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Why Was the Plaza Accord Unique?

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Abstract

This chapter explores what made the Plaza such a unique combination of strong cooperation and effective intervention relative to the rest of the post-Bretton Woods period. We demonstrate that in the first quarter of 1985 the US dollar was more overvalued in real terms, relative to exchange rates implied by real interest differentials, for all G-7 economies except Canada, than at any other time between 1973 and 2005. Further, we use Taylor rules to create a benchmark for consistency of intervention with monetary policy. We show that foreign exchange intervention in 1985 was consistent with the direction of monetary policy prescribed by the deviation of policy rates from the implied Taylor rule rates for the U.S., but only weakly so for Germany and Japan. This reinforces the view that the impact of the Plaza on exchange rates derived primarily from the major policy shift in the U.S.

1 Introduction

The attention given to the 30th anniversary of the Plaza Accord reached on September 22, 1985 between the U.S., Japan, Germany, France and the U.K. is testament to the fact that it was a watershed moment in exchange rate policy. It initiated a new paradigm of cooperation among the major economies outside of a crisis period. The experience of the Plaza Accord led to more ambitious, though arguably less successful, efforts like the Louvre Accord (Baker 2006; Mulford 2014). It also appears to be the most effective example of coordinated exchange rate policy in the post-Bretton Woods period, with the dollar appreciating far more against the yen and mark than anticipated.[1]

What made the Plaza so unique, combining both strong cooperation between major countries and effectiveness at impacting exchange rates? The uniqueness of the Plaza relates at least partly to the infrequency of simultaneous motivation by the major economies to engage in potentially costly intervention. Several explanations could play a role in dissuading countries from attempting intervention. This chapter explores two potential explanations for why the Plaza has not been repeated.

First, the year 1985 was an outlier in post-Bretton Woods experience in the degree of currency misalignment present. We use a measure of real overvaluation relative to real interest differentials and demonstrate that the US dollar was more overvalued in the first quarter of 1985 than at any other time, against all other G-7 currencies except the Canadian dollar. The potential disruption from such large overvaluation may have provided an overwhelming motivation for intervention.

The size of overvaluation also may have amplified the effectiveness of intervention via a "coordination channel". By pointing out that the market had deviated from fundamentals, sterilized intervention coordinates the beliefs of traders that the market needs to correct towards fundamental-determined values.[2] After the Plaza intervention, when the

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[1] Agreement on the effectiveness of the Plaza is not universal. See Feldstein (1986) and Bordo, Humpage, and Schwartz (2010).

[2] Note the "coordination channel" does not necessarily imply coordinated intervention by multiple monetary authorities. The coordination in this case involves coordinating the beliefs among traders about fundamental-based exchange rate values. Evidence has been provided for the coordination channel operating in the dollar-mark market (Reitz and Taylor 2008) and dollar-yen market (Reitz and Taylor 2012).

market finally began to realign with fundamentals, it had a large correction to make. The size of the correction made the Plaza anomalously effective.

The second explanation we investigate for why the Plaza has not been repeated is whether intervention was uniquely consistent with the direction of monetary policy implied by domestic economic conditions for the three key countries, the U.S., Germany and Japan in 1985. Since at least the Jurgensen report, it has been recognized that sterilized exchange rate intervention is only likely to be effective when consistent with the direction of monetary policy (see for instance Jurgensen 1983; Sarno and Taylor 2001; Menkhoff 2010). The need for policy consistency relates to the need for credibility with markets for intervention to work through signaling or coordination channels. Signaling involves sterilized intervention indicating the direction of monetary policy to markets. For the coordination channel discussed above, the direction of monetary policy is one critical fundamental.

In 1985 inflation had stabilized in all three countries, below four percent in the US and at two percent in Japan and Germany. However, their growth rates were moving in opposite directions. According to real-time data available to policymakers, the US in 1985 was experiencing slower economic growth, while it was trending upwards in Germany and Japan in the first half of 1985. The Plaza intervention may have gained effectiveness because it was consistent with looser monetary policy in the US and tightening in Germany and Japan. If intervention credibly signaled future monetary policy consistent with the intervention, any coordination effect would have been amplified because the fundamentals themselves would be moving in favor of a weaker dollar.

There are other explanations for the Plaza's uniqueness. For instance, the strong depreciation of the dollar may have been assisted by expectations of shifts in fiscal policy. The Gramm-Rudman-Hollings Balanced Budget Act was introduced and passed the House on August 1, 1985, passed the Senate on October 1, 1985, and became law in December 1985.

Contributing to the uniqueness of the Plaza is the fact that coordinated intervention in general has been relatively rare. Major shifts in exchange rate policy of the magnitude announced at the Plaza have been even rarer. Ideology contributes this rarity, as key players in office during other times, like Treasury Secretaries Donald Regan and Robert Rubin, preferred to trust the market to determine the exchange rate, rather than attempt to influence market outcomes.

Experience matters, as empirical evidence of the effectiveness of sterilized intervention is not strong. Whether measured using instrumental variables, event study methods, or high-frequency data, the empirical literature for over thirty years has found that sterilized intervention by major economies has no impact on exchange rates beyond a period of a few weeks.[3] Monetary authorities may believe intervention is effective (Neely 2001; 2008), but they likely subscribed to Truman's (2003) view that short-term impacts are the best that can be achieved.

Economic theory may have discouraged efforts to coordinate intervention. New Keynesian open economy models typically suggest optimal monetary policy can ignore the exchange rate and focus exclusively on domestic inflation using a Taylor rule. Since the turn of this century, dynamic stochastic general equilibrium models have been developed that include nominal rigidities, monopolistic competition and producer-currency pricing (Obstfeld and Rogoff 2002; Benigno and Benigno 2006; Clarida 2014). These models demonstrate that domestic inflation-targeting regimes constitute optimal monetary policy or come trivially close. In other words, the exchange rate need not enter the objective function of the central bank. Exchange rate intervention—or, equivalently, altering domestic interest rates to achieve an exchange rate target—is not necessary for optimal monetary policy. Allowing coordination of policies does not alter this theoretical result. A floating exchange rate with the central bank remaining focused on domestic targets remains optimal, so coordinated exchange rate intervention cannot improve welfare.[4]

In exploring our first potential explanation for the uniqueness of the Plaza accord, we define overvaluation as the residual between the actual and predicted real exchange rate from a simple short-term real interest rate differential model. We calculate dollar overvaluation against the mark, lira, franc, euro, yen, pound and Canadian dollar for the entire post-Bretton Woods period. The period just before the Plaza demonstrates the

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[3] For surveys of the literature on intervention effectiveness at various points in time, see Jurgensen (1983), Edison (1993), Taylor and Sarno (2001), and Menkhoff (2010).

[4] Importantly, a model developed by Engel (2011) suggests the real exchange rate should be targeted by monetary policy. His model is similar to others reviewed by Clarida (2014) except that it makes the more realistic assumption of local-currency pricing. This assumption allows something akin to differential pricing, creating welfare losses that are better minimized by including a real exchange rate term in the Taylor rule. While domestic interest rates provide sufficient tools to hit the target, the model opens the door to exchange rate intervention consistent with the optimal monetary policy target when large deviations of the real exchange rate occur.

greatest historical overvaluation of the dollar against every European currency. Against the yen the dollar overvaluation peaked in the 3rd quarter of 1982, but remained high and nearly matched the peak in the 1st quarter of 1985. The Canadian dollar, in contrast, was only mildly undervalued in 1985.

For examining the second potential explanation, we propose that the deviation of policy rates from the Taylor rule-implied rate indicates policy space for credible, consistent sterilized intervention. For instance, if the policy rate is above the Taylor rule-implied rate, markets would be likely to believe a central bank signal that it wants to loosen monetary policy. Intervention to depreciate the domestic currency would be consistent with movement towards the Taylor rule-implied rate, and hence more likely to be credible.

Clarida, Gali, and Gertler (1998) indicate that Taylor rules do a reasonable job of describing monetary policy for most G-7 countries at least since the 1980s, and studies like Orphanides (2003) have established the importance of using real-time data when evaluating historical policy scenarios. Further, survey data shows that Taylor rules provide close approximations to professional forecasts of policy interest rates across the G-7 countries since at least the Greenspan era (Mitchell and Pearce 2010; Fendel, Frenkel, and Rülke 2011; Pierdzioch, Rülke, and Stadtmann 2012). Engel, Mark, and West (2008) Molodtsova and Papell (2009) show that Taylor rule models provide more evidence of out-of-sample exchange rate predictability than monetary, interest rate, or purchasing power parity models.

Consistent with the theory that foreign exchange market participants pay attention to Taylor rule deviations, Wilde (2012) finds that real exchange rates correlate with bilateral Taylor rule deviations (deviations of the interest differential from the Taylor rule-implied differential) in the expected direction in both the dollar-mark and dollar-yen markets. One interpretation of Wilde's (2012) evidence, however, is that markets will respond to Taylor rule deviations regardless of whether intervention occurs. On the other hand, Ito and Mishkin (2006) caution against using Taylor rules for Japan because of the sensitivity of results to the estimation period and measure of the output gap.

While there are many ways to specify policy rules, we focus on the original Taylor (1993) rule where the federal fund rate equals 1.0 plus 1.5 times inflation plus 0.5 times the output gap, assuming that the target inflation rate and the equilibrium real interest rate both equal 2.0 percent. We use real-time data available to policymakers when interest rate decisions were made: real-time GDP (or GNP) and GDP (or GNP) deflator data. We compute Taylor rule deviations as the difference between the federal funds rate and the interest rate implied by the Taylor rule for the US, Germany and Japan.

By our metric foreign exchange intervention to depreciate the dollar in the 3rd quarter of 1985 was consistent with monetary policy for the U.S. Intervention by Germany and Japan was not consistent. However, it was consistent with the Taylor rule-implied interest rate differentials between the U.S. and both Germany and Japan. We consider this weak consistency for Japan and Germany. The overall pattern of consistency suggests, to the extent consistency with monetary policy mattered, the effectiveness of the Plaza derives from the fact that markets were focused on the U.S.

In the first section of the chapter we focus on the real overvaluation explanation, laying out the empirical approach, describing the data, and presenting the results. The second section does the same for the monetary policy consistency explanation. The final section discusses the results to interpret the historical record and consider the modern context.

2 Real Exchange Rate Overvaluation

Nominal exchange rates receive the bulk of attention from policy-makers, primarily due to their high frequency availability. Nominal exchange rates matter for inflation because of the impact on imported goods. These considerations should play into policymakers' inflation-targeting rules, according to most variations on the models mentioned above. In practice, the impact of nominal exchange rates on inflation rises to the fore. Truman (2014) documents that concern outside the US about the impact of dollar appreciation on domestic inflation was one impetus for commissioning the Jurgensen Report of 1983 on the effectiveness of foreign exchange intervention. Germany in particular was concerned about the inflationary impact of mark depreciation against the dollar in the pre-Plaza period (Funabashi 1989). For these reasons, most evaluations of exchange rate misalignment during the Plaza period have examined nominal values.[5]

However, to understand incentives to intervene, real exchange rates are the preferred unit of observation. Real exchange rates matter for trade balances, and hence for the bulk of

[5] For instance, Feldstein (1994) casually assess the dollar to be overvalued relative to interest rate differentials in nominal terms by the end of 1984.

political pressure related to exchange rates. There are many metrics for overvaluation of real exchange rates, the development of which remains an active area of research. For instance, as part of its exchange rate surveillance the IMF uses the residual of a panel regression of real effective exchange rates on a substantial battery of explanatory variables, including real short-term interest rate differentials (Phillips et al. 2013).

This chapter is concerned with monetary policy, so it develops a benchmark for overvaluation relying exclusively on the short-term real interest rate differential. Central banks primarily target short-term nominal interest rates and inflation, which yield the real interest rate. Real interest parity theoretically indicates that real exchange rate movements can be entirely explained by the expected short-term real interest rate differential. Unlike uncovered interest parity in nominal terms, real interest parity has more—if not conclusive—evidence of validity (Edison and Melick 1999; MacDonald and Nagayasu 2000; Mark and Moh 2005; Hoffmann and MacDonald 2009; Byrne and Nagayasu 2010), although it is generally only found to hold at long-run (business cycle) frequencies.

From a theoretical perspective, real interest parity derives from combining the uncovered interest parity condition $E_t \Delta s_{t+1} = i_t - i_t^*$ with the Fisher equation $r_t = i_t - E_t \pi_{t+1}$ to get

$$E_t \Delta q_{t+1} = r_t - r_t^* \, , \qquad (1)$$

where s_t is the log of the nominal exchange rate at time t (foreign currency/US dollar), i_t is the nominal short-term interest rate, r_t is the real interest rate, π_t is the inflation rate, q_t is log of the real exchange rate, defined as $q_t \equiv s_t + p_t - p_t^*$. The operator $E_t(\cdot_{t+j})$ indicates expectations at time t of the value of $(\cdot)$ for time $t + j$, Δ is the first difference operator and the * notation indicates a foreign variable.

Equation 1 requires specification of the future value of the real exchange rate, so we make what Edison and Melick (1999) describe as the "standard" assumption that relative purchasing power parity (PPP) holds. That is, the expected real exchange rate is constant. Hence, the relationship we estimate is

$$q_t = \alpha + \beta(r_t - r_t^*) \, . \qquad (2)$$

This specification, which we will use to explain short-run movement of the real exchange rate, admittedly plays a little loose by using a long-run PPP relationship. For purposes of the present exercise to identify overvaluation, however, this assumption is unlikely to materially change the results.[6] We assume from Engel (2015) that the real exchange rate is stationary, so we estimate the equations using OLS.

We examine misalignment of the dollar against the mark, lira, franc, euro, yen, pound and Canadian dollar using quarterly data from 1973:Q2 until 2015:Q2. The nominal exchange rates from the Pacific Exchange Rate Service are the average of the daily rates in the last month of the quarter.[7]

Consumer price indices and short-term interest rates come from the OECD database, using the last month of the quarter. The data for Italy begin only at 1978:Q4. Because of missing short-term interest rate data, for Japan and the UK interest differentials (including the counterpart US rate) we use T-bill data from the International Financial Statistics database (FITB). The real interest rate is constructed as the nominal interest rate for the quarter minus the percentage change of the CPI on the same quarter one year earlier.[8]

We begin with nominal exchange rates since they frame the public perception of currency values. Panel (a) in Figures 1 through 6 depict the nominal exchange rate for the other G-6 currencies against the dollar. For all of the European currencies, March 1985 is a very clear peak of dollar strength, with no comparable episodes within ten years before or after.[9] Of course, the franc, mark and lira were joined in the Exchange Rate Mechanism (ERM) at the time, and so did not float independently. For Japan, the dollar had been strong for some time. It had reached comparable values in the late 1970s, 1980 and 1982. However, the dollar never saw comparable strength against the yen after February 1985. Even Canada, which was not part of the Plaza narrative, faced a historically strong dollar that year, although the Canadian dollar would remain weak for another year before declining in March 1986.

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[6] Many more sophisticated approaches to estimating this equation have been performed. See for example Campbell and Clarida (1987) Edison and Pauls (1993) Mark and Moh (2005) Hoffmann and MacDonald (2009) Engel (2015).

[7] Prior to the euro adoption these are historical series, and following the euro adoption these are pseudo rates imputed by applying the euro locking rate to the current euro exchange rate.

[8] While not a sophisticated proxy for $E_t\pi_{t+1}$, use of π_t is not uncommon. See, for instance, Edison and Pauls (1993) and Edison and Melick (1999).

[9] There may be some discrepancy between the peaks for monthly average data and daily data. For instance, Germany's daily peak occurred on February 25.

Adjusting for prices makes 1985 stand out more prominently. Panel (b) in Figures 1 through 6 present the log of the real exchange rates. For the European countries, even extending the euro countries forward in a composite series for France, Germany and Italy, March 1985 is an absolute maximum in the post-Bretton Woods era. For Japan, February 1985 becomes an absolute maximum, although the real yen had been pointedly weak since 1982. In real terms, 1995:Q2 also stands out as an extremely strong yen, almost on the magnitude of the yen weakness ten years earlier.

Panel (b) also includes the predicted exchange rates from the real interest differential models. The predicted values derive from the results of the regressions of equation (2) presented in Table 1. The coefficients for the real interest differential have the proper sign at high levels of significance, indicating higher relative interest rates strengthens a country's exchange rate. The coefficients are consistent with the coefficients found by Engel (2015) using a vector error correction model and forecasted future inflation rates. The explanatory power of our model is low, however, with the possible exception of Germany. This is apparent in Figures 1 through 6, as the real exchange rates display much greater volatility than real interest differentials would predict.

The wide difference in volatility means that our key indicator, the regression residuals, or the deviation of the real exchange rate from the rate predicted by real interest differentials, broadly reflect the same pattern as the real interest rate. Panel (c) in Figures 1 through 6 presents this measure. Once again, March 1985 stands out as the largest case of dollar overvaluation relative to the European countries in the post-Bretton Woods period. In the case of the three Eurozone countries, however, the euro weakness in 2000-2001 presents another period of similar dollar strength, with a peak in Q2 2000 of comparable magnitude to that seen in the days before the Plaza. For the UK, the 2000-2001 period of dollar strength is visible, but not especially pronounced.

Outside of Europe, the deviations continue to show that 1985 was an outlier, though perhaps not as unique as for the Europeans. The dollar had experienced episodes of strength against the yen for a decade, with February 1985 representing only a local maximum within an episode that had begun in 1982. Further, the dollar weakness ten years later in 1995:Q2 emerges as the largest single episode of dollar-yen misalignment. In Canada, the deviations draw out the strength of the dollar in the pre-Plaza period, with a local maximum in Q1 1985 and a decline beginning in Q4 1985. While the maximum is not an all-time high for the dollar against the Canadian dollar—and again, Canada is not conventionally part of the Plaza-Louvre narrative—it was the highest point at the time in the post-Bretton Woods period.

Unmentioned thus far is the obvious fact that the Plaza meeting took place six to seven months after the peak of dollar overvaluation. The beginning of the decline coincided with Secretary Baker taking office in the Treasury in early February and Frankel (1994) dates the policy switch to that time. Nevertheless, it seems unlikely markets would have anticipated the Plaza. Surprise was central to the planning of the Plaza (Mulford 2014). Rather, it remains an open question whether the entire post-Plaza decline of the dollar resulted from the Plaza, whether it only accelerated the decline for a brief period, or something in between.

3 Consistency of Intervention with Monetary Policy

We now turn from the question of why the G-5 joined together to intervene in 1985 to the question of why that intervention appeared effective. For this exercise, we narrow our focus to the G-3, the U.S., Germany and Japan, in whose currencies the Plaza intervention was planned. The intention is to identify the signaling or coordination channel content of intervention, as perceived in real time by monetary authorities, central bankers and market participants. We focus on the question of whether intervention was consistent with the intentions of the central bank, a factor critical for the effectiveness of sterilized intervention.

The need for policy consistency relates to the need for credibility of sterilization, pointed out in King's (2003) survey on intervention effectiveness. For intervention to work through signaling or coordination channels, the message about future monetary policy or a broader set of fundamentals that influence exchange rate values must be credible. Consistency of intervention with monetary policy provides credibility.

Further, while they certainly have done so, central banks do not like intervening when it is inconsistent with their monetary policy objectives. Truman (2003) calls it "signal risk", that inconsistent intervention will damage central bank credibility on the inflation front. Truman and Bordo, Humpage, and Schwartz (2010) document how this concern led the Federal Reserve in 1990 to unilaterally stop the practice of joining the US Treasury

Department in US intervention. The desire to avoid signal risk presents another reason why monetary policy consistency provides a useful indicator of policy space for intervention.

For this purpose we need a measure of consistency with monetary policy available in real-time with at least quarterly frequency. A target policy rate predicted by a Taylor rule using real-time data meets this requirement. While the Taylor rule does not perfectly predict policy rates—central banks certainly had many more subtle factors influencing their decisions than the arguments of the Taylor rule—the Taylor rule's broad success at predicting policy rates makes it a reasonable proxy. In this section we shift the analysis back to nominal measures, as is standard for Taylor rule analysis.

Taylor (1993) originally proposed the following monetary policy rule:

$$i_t^* = \pi_t + \delta(\pi_t - \pi_t^*) + \gamma y_t + r^* \qquad 3$$

where i_t^* is the central bank's target level of the short-term nominal interest rate, π_t is the inflation rate, π_t^* is the central bank's target level of inflation, y_t is the output gap, the percent deviation of actual real GDP from an estimate of its potential level, and r^* is the equilibrium level of the real interest rate. Taylor postulated that the output and inflation gaps enter the central bank's reaction function with equal weights of 0.5 ($\delta = \gamma = 0.5$) and that the equilibrium level of the real interest rate and the inflation target were both equal to 2%, producing the following equation:

$$i_t^* = 1.0 + 1.5\pi_t + 0.5y_t \, . \qquad 4$$

We define deviations as the difference between the actual federal funds rate and the interest target implied by the Taylor rule with the above coefficients. A positive deviation of the observed federal funds rate from the Taylor rule rate can be interpreted as providing the central bank with "policy space" to raise the interest rate if it wanted to appreciate its currency. In this case, sterilized intervention to appreciate the currency (sales of foreign exchange reserves in exchange for domestic currency, combined with using the domestic currency for offsetting open market purchases of domestic assets) would be viewed as consistent with domestic monetary policy objectives.

We apply this specification of the Taylor rule to the G-3 economies. Taylor originally proposed the parameters with the Federal Reserve in mind, but Gerberding, Seitz, and Worms (2005) and Clausen and Meier (2005) use real-time data to establish its suitability for Germany as well. For Japan, Bernanke and Gertler (1999) and Ito and Mishkin (2006) support an inflation target of two. Kamada (2005) prefers a Taylor rule with an inflation target of zero, which effectively shifts the implied interest rate up by one percentage point relative to the standard parameterization. For the purposes of analyzing the Plaza period, the choice of inflation target makes no difference, as we will show that the deviation exceeds one in 1985.

The implied Taylor Rule interest rate is calculated from data on inflation and the output gap. We limit our analysis to data from 1980:Q1to 1989:Q4, the period surrounding the time of the Plaza-Louvre Accords. For the United States, we use the Real-Time Data Set for Macroeconomists, originated by Croushore and Stark (2001) and maintained by the Philadelphia Fed, which contains vintages of nominal and real GDP (GNP before December 1991) from 1965:Q4 with the data in each vintage extending back to 1947:1. For Japan, we use the international real time data set compiled by Fernandez, Koenig and Nikolsko- Rzhevskyy (2011) which contains vintages of nominal and real GNP with the data in each vintage extending back to 1968:Q1.[10] For Germany we use the real-time data set compiled by Gerberding, Worms and Seitz (2005) which includes real and nominal output, the Bundesbank's own estimates of potential output, and the GDP deflator.[11]

In order to construct the output gap, the percentage deviation of real GDP around potential GDP, for the US and Japan, the real GDP data needs to be detrended. We use real-time detrending, where the trend is calculated from 1947:Q1 through the vintage date for the US and from 1968:Q1 for Japan. The three leading methods of detrending are linear, quadratic, and Hodrick-Prescott (HP). For the U.S., Nikolsko-Rzhevskyy, Papell, and Prodan (2014a, b) and Nikolsko-Rzhevskyy and Papell (2012) find that quadratic detrended output gaps provide a closer approximation to a benchmark real-time output gaps calculated using Okun's Law and a better representation of the recovery from the Great Recession than the alternatives. On this basis they suggest that quadratic detrending should be the preferred method.

For Japan, we also compute the quadratic detrended output gaps from 1980:Q4 to 1989:Q4. During this period, the measure corresponds with all three of Japan's official

[10] Their data set was assembled from the original OECD Main Economic Indicators available from 1962 to 1998 which was merged with the current OECD real-time dataset, which starts in 1999.

[11] More details about this data set can be found in Molodtsova, Nikolsko-Rzhevskyy and Papell (2008).

business cycle turning points as determined by the Cabinet Office. Most importantly for this paper, it corresponds well to the peak of the Japanese business cycle in 1985:Q2, when we find a real-time output gap of 3.3 percent. Previous studies, using real time and revised data and an HP filter, find an output gap which falls between 0 and 1, for the same time period.[12] Such low output gap values at the peak of the cycle suggest that the quadratic detrending method is more accurate than the HP detrending method for Japan. For Germany, the output gap is simply the difference between real GDP and potential output, so no detrending is necessary. For all countries, we construct inflation rates as the year-over-year change in the GDP Deflator, the ratio of nominal to real GDP.

The actual federal funds rate and the original Taylor rule implied interest rates for the U.S., as well as the deviations from the original Taylor rule, from 1980 to 1989, are depicted in 1Figure 7. The picture illustrates the fact that the Taylor rule deviations were positive through the entire Plaza-Louvre period. Positive deviations at that time are consistent with other Taylor rule findings using revised (Clarida, Gali, and Gertler 1998) or real time data (Orphanides 2003). The positive deviations during the Volcker disinflation period preceding the Plaza accord were, as shown by Nikolsko-Rzhevskyy, Papell, and Prodan (2015), atypical of the U.S. historical experience of negative deviations during most of the 1970s and 2000s and small deviations during the Great Moderation of the late 1980s and 1990s.

We can also look in detail at what actually happened with rates in the key time around the Plaza Accord. The Federal Reserve had been easing interest rates back into the single digits since 1984, but it reversed course in the second half of 1985. The FOMC moved the target rate up from 7.75 percent on May 20, 1985 to 8.0 on September 6, and the effective Fed funds rate rose from 7.5 to 7.9 percent. The Taylor rule, in contrast, suggests loosening by 0.4 percent over this period because of a drop in the output gap and a minor decline in inflation.

By December the effective Fed funds rate had tightened to 8.3 percent, despite the fact that the FOMC lowered the Fed funds target back to 7.75 on December 18. The policy

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12 Kamada (2005), using an HP filter, finds a real-time output gap of 1 percent. Using and HP filter with revised data, Haltmaier (2001), Hirose and Kamada (2003), Kamada (2005), Urasawa and Seitani (2008), Hirose and Naganuma (2010) and Yamada and Jin (2012) find a value for the output gap that falls within the range between 0 and 1 percent. The only exception to this pattern is the IMF's World Economic Outlook estimate of -0.5 percent.

rate decline matches the suggestion of the Taylor rule to lower rates by 0.2 percent. Indeed, the Fed went on to continuously lower target rates until it reached 5.875 percent at the end of 1986. So while the Taylor rule was suggesting interest rates 1.5 to 2.0 percentage points below the effective rate in 1985, the U.S intervention during Q4 1985 did forecast a significant change in the direction of monetary policy as it moved closer to the rate implied by the Taylor rule.

The results for Germany do not comport so nicely with the hypothesis. For Germany, the Taylor rule-implied rate and the money market rate presented in 1Figure 8 track fairly closely, but present a large, sustained positive deviation in the early 1980s, similar to the U.S. Where it does deviate, such as in the early 1980s, it roughly matches previous results using revised (Clarida, Gali, and Gertler 1998) or real time data (Gerberding, Seitz, and Worms 2005).

Most importantly for this study, the Taylor rule lies below the money market rate, which we interpret to mean that the Bundesbank did not have policy space for intervention to weaken the dollar. Indeed, the Lombard rate was cut a half percentage point in August 1985 and not moved further until the start of 1987. However, the Bundesbank cut the deviations between the key money market interest rates and the Taylor rule-implied rate to zero between 1984:Q4 and 1986:Q2, with money market rates falling all the way until 1988:Q1. Rates moved consistently with the Taylor rule, helping to validate its use as an indicator of the direction of monetary policy at this time.

As discussed in the previous section, the interest rate differential is an important factor determining the exchange rate. If the foreign Taylor rule suggests that foreign rates would fall more slowly than U.S. rates, foreign monetary policy could still be interpreted as consistent with dollar weakening. In 1985 German overnight money market rates were below the Fed funds rate with the differential growing steadily across the year from 2.75 to 3.5 percentage points. Because of lower inflation and a much more negative output gap in Germany the differential in the Taylor rule-implied rates was much larger than the observed differential, hitting 6.1 percentage points in 1985:Q2.

In 1985:Q3, however, output improved in Germany and softened in the U.S., so the Taylor rule-implied differential shrank. In the subsequent four quarters the Taylor rule-implied differential continued to fall on the back of strengthening German growth and inflation and persistent softening of U.S. inflation. It was not a mere blip, and the actual nominal interest rate differential fell as well throughout 1986.

For Japan, the Taylor rule-implied rate presented in 1Figure 9 presents a fairly tight fit after 1980 to the overnight call rate targeted by the Bank of Japan (BOJ), though it too exhibits a large, sustained positive deviation in the early 1980s. The Taylor rule rates correspond with previous results using real time data (Kamada 2005).[13] For our period of interest, the deviation of the call rate and the Taylor rule rates declines from 1984:Q1 through 1985:Q2 suggesting the Taylor rule provides some guidance for the direction of monetary policy during the Plaza.

As with the U.S. and Germany, Japanese interest rates were well above the Taylor rule-implied rates for all of 1985. Positive deviations suggest that Japanese participation in the Plaza intervention was not consistent with policy space available to monetary policy. The BOJ did not heed the Taylor rule, however, and allowed the call rate to rise through the second half of 1985, perhaps in support of the intervention. On the other hand, real-time data showed inflation falling in the final quarter, so the Taylor rule-implied interest rate dropped, causing the deviation to grow in 1985:Q4. The next move of the official discount rate did not come until in January 1986 when it was lowered by a half percentage point. Inflation picked up in Japan that year yet the BOJ continued to ease, so for 1986 and most of 1987 the call rate converged to the Taylor rule.

In 1985:Q3, as the G-5 began intervening, rates in Japan were lower than in the U.S. Since Japanese call rates rose that quarter, the nominal rate differential moved to support the direction of intervention. Inflation ticked up in Japan that quarter, while US output softened, so the Taylor rule-implied interest rate differential moved in the same direction as the nominal differential. However, as intervention continued into Q4, the two differentials diverged. The nominal differential supported the intervention, but the Taylor rule-implied differential moved in favor of dollar strengthening. For the subsequent five quarters the Taylor rule-implied differential suggests growing policy space in support of a weakening

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[13] As Ito and Mishkin (2006) point out, there is disturbingly little consistency among the Taylor rule-implied interest rates estimated for Japan in the mid-1980s. Findings vary significantly, depending on the estimation period, measure of output gap and estimation method (Kamada (2005) and Miyazawa (2011) illustrate the variety of results). Looking only at 1985, (Clarida, Gali, and Gertler 1998) find no significant gap. Several studies which attempt to follow the CGG methodology find positive gaps in 1985 (Bernanke and Gertler 1999; Okina and Shiratsuka 2002; Miyazawa 2011; Wilde 2012).

dollar, but with the BOJ cutting rates, the observed nominal differential did not favor a weakening dollar.

4 Discussion

It is uncontroversial to observe that the overvaluation of the dollar at its peak in 1985:Q1 was unprecedented in the post-Bretton Woods era. We document the overvaluation by examining the real exchange rate relative to a rate implied by the real interest rate differential. Other chapters in this volume provide more detail on the general point we aim to make, that such a large overvaluation provides the necessary motivation for policymakers to attempt a difficult act like coordinated exchange rate intervention. Fortunately, such large misalignments of the dollar against other major currencies are relatively rare. Against the European currencies examined here 1985 was the largest single episode of real misalignment seen under floating exchange rates, with or without adjusting for interest rate differentials. Hence the degree of misalignment helps explain uniqueness of the occurrence of the Plaza Accord.

Of course, the dollar turned around in 1985:Q1, and our real exchange rate measure had depreciated almost 20 percent in September. Why was the urgency not gone by then? As noted by others in this volume, the U.S. Congress was actively considering protectionist trade measures. While the depreciation would have certainly helped their constituents, the J-curve effect imposes a long lag between movements in the real exchange rate and the political pressure to help tradable goods producers. With normal J-curve lags in trade responding to real exchange rate changes, not until a year after the Plaza did U.S. industry *begin* to feel the impact of the dramatic reversal of exchange rate (Feldstein 1994). Not until the time of the Louvre Accord would it have started to make a difference, and Funabashi (1989) documents that political pressure from Congress supported U.S. Treasury negotiations on exchange rate policy throughout this period.[14]

In understanding the impact of the Plaza Accord on the exchange rate, examination of Taylor rule-implied interest rates paints an interesting picture of one potential source of

[14] In nominal terms, the dollar fell until the end of 1988, depreciating a further 37 percent against the mark and 48 percent against the yen beyond the amount it fell before the Plaza.

impact. Several other authors in this volume have noted that the major policy change that impacted the foreign exchange market came from the U.S. Our evidence is consistent with this interpretation. The U.S. was the only one of the G-3 with policy space to intervene consistently with monetary policy, as measured by the deviation of target short-term rates from the Taylor rule-implied interest rate, as both Germany and Japan shared the large, sustained positive Taylor rule deviation with the U.S. through most of the early 1980s.

It can be argued, however, that the Taylor rule-implied interest differential was consistent with the Plaza intervention for both currency pairs. Both declined going into 1985:Q3, suggesting greater policy space for the Bundesbank and BOJ cutting rates more slowly than the Fed. This type of policy space is a weaker standard for monetary policy consistency, since it does not resolve the purely domestic policy inconsistency. (Unsterilized sales of dollars by foreign central banks would move foreign interest rates upwards, so sterilized sales would not exactly be consistent with foreign rates declining more slowly than U.S. rates.) In fact, the Bundesbank did subsequently drop rates slowly enough to close the interest differential, though the BOJ did not.

To the extent that there was a signaling or coordination channel propelling the dollar downwards after the Plaza, it was primarily a U.S. story. The coordinated nature of the Plaza helped in terms of amplifying the signal from the U.S., making it appear more credible and durable. In addition, the U.S. Treasury wanted to leverage its policy change to extract concessions from Japan and Germany (Funabashi 1989). Indeed, the combination of fiscal stimulus in Germany and Japan and discipline in the U.S. noted in the Plaza communiqué were also consistent with a weaker dollar. But one can speculate whether the impact would have been similar if the U.S. side had made a Plaza-type announcement unilaterally.

The synchrony of large positive Taylor rule deviations in all three countries in this period may be no coincidence. Presumably the large U.S. deviation at this time reflected Paul Volcker's effort to rebuild the Federal Reserve's inflation-fighting credibility. Rates in the other two economies may have been pulled above Taylor rule-implied rates in order to resist the pace of dollar appreciation. Hutchison (1988) and Glick and Hutchison (1994) show empirically that BOJ monetary policy from 1975 until the Plaza was influenced by attempts to stabilize the exchange rate against the dollar. Clarida, Gali, and Gertler (1998) and Molodtsova, Nikolsko-Rzhevskyy, and Papell (2008) find the same for the Bundesbank starting in 1979, and Bundesbank data shows consistent intervention to weaken the dollar from 1981Q1 until 1985:Q1.

After the Plaza Accord provided assurance of the direction of the dollar, both the Bundesbank and the BOJ appeared to take advantage of their policy space to lower rates, despite the fact that it works against continued dollar weakness. The Taylor rule deviation closed for both economies by the middle of 1986.

It is interesting to note that as the Taylor rule deviations for all three countries moved closer to zero in 1986 and 1987, the language of various communiqués shifted emphasis towards currency stability. The Louvre Accord of February 1987 of course exemplifies this shift most effectively. The negotiating tactic of the U.S. Treasury to elicit more economic stimulus from Germany and Japan was to offer in exchange U.S. support for putting a floor beneath the falling dollar. In terms of policy consistency, however, the push for economic stimulus mixed messages about how exchange rates should move.

The Treasury wanted lower rates in all three countries. To the extent that all three lowered equally, differentials did not change, so monetary policy was not inconsistent with exchange rate objectives of stopping the dollar's fall. Significant attention was paid among the central banks to move rates in step together, though synchrony did not always happen (Funabashi 1989; Volcker and Gyohten 1992).

Fiscal policy goals, on the other hand, were explicitly inconsistent with exchange rate objectives. They had remained unchanged from the Plaza: fiscal stimulus in Germany and Japan and greater discipline in the U.S. Textbook macroeconomic models indicate this pattern of fiscal policy change should cause the dollar to fall further. Had the G-3 been more successful at implementing its fiscal commitments, fiscal policy might have been a reasonable explanation for why the Louvre Accord was not more effective at halting the decline of the dollar. Instead, Funabashi's (1989) interpretation of contemporary market reports indicates the lack of progress on the fiscal agenda helped cause the dollar to fall during this period.

The dollar is, of course, strong again at present. Our measure of overvaluation indicates the dollar has risen about 10% in real terms against the euro and Canadian dollar, and 15% against the yen through 2015:Q2. Against the euro, the current pace of real appreciation implies the dollar would hit the 1985 peak within 2.5 years. The level of dollar overvaluation against the yen is already approaching the peaks witnessed in 1985. The pace of nominal yen appreciation has halted at the time of this writing, but the previous pace of appreciation was steep.

A strong dollar at the 30th anniversary of the Plaza naturally raises questions about the desirability of a similar agreement today. The G-3—now replacing Germany with the European Central Bank (ECB)— have all hit the zero lower bound for short-term interest rates. In order to be consistent with monetary policy a coordinated intervention to weaken the dollar would require the ECB and BOJ to raise interest rates, and it is inconceivable at present that either institution would agree to higher interest rates for a goal of a stronger currency. At the time of this writing, monetary policy in the U.S. is moving, albeit slowly, toward tightening, and intervention to take the steam out of the dollar would not be credibly consistent with monetary policy. Further, the prospects for enacting fiscal policy changes consistent with a weakening dollar appear similar to 30 years ago, with a lack of fiscal space in Japan, gridlock in the U.S. and conservative fiscal preferences in Germany. For the moment, at least, we should not expect another Plaza Accord.

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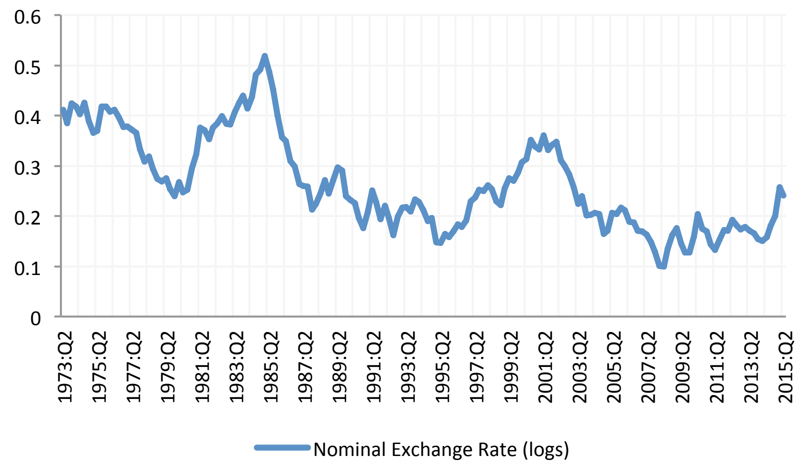
Table 1. Real Exchange Rates and Real Interest Differentials

$q_t = \alpha + \beta(r_t - r_t^*)$

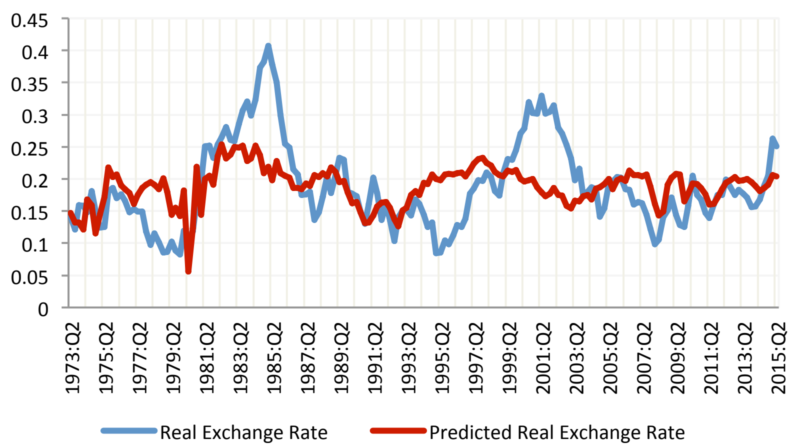
	β	*Standard Error*	*t-stat*	*P-value*
Germany	0.014	0.002	6.428	0.000
France	0.007	0.002	3.445	0.000
Italy	0.009	0.002	4.711	0.000
UK	0.003	0.001	2.867	0.004
Japan	0.012	0.002	5.633	0.000
Canada	0.005	0.002	2.206	0.028

Figure 1. Germany

Panel A. Nominal Exchange Rate Mark/Dollar



Panel B. Real Exchange Rate and Predicted Real Exchange Rate



Panel C. Deviations of the Real Exchange Rate from the Predicted Real Exchange Rate

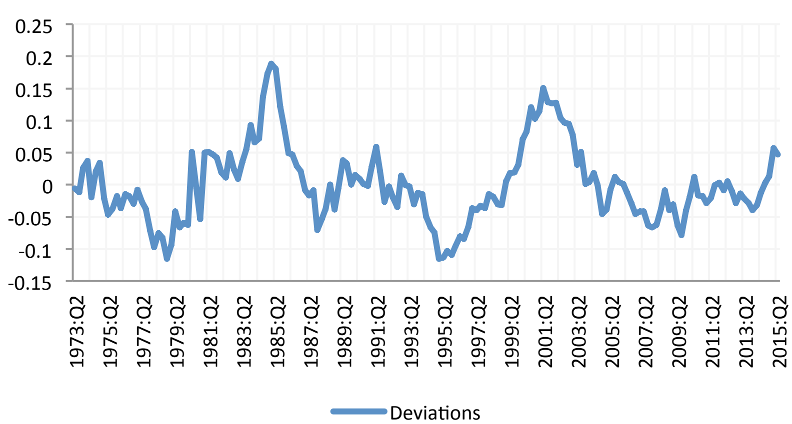
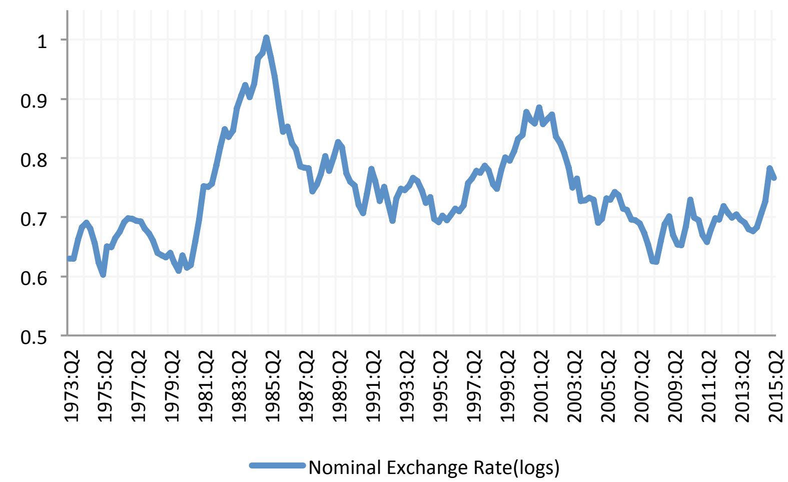
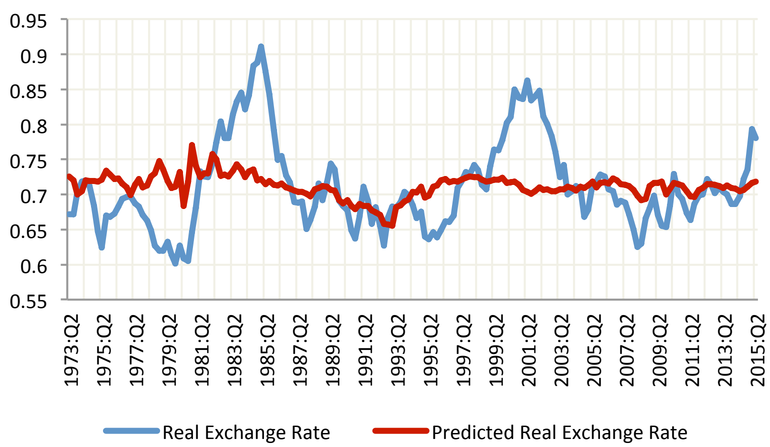


Figure 2. France

Panel A. Nominal Exchange Rate Franc/Dollar



Panel B. Real Exchange Rate and Predicted Real Exchange Rate



Panel C. Deviations of the Real Exchange Rate from the Predicted Real Exchange Rate

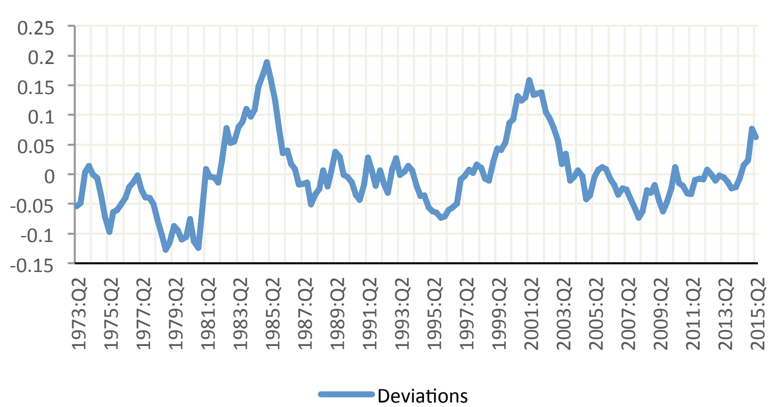
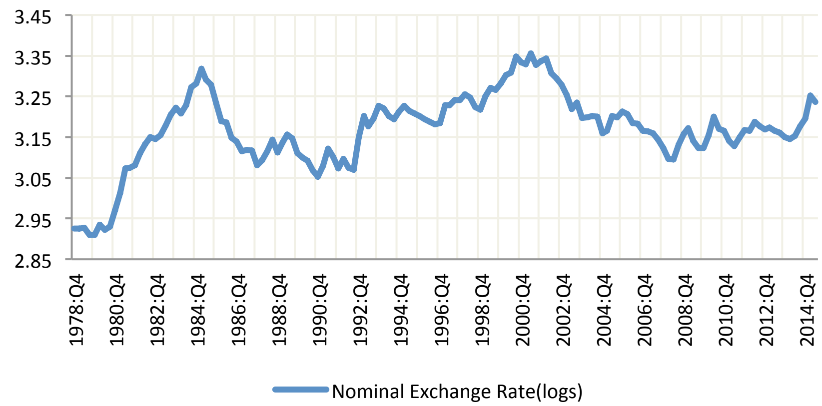
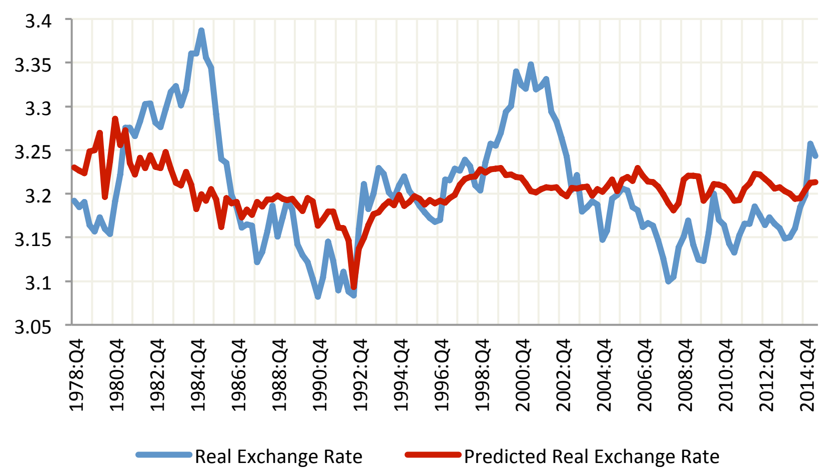


Figure 3. Italy

Panel A. Nominal Exchange Rate Lira/Dollar



Panel B. Real Exchange Rate and Predicted Real Exchange Rate



Panel C. Deviations of the Real Exchange Rate from the Predicted Real Exchange Rate

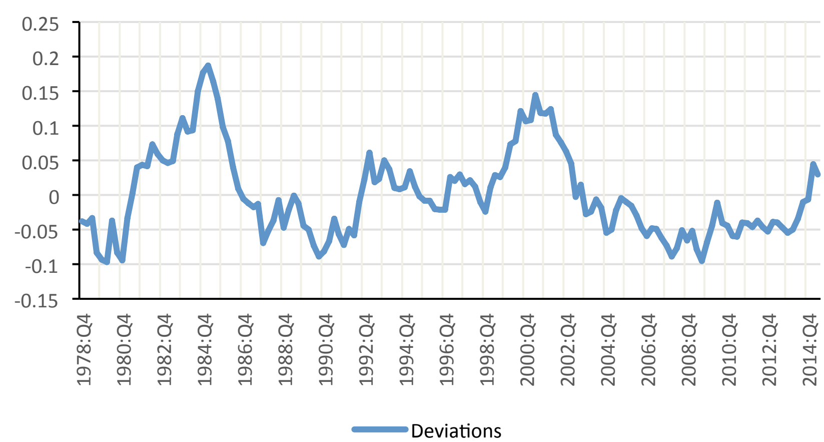
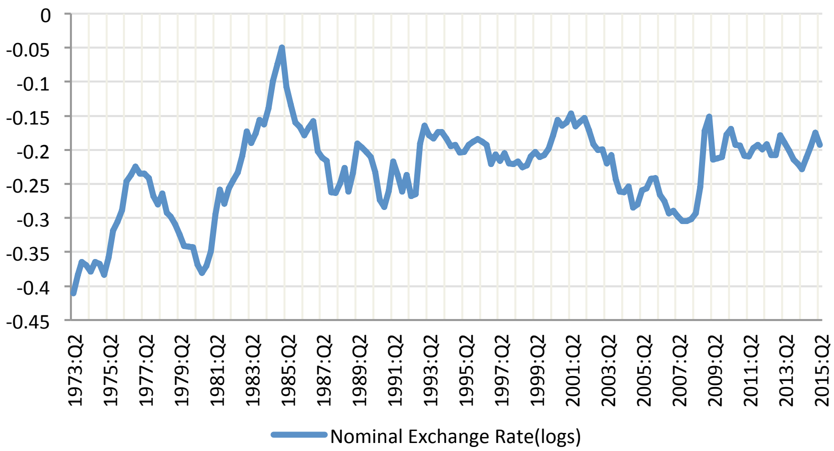
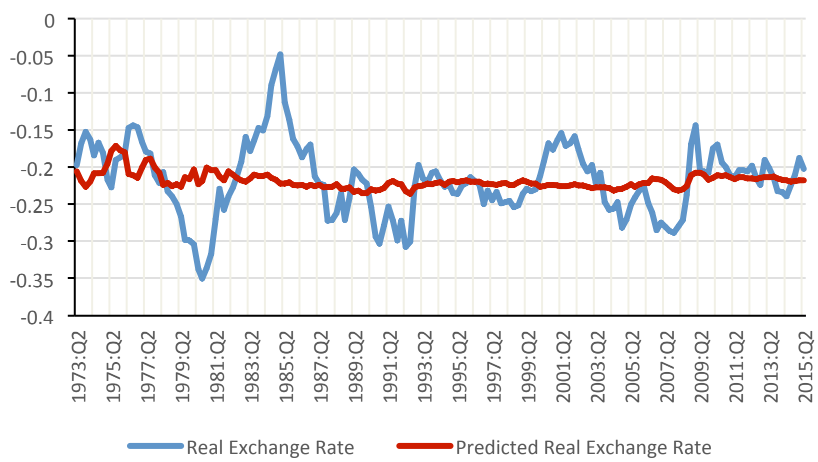


Figure 4. United Kingdom

Panel A. Nominal Exchange Rate Pound/Dollar



Panel B. Real Exchange Rate and Predicted Real Exchange Rate



Panel C. Deviations of the Real Exchange Rate from the Predicted Real Exchange Rate

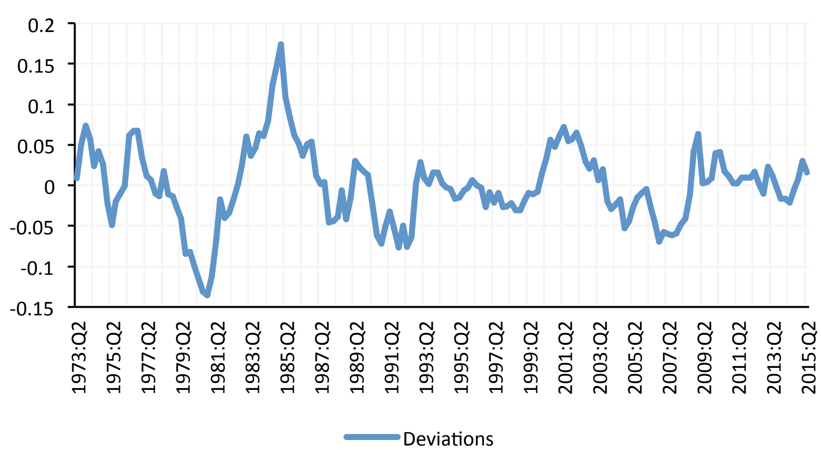
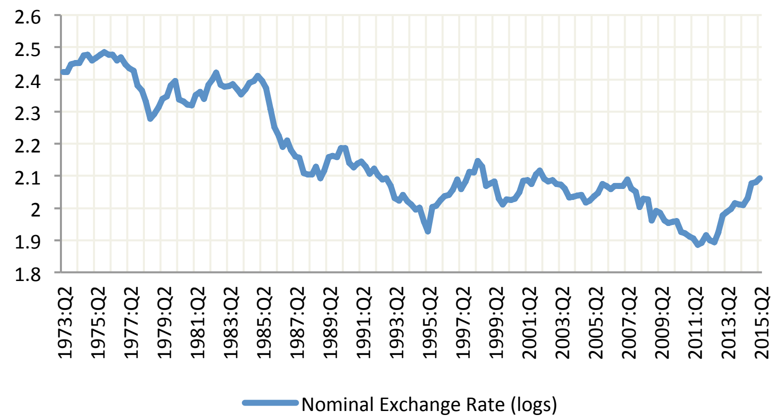
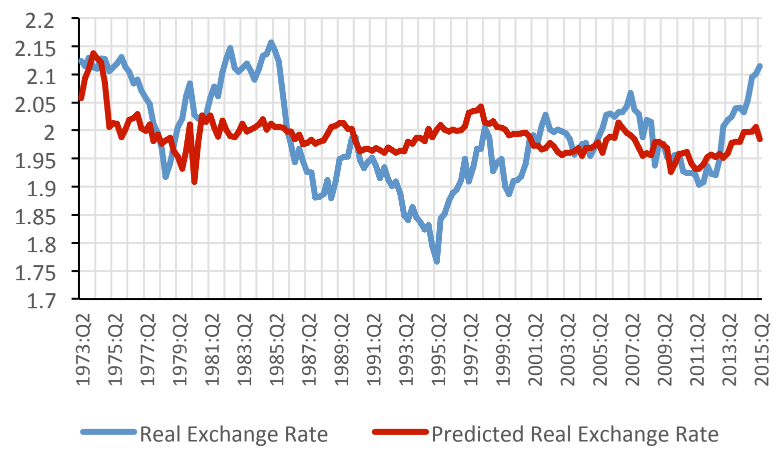


Figure 5. Japan

Panel A. Nominal Exchange Rate Pound/Dollar



Panel B. Real Exchange Rate and Predicted Real Exchange Rate



Panel C. Deviations of the Real Exchange Rate from the Predicted Real Exchange Rate

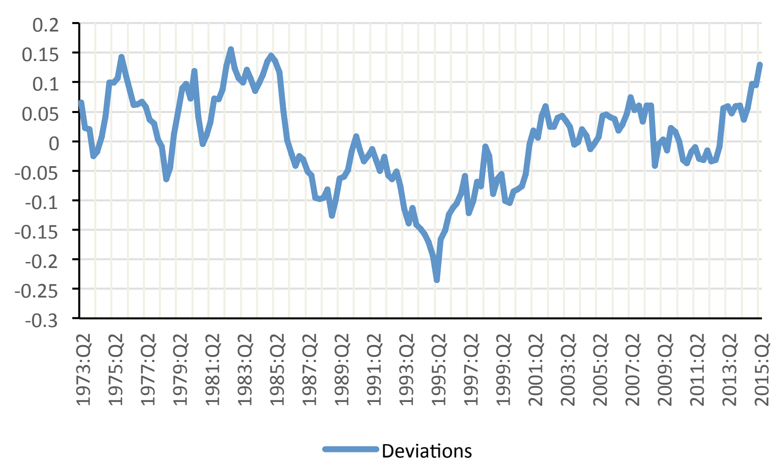
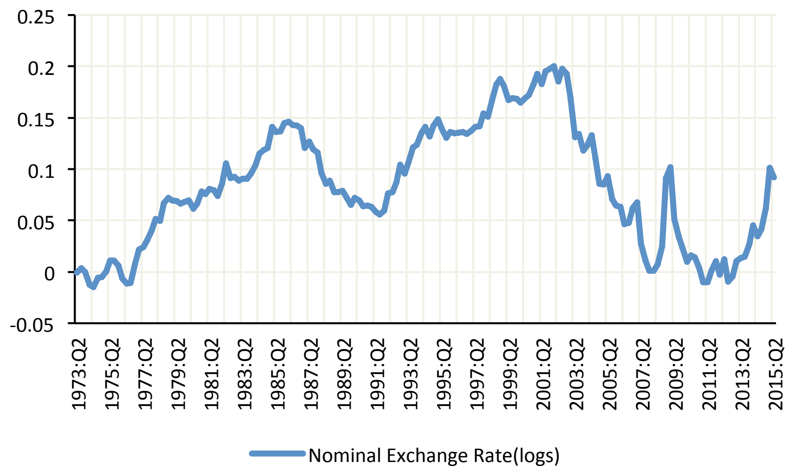
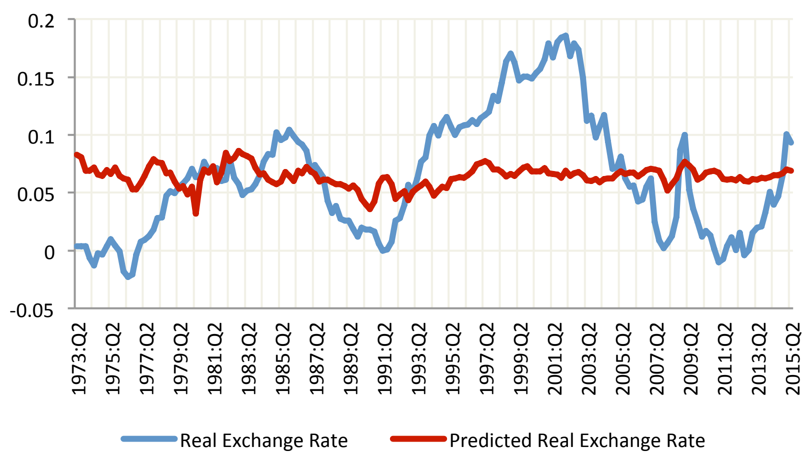


Figure 6. Canada

Panel A. Nominal Exchange Rate Canadian Dollar/Dollar



Panel B. Real Exchange Rate and Predicted Real Exchange Rate



Panel C. Deviations of the Real Exchange Rate from the Predicted Real Exchange Rate

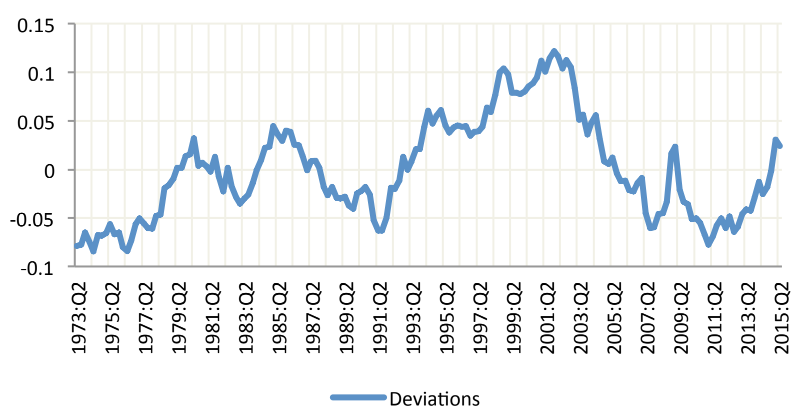
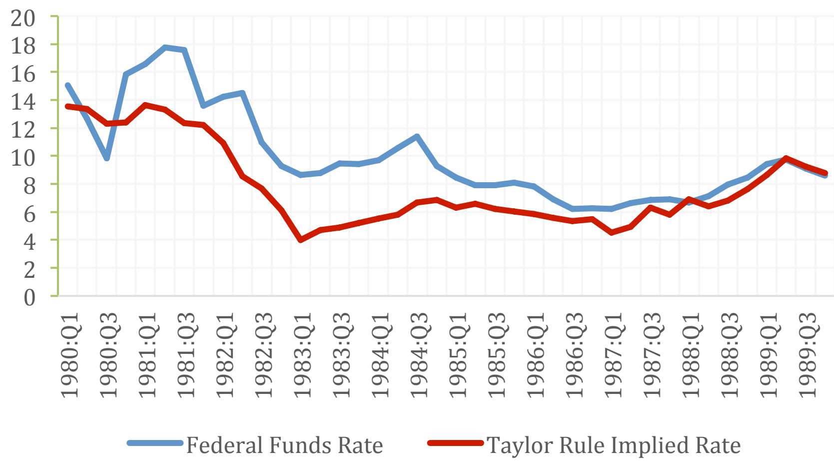


Figure 7. Deviations from the Taylor Rule: US

Panel A. The Federal Funds Rate and Taylor Rule Implied Rate



Panel B. The Difference between the Actual and the Implied Rates

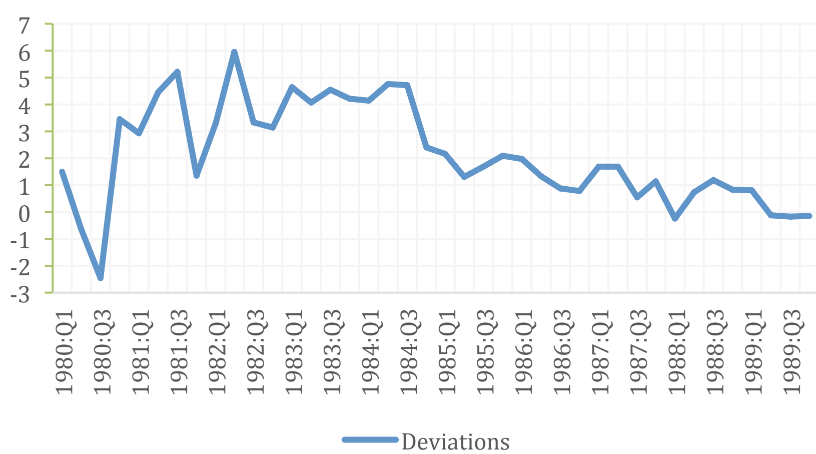
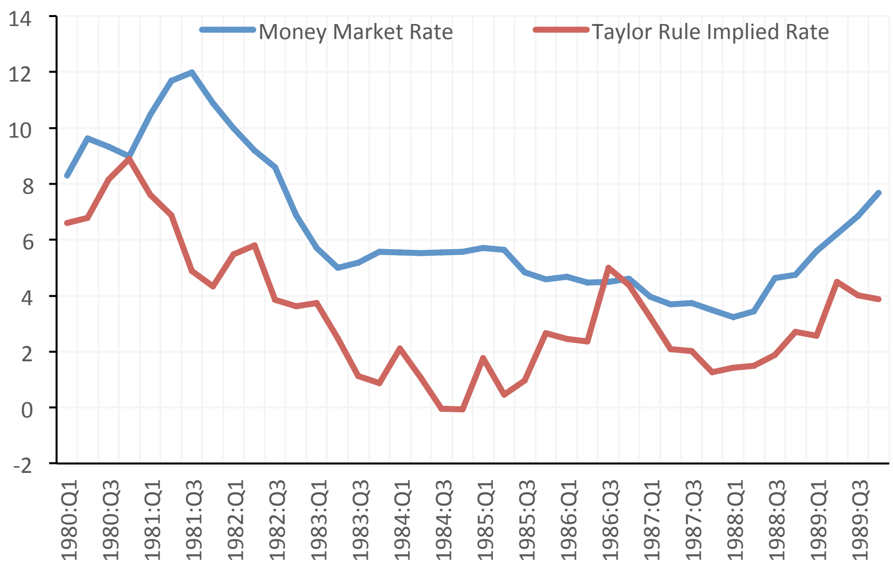


Figure 8. Deviations from the Taylor Rule: Germany

Panel A. The Money Market Rate and Taylor Rule Implied Rate



Panel B. The Difference between the Actual and the Implied Rates

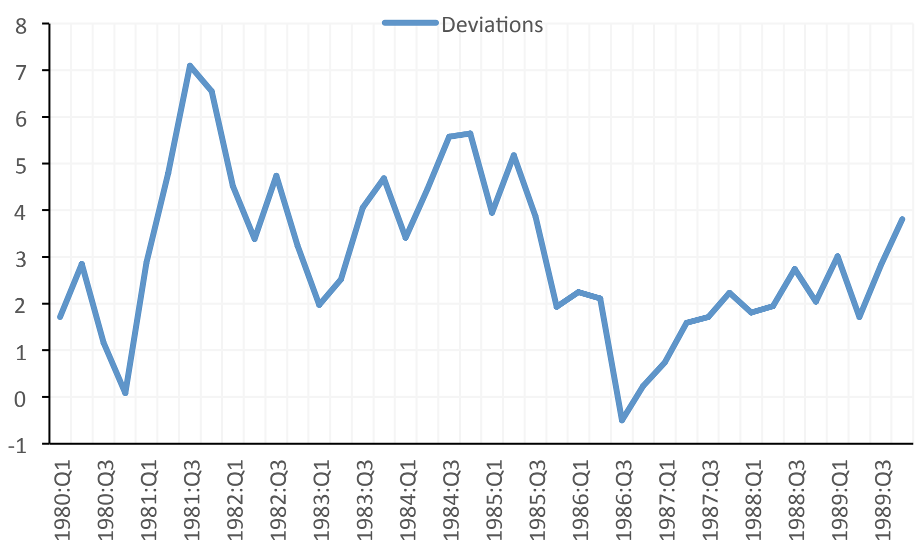
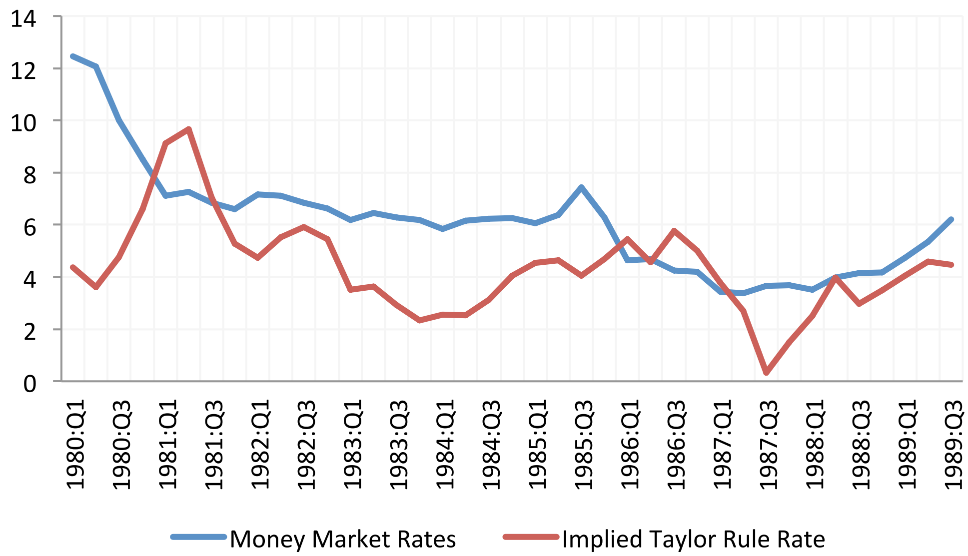


Figure 9. Deviations from the Taylor Rule: Japan

Panel A. The Money Market Rate and Taylor Rule Implied Rate



Panel B. The Difference between the Actual and the Implied Rates