accompanied by a decline in the other sector. Assume that points A_{n0} and A_{t0} at relative price p_0 represent an initial equilibrium. At the outset, therefore, domestic production of tradables is

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rise relative to import prices, implying an improvement in the country's terms of trade.

assumed to be equal to domestic absorption, so that the country's current account is in balance, with exports equal to imports.

Now suppose that a monetary expansion causes both demand curves in figure 2 to shift out. As discussed in the previous section, there will be upward pressure on both tradables and non-tradables prices, with the latter expected to be larger. This is shown in the figure as a decline in the relative price to p_1, at which the non-tradables market once again clears. The change in p — a real appreciation — must be large enough to return the non-tradables sector to equilibrium. Output has risen by drawing productive resources from tradables, where output has declined. In addition, there is now a current account deficit, equal to the gap between points A_{s1} and A_{D1}. This deficit is the result not only of the rise in demand for tradables, but also of the decline in their production in the U.S.

The figure reflects stylized facts that were widely noted and discussed, namely, that the U.S. current account deficit was large, was growing larger, and was seemingly permanent, while the dollar's international value remained surprisingly "strong." This combination of rising trade imbalance and strong or appreciating currency is critically important to the present argument. As noted, a rise in the price of non-tradables relative to tradables represents dollar appreciation in real terms. Conventional wisdom typically associates trade deficits with weak or weakening currency values. But in this context, the function of the real appreciation is to allow resources to be moved into non-tradables production, while bridging the resulting shortfall of domestic tradables output by reducing exports and raising imports.

At the time, however, the international strength of the U.S. currency was widely attributed to the dollar's role as reserve currency and to the importance of U.S. assets as "safe haven" investments. That argument undoubtedly has merit, but when dollar strength is accompanied by a deteriorating trade balance, that combination should raise alarm bells about resource pressures and overheating of the economy. It should not be automatically treated as benign.

4. PULLING THE PIECES TOGETHER

The highlights and essential elements of this paper's take on the economic ups and downs of the past two decades may be summarized as follows.

Adjustment in payments between the U.S. and the Eurozone went largely as expected under a floating rate system. Dollar depreciation made expansionary monetary policy more effective initially, along the lines taught in the standard textbook and as understood by policy makers around the globe. Unlike the textbook case, however, gradual closure of the output gap shifted more of the energy of monetary stimulation onto prices. Any rise in domestic tradables costs and prices due to expenditure switching diminishes the benefits of nominal dollar depreciation by reducing the extent of real depreciation. If the dollar-yuan rate had also been flexible, the tightening of resource constraints would have come faster and would have been more apparent. That would have put greater pressure on prices and might have been enough to alert the authorities to the dangers of overheating.

By fixing its currency to the dollar, China eliminated the payments adjustment mechanism that is typically associated with floating rates. The main consequence was that imports from China remained cheap in terms of dollars and those imports contained huge quantities of consumer goods in wide use among U.S. households. Having incapacitated the exchange rate channel as an avenue for external adjustment, the Chinese authorities then blocked the adjustment mechanism under fixed rate systems by sterilizing the contractionary effects of the money supply reduction brought about by the exchange market intervention.

The ready availability of imported consumer products spelled trouble for U.S. tradables producers whose freedom to raise prices was limited. With the stimulus of an easy-money policy, U.S. demand continued to rise, the output gap shrank and U.S. GDP moved beyond what was then believed to be full employment (natural rate) output without significant pressures in popular price indexes. At these high levels of economic activity, the rising demand for non-tradables could not be met without drawing labor and other

productive resources away from tradables. Pressures on wages and factor prices generally would be expected to rise throughout the economy in such circumstances. These cost increases represent additional threats to U.S. international competitiveness. Manufacturing and other U.S. tradables industries were shrinking and the current account was deteriorating.

The puzzle is why these developments failed to alarm U.S. policy makers? A possible answer may lie in the tendency among policy makers to interpret inflation in housing as pure asset inflation. A pure asset price bubble's principal direct effect is to raise wealth, some of which will eventually affect demand for goods and services. During the housing boom, however, the demand for new housing and new commercial property was in the first instance a demand for durable goods that needed to be produced and producing them requires inputs of labor, capital and other productive resources. In a high-employment economy such a sustained surge in demand is bound to be inflationary. This rise in non-tradables prices, together with a strong dollar, a shrinking U.S. tradables sector and a growing current account deficit should have provoked a better policy response than it did.

5. CONCLUDING REMARKS

The argument made in this paper is summarized in the preceding section. It seeks to understand macroeconomic developments in the U.S. economy since the early nineties. The mixed exchange rate regime makes a key contribution to the ultimate outcome, but other factors also play a role. China's exchange market intervention prevents the U.S. from enjoying a key benefit of floating rates, namely, timely adjustment of payments imbalances. Having fixed the rate, China again prevents normal adjustment patters from taking place by recycling intervention dollars back into the U.S. and thus effectively sterilizing the contractionary effects of the pegging operation. The large size of the Chinese economy and its ability to supply a wide range of products at stable prices is an important source of moderation in world

tradables prices.

Distinction between tradables and non-tradables sectors helps in understanding these developments. Variations in the relative price of tradables to non-tradables play a key role in shifting labor, capital and other productive resources between the two sectors. As the U.S. expansion matures, relative inflation in non-tradables allows production in that sector to expand at the expense of tradables. It is a key source of the dollar's continued strength and of the large U.S. current account deficit.

Housing is a major component of the non-tradables sector, not so much in the materials that go into dwellings and other structures, but in terms of labor and other factors of production needed to produce them. Rapid inflation in housing prices and construction costs during the real estate bubble had major effects on the movement of relative prices in the U.S. economy and thus on the sectoral allocation of productive resources. Hence, it is inappropriate to view this type of inflation as inconsequential for the real economy.

REFERENCES

Arndt, S. W., "Adjustment in an Open Economy with Two Exchange-Rate Regimes," *Journal of Economic Asymmetries*, 8(2), December 2011, pp. 11-22.

_____, "Stabilization Policy in an Economy with Two Exchange Rate Regimes," *Global Economy Journal*, 12(2), June 2012.

Fischer, S., "Exchange Rate Regimes: Is the Bipolar View Correct?," *Journal of Economic Perspectives*, 15(2), Spring 2001, pp. 3-24.

IMF, "De Facto Classification of Exchange Rate Regimes and Monetary Policy Frameworks," April 2008.