

**Remarks at the Panel  
“Toward a Rules-Based International Monetary System”**

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It is a pleasure to be on this panel on moving toward a more rules-based international monetary system. Over the past few years I have been making the case for such a system.<sup>2</sup> In fact I made the case over 30 years ago in Taylor (1985), and the ideas go back over 30 years before that to Milton Friedman (1953). However, the case for such a system is now much stronger because the monetary system drifted away from a rules-based approach in the past dozen years and, as Paul Volcker (2014) reminds us, the absence of a rules-based monetary system “has not been a great success.”

To bring recent experience to bear on the case, we must recognize that central banks have been using two separate monetary policy instruments in recent years: the policy interest rate and the size of the balance sheet, in which reserve balances play a key role. Both policy instruments have deviated from rules-based policy.

Regarding policy interest rates, there has been an international contagion of deviations from monetary policy rules that have worked well in the past, as I argued in Taylor (2007,

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<sup>2</sup> Taylor (2013, 2014, 2015, 2016a, 2016b, 2017)

2013).<sup>3</sup> This international contagion is due in part to a concern about exchange rates. If a foreign central bank with global financial influence cuts its interest rate by a large amount, then the currencies of other countries will tend to appreciate unless the other central banks react and adjust their interest rates. Central bank reactions may also include exchange market interventions, capital flow restrictions, or some form of macro-prudential actions aimed at international capital flows. These actions and reactions accentuate the deviation of monetary policy from traditional policy rules. To be sure, the international contagion of policy interest rates may be due to omitted factors which push interest rates around for many central banks. However, there is considerable econometric evidence that the deviations from policy rules are caused by unusual interest rate changes in other countries. There is also direct evidence from many central bankers who admit to these reactions. Norges Bank reports on monetary policy, for example, show that its policy interest rate is adjusted in parallel with interest rate decisions at the ECB.

Regarding central bank balance sheet operations, there has also been international contagion, and this is also likely due to exchange rate concerns, as shown in Taylor (2017). Here an important distinction must be made between the central banks in large open economies and central banks in small open economies. In large open economies, the effects of balance sheet operations on exchange rates have been harder to detect than for central banks in small open economies. There is now evidence, however, of statistically significant impacts on exchange rates of the balance sheet operations by the Federal Reserve, the Bank of Japan, and the European Central Bank. There are also exchange rate effects in the small open economies where explicit foreign exchange purchases are often financed by an expansion of reserve balances.

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<sup>3</sup> See also Carstens (2015), Gray (2013), Hoffman and Bogdanova (2012).

## **A Framework and a Policy Matrix**

To investigate the international aspects of central bank interest rate and balance sheet policies, it is necessary to introduce a simple framework which captures key features of the recent economic policy environment. In the framework I use here, central banks have two separate policy instruments—the short-term interest rate and reserve balances. By paying interest (either positive or negative) on reserve balances, central banks can separately set the interest rate and reserve balances. This enables the central bank to intervene into other markets for a variety of reasons. In fact, in recent years, central banks in large open economies have purchased domestic securities denominated in their own currency through their quantitative easing (QE) programs. The stated aim has often been to raise the price and reduce the yield of these domestic securities, though there are sometimes references to exchange rates. In contrast, the central banks in smaller countries have purchased foreign securities denominated in foreign currency with the aim of affecting the exchange rate.

To operationalize this framework in Taylor (2017), I examined the balance sheet of three central banks in large open economies--the Federal Reserve, the European Central Bank (ECB), and the Bank of Japan—and a central bank in a relatively small open economy—the Swiss National Bank (SNB). Most of the purchases of assets by these banks are financed by increases in reserve balances. For the Fed, purchases of dollar-denominated bonds are financed by dollar reserve balances. For the Bank of Japan, purchases of yen-denominated securities are financed by yen-denominated reserve balances. For the ECB, purchases of euro-denominated securities are financed by euro-denominated reserve balances. For the SNB, purchases of euro and dollar denominated securities are financed by Swiss franc denominated reserve balances. In addition, each of these central banks sets its short-term policy interest rate, which in the case of the Fed is

the federal funds rate. The private sector holds securities and deposits funds (reserve balances) at the central bank. Prices and yields are determined by market forces. The exchange rates between the dollar, the yen, the euro, and Swiss franc are determined in the markets just as is the price of other securities.

The framework thus includes eight different policy instruments for the four central banks: the balance sheet items (R for reserve balances)  $R_U$ ,  $R_J$ ,  $R_E$ , and  $R_S$ , and the short-term policy rates (I for interest rate)  $I_U$ ,  $I_J$ ,  $I_E$ , and  $I_S$ , where the subscripts indicate the United States (U), Japan (J), Europe (E) and Switzerland (S).

The policy matrix shown below summarizes the cross correlations and the time series patterns of the eight policy instruments in the four countries in the past dozen years from 2005 to 2017. The numerical entries below the diagonal are the simple correlations; the small charts above the diagonal show the time series patterns for each pair of variables. The charts are color coded with a dual scale, which can be more easily read by “zooming in” on the pdf document.

Observe the strong positive correlation between the reserve balances in each country. This could indicate either a contagion of such policies or that they have been reacting to a common shock.

Observe also the strong positive correlation between the interest rate instrument in each country, which is consistent with the recent literature on interest rate contagion. The most highly correlated of all the entries in the policy matrix is between the SNB policy rate and the ECB policy rate.

**International Monetary Policy Matrix.** The policy instruments for the central banks (United States (U), Japan (J), Europe (E), Switzerland (S)) are reserve balances  $R_U, R_J, R_E, R_S$ , and the policy interest rates  $I_U, I_J, I_E, I_S$ .

	$R_U$	$R_J$	$R_E$	$R_S$	$I_U$	$I_J$	$I_E$	$I_S$
$R_U$								
$R_J$	0.72							
$R_E$	0.49	0.64						
$R_S$	0.89	0.85	0.69					
$I_U$	-0.77	-0.36	-0.44	-0.58				
$I_J$	-0.53	-0.45	-0.37	-0.48	0.49			
$I_E$	-0.81	-0.57	-0.51	-0.71	0.76	0.87		
$I_S$	-0.81	-0.62	-0.57	-0.72	0.83	0.81	0.93	

The policy matrix also reveals a strong negative correlation between the two policy instruments *within* each central bank: When the interest rate is lower, reserve balances are higher. This is likely due to the assumption that the impact of the two instruments is similar: a lower policy rate and an expanded balance sheet with higher reserve balances are assumed to increase aggregate demand, raise the inflation rate, and depreciate the currency.

Note also the negative correlation between reserve balances and the interest rates *across* countries. These are simple correlation coefficients, so the negative effect could be due to a negative correlation within each country coupled with a positive contagion effect of either the interest rate or reserve balances in each country.

More detailed information on the connection between reserve balances in different countries is presented in the small charts above the diagonal of the policy matrix. One group of charts shows the path of reserve balances for the Fed, the BOJ, the ECB, and the SNB. Here one can see the underlying reasons for the numerical correlation and as well as some temporal causality. During this period, the Fed was out in front with large-scale asset purchases of U.S. Treasuries and mortgage-backed securities in 2009 following the short-lived liquidity operations during the panic in 2008. These large-scale purchases, commonly called Quantitative Easing (QE) I, II and III, were financed with the large increases in reserve balances. For the past few years, reserve balances have started to decline in the United States as securities purchases were reduced in size and then were ended. Currency demand has grown, also reducing the need for financing the stock of securities with reserve balances.

As the charts in the policy matrix show, this expansion of reserves balances in the United States was followed by a similar move by the Bank of Japan at the start of 2013. Soon thereafter the ECB started increasing reserve balances. Note how the increase in reserve balances began in

the US, then in Japan, and then in the euro zone. In the end, the increase in global liquidity was much larger than if there had not been this contagion.

The charts above the diagonal also show the timing of the interest rate decisions with the central banks apparently following each other. In earlier work on policy interest rate contagion (Taylor (2007)), I documented this contagion using interest rate reaction functions. With such functions, one can measure the reaction of central banks to other countries' interest rates by including the foreign central bank's interest rate in the reaction function. This is more difficult in the case where the balance sheet is the instrument.

### ***Exchange Rate Effects***

While the policy matrix shows a close association between the policies, there is a question about whether central banks were jointly trying to provide liquidity or whether the actions were part of a competitive devaluation process. In results reported in Taylor (2017) I found statistically significant exchange rate effects in estimated regressions of exchange rates on reserve balances. To summarize, the regression equations showed that: (1) an increase in reserve balances  $R_J$  by the Bank of Japan causes the yen to depreciate against the dollar and the euro, (2) an increase in reserve balances  $R_U$  by the Fed causes the dollar to depreciate against the yen and the euro, and (3) an increase in reserve balances  $R_E$  by the ECB causes the euro to depreciate against the yen and the dollar.

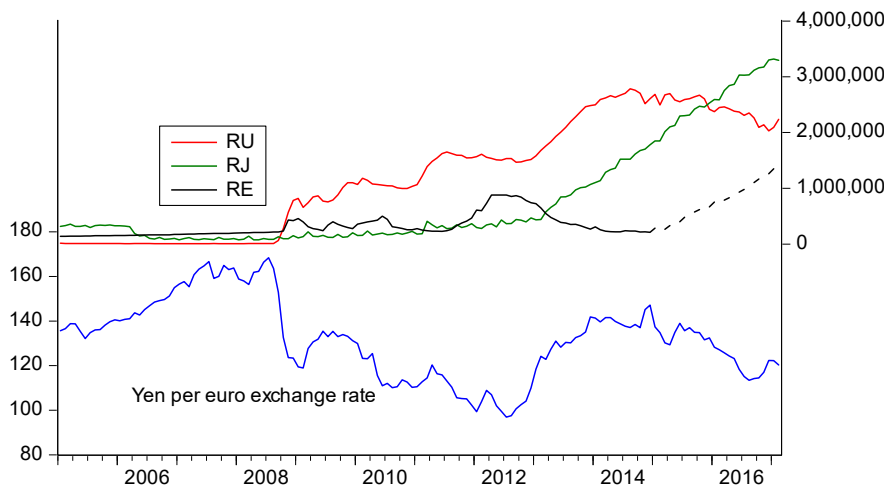
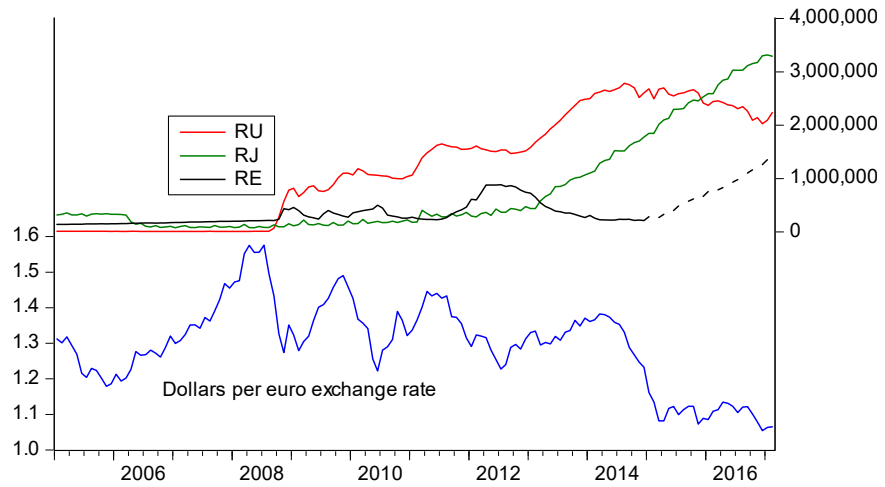
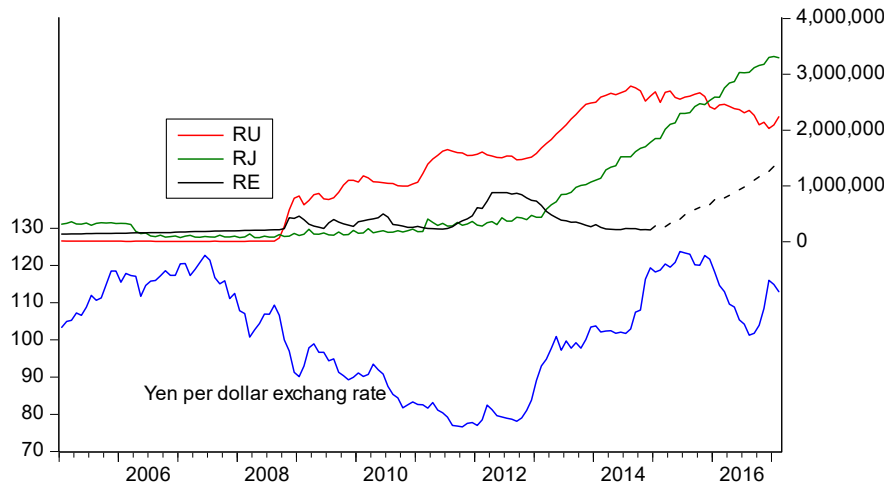
These results confirm the policy narrative presented in Taylor (2016): Following the financial crisis and the start of the US recovery, the yen significantly appreciated against the dollar as the Fed extended its large-scale asset purchase program financed with increases in reserve balances. At first there was little or no response from the Bank of Japan, but the yen

appreciation in Japan became a key issue in the 2012 Japanese election, and when Shinzo Abe was elected he appointed Haruhiko Kuroda under whom the Bank of Japan implemented its own quantitative easing. A depreciation of the yen accompanied the change in monetary policy. The subsequent moves by the ECB toward quantitative easing were also due to concerns about an appreciating euro. At the Jackson Hole conference in August 2014, Mario Draghi spoke about these concerns and suggested quantitative easing, which soon followed. This shift in policy was followed by a weaker euro.

These estimated statistical effects can be illustrated in the three panels in the chart below. The top part of each panel shows the time series patterns of reserve balances for the three large central banks. This combines the bilateral times series charts in the international policy matrix. The lower portion of each of the three panels shows a different exchange rate pair. The first panel, shows the dollar getting weaker against the yen following the increase in reserve balances in the US, until the BOJ increased its own reserve balances and the dollar then strengthened against the yen. One can see the weakening of the euro against the dollar and the yen after the action by the ECB.



## Reserve Balances ( $R_U$ , $R_J$ , $R_E$ ) and Exchange Rates (2005-2017)



Exchange rate effects can also be documented for small open economies such as Switzerland where reserve balances are used to finance direct interventions in foreign exchange markets. Vector auto-regressions show that there is two-way causality between the Swiss exchange rate and reserve balances: The hypothesis that  $R_s$  does not Granger-cause the Swiss franc-euro exchange rate is rejected with an F-statistic of 4.74; the hypothesis that the Swiss-franc-euro rate does not Granger-cause  $R_s$  is rejected with an F-statistic of 4.04. In other words, changes in the exchange rate Granger-cause an expansion of reserve balances, and the expansion of reserve balances Granger-cause a change in the exchange rate. In addition, I have found that a similar pattern of causality exists when the policy instrument is the interest rate rather than the balance sheet.

### ***Policy Implications***

For both policy instruments, the empirical results show that exchange rate considerations have helped cause deviations from rules-based policy in the international monetary system. To the extent that the deviations take policy away from the better performance observed in the 1980s and 1990s, they are a source of instability to the global economy. Moreover, there appears to be a “competitive devaluation” aspect to these actions as argued by Meltzer (2016). To the extent that the policies result in excess movements in exchange rates, they are another source of instability in the global economy as they affect the flow of goods and capital and interfere with their efficient allocation. They also are a source of political instability as they raise concerns about currency manipulation. Moreover, as countries have used balance sheet operations to affect currency values, actual balance sheets have grown throughout the world, and this has raised concerns about the global impact of unwinding them.

A counterfactual exercise using the estimated regressions mentioned above shows that exchange rates would have been significantly less volatile without the balance sheet operations. For the yen/dollar equation, the standard error of the regression is 7.27 and the standard deviation of the dependent variable is 14.11 indicating that the movements in reserve balances have nearly doubled the volatility of the exchange rate. Using the yen/euro equation and euro/dollar equations in the same way shows that movements in reserve balances have increased the volatility of the yen-dollar exchange rate by 60 percent and the euro-dollar exchange rate by 40 percent.

There is other evidence that exchange rate volatility and capital flow volatility has increased in recent years. According to Rey (2013), Carstens (2015), Coeure (2017), Taylor (2016) and Ghosh, Ostry, and Qureshi (2017), exchange rate volatility and/or capital flow volatility has increased recently. Rey (2013) found that a global financial cycle, which was driven in part by monetary policy, affected credit flows in the international financial system. Carstens (2015) documented a marked increase in the volatility of capital flows to emerging markets in recent years. To be sure, there are other explanations for this increased volatility. Ghosh, Ostry, and Qureshi (2017) argue that the volatility has increased because of international externalities and market imperfections. Nevertheless, the evidence provided here and in other recent studies suggests that a deviation from rules-based monetary policy has been part of the problem.

The main policy implication is that the international economy would be more stable if policy makers could create a more rules-based international monetary system. The approach that I favor would be for each central bank to describe and commit to a monetary policy rule or strategy for setting the policy instruments. These rules-based commitments would reduce

exchange rate volatility and uncertainty, and remove some of the reasons why central banks have followed each other in recent years. The strategy could include a specific inflation target, an estimate of the equilibrium interest rate, and a list of key variables to react to in certain specified ways. The process would not impinge on other countries' monetary strategies. It would be a flexible exchange rate system between countries and between currency zones.

Each central bank would formulate and describe its strategy, so there would be no reduction in either national or international independence of central banks. The strategies could be changed or deviated from if the world changed or if there was an emergency, so a commonly understood procedure for describing the change and the reasons for it would be useful. It is possible that some central banks will include foreign interest rates in the list of variables they react to so long as it is transparently described. But when they see other central banks not doing so, they will likely do less of it, recognizing the amplification effects.

The process would be global, rather than for a small group of countries, though, as with the process that led to the Bretton Woods system, it could begin informally with a small group and then spread out. The international rules-based approach I suggest here is supported by research over many years, for example, in Taylor (1985). It is attractive because each country can choose its own independent strategy and simultaneously contribute to global stability.

The major central banks now have explicit inflation goals, and many use policy rules that can describe strategies for the policy instruments. Explicit statements about policy goals and strategies to achieve these goals are thus feasible. There is wide agreement that some form of international reform is needed. In any case, a clear commitment by the Federal Reserve to move in this rules-based direction would help. A prerequisite would be for the international monetary system to normalize. Getting back to balance sheets with reserve levels such that policy interest

rates are determined by the supply and demand for reserves—rather than by paying interest on excess reserves—will facilitate a rules-based international system because the balance sheet decisions and interest rate decisions would be linked.

The biggest hurdle to achieving such a rules-based system is a disparity of views about the problem and the solution. Some are not convinced of the importance of rules-based monetary policy. Others may doubt that it would deal with the problems of volatile exchange rates and capital flows. Still others believe that the competitive depreciations of recent years are simply part of a necessary process of world monetary policy easing.

Such a disparity of views has existed for generations of economists and central bankers. Indeed, the current discussion of reforms in the international monetary system reminds one of the debate about exchange rates and capital flows that occurred when “Friedman (1953) famously challenged the generality and accuracy of the indictment of capital flows in Nurkse (1944)” as described by Eichengreen (2004). But the experience over these years—the improvements in economic models, the enormous volume of research on policy rules, and, especially, the poorer performance in the past dozen years as policy has deviated from a rules-based system—suggests that the answer is a more open, transparent, and rules-based international monetary system in the future.

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