

Does Exchange Rate Behavior Change when Interest Rates are Negative?

Allaudeen Hameed and Andrew K. Rose*

Updated: November 7, 2016

Abstract

In this column, we review exchange rate behavior during the recent period with negative nominal interest rates. We use a daily panel of data of 61 currencies from Jan 2010 through May 2016; during this time a number of both small (Denmark, Sweden, and Switzerland) and large (Eurozone and Japan) economies have experienced negative nominal interest rates. We examine both effective exchange rates and bilateral rates, the latter typically measured against the Swiss franc since Switzerland has had the longest period of negative nominal rates. We examine exchange rate volatility, exchange rate changes, deviations from uncovered interest parity, and profits from the carry trade. We find that negative interest rates seem to have little effect on observable exchange rate behavior.

Contact:

Andrew Rose, Haas School of Business, University of California, Berkeley CA 94720-1900
Tel: +1 (510) 642-6609 Fax: +1 (510) 642-4700
Email: arose@haas.berkeley.edu URL: <http://faculty.haas.berkeley.edu/arose>

1. Introduction

One of the most striking features of the macroeconomic and financial environment since the global financial crisis has been the emergence of negative nominal interest rates. Switzerland was the first economy to experience negative interest rates in a substantive way. In the last five years, Switzerland experienced over three years of negative nominal interest rates; it has also experienced the largest negative interest rates in absolute value. But a number of other economies have also implemented negative nominal interest rates, including smaller countries like Denmark and Sweden but also powerhouses like the Eurozone and Japan. Negative interest rates have consequences for banks,

the banking industry, and the financial sector more broadly. These have been surveyed recently by Arteta et al (2016) and Viñals et al (2016). In this column, we review our recent research which asks a more narrow question: “What are the consequences of negative nominal interest rates for exchange rate behavior?” At least so far, our answer can be summarized in a single word: “negligible”.

2. Exchange Rate Volatility and Negative Interest Rates

We are interested in understanding exchange rate behavior during the contemporary period of negative nominal interest rates. Negative interest rates are a recent phenomenon, so we wish to maximize the potential scope of a necessarily limited data set. We begin the data set in January 2010, so as to reduce the after-effects of the Global Financial Crisis and Great Recession while also including a period of comparable data before the onset of negative interest rates. We rely on the highest frequency of data (daily) that is reliably available for a wide range of countries, since we must bring a large cross-section to bear on a problem with a necessarily limited time-series span. We use conventional spot and (1-month) forward exchange rates, for all (61) currencies available; we also use effective exchange rate series are drawn from the Bank of England. Our (annualized 1-month) interest rates are also conventional; our series are more fully described in Hameed and Rose (2016).

We begin with a look at the data in Figure 1, which provides simple time-series plots of the Swiss effective exchange rate and the (annualized 1-month LIBOR) Swiss interest rate. Swiss interest rates (the dashed line labelled on the left axis) first went negative briefly in August 2011, shortly after a sudden appreciation of the Swiss franc (the solid line labelled on the right) triggered a relaxation of monetary policy by the Swiss National Bank (SNB). The SNB diagnosed “massive overvaluation” and loosened to protect Swiss competitiveness and reduce deflationary pressures. The appreciation was quickly reversed after a series of SNB policy innovations including quantitative easing, swap

transactions, and most radically, the establishment of a floor on the Euro/Swiss Franc exchange rate on September 6 2011. Swiss interest rates then fluctuated around zero until the dramatic events of mid-January 2015 when the SNB removed the exchange rate floor, lowered interest rates to substantially negative levels, and allowed the franc to appreciate.

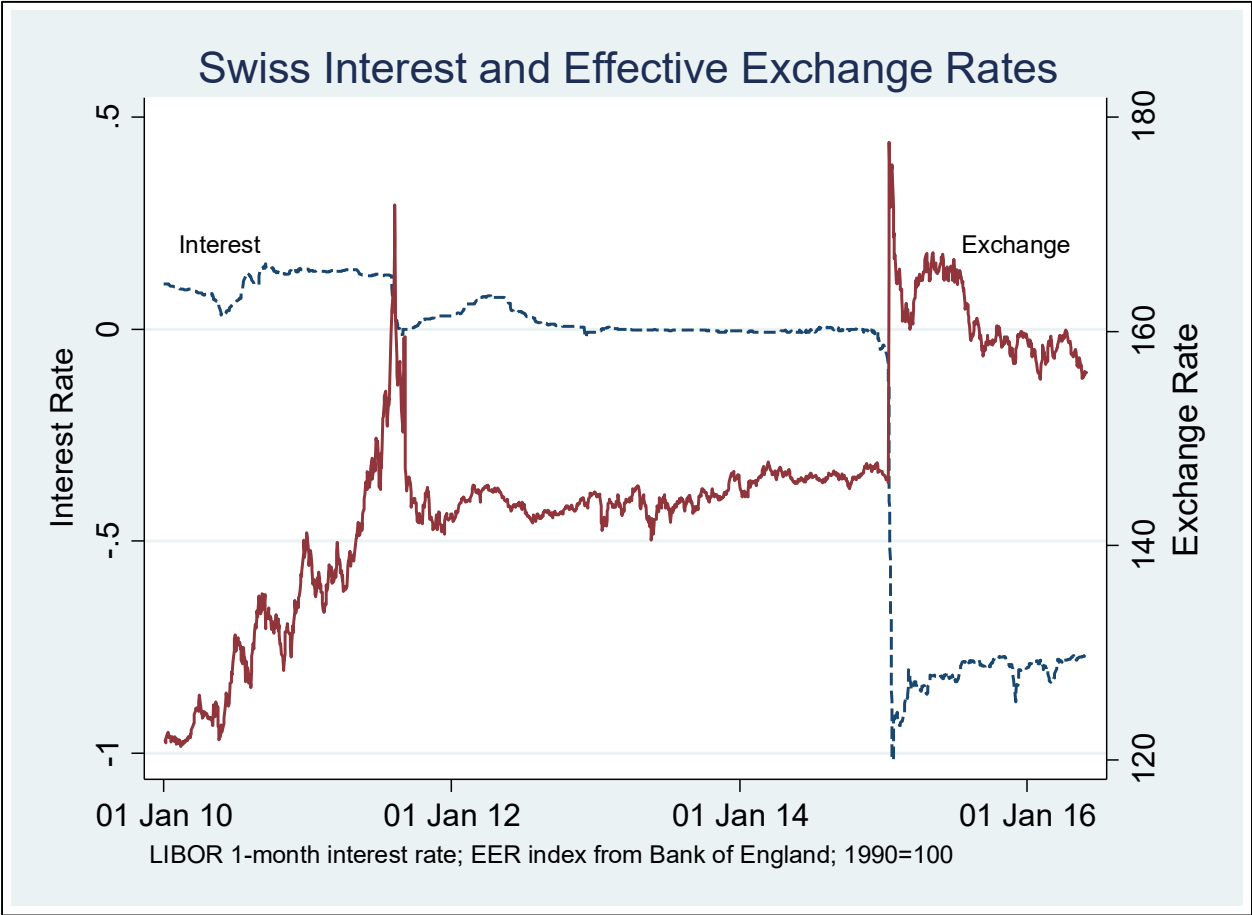


Figure 1

The temporary spike of the Swiss franc in August 2011 and its jump appreciation of January 2015 are important features of this data set. Still, we are struck by the fact that the *volatility* of the effective exchange rate seems unrelated to the interest rate *level*, with the exception of the 8/2011 and 1/2015 events. There is no theoretical reason to expect a relationship, either positive or negative,

between exchange rate volatility and nominal interest rate levels; the question is whether there is a linkage in practice. Since *bilateral* exchange rates necessarily involve two currencies and thus two interest rates, it is easiest to visualize the relationship between a single interest rate level and the volatility of an *effective* exchange rate. To measure volatility, we use the standard deviation of the first-difference in the log of the daily log effective exchange rate, calculated over the (21 business) days that compose a month. Figure 2 then scatters this monthly measure of Swiss effective exchange rate volatility against the level of Swiss interest rates; we also include a fitted least-squares regression line.

There are three outliers in Figure 2; each of these spikes in Swiss exchange rate volatility is clearly associated with the events that began and ended the Swiss exchange rate floor. But whether or not one ignores the outliers, exchange rate volatility does not seem to vary systematically as interest rates vary between small positive and substantially negative levels.

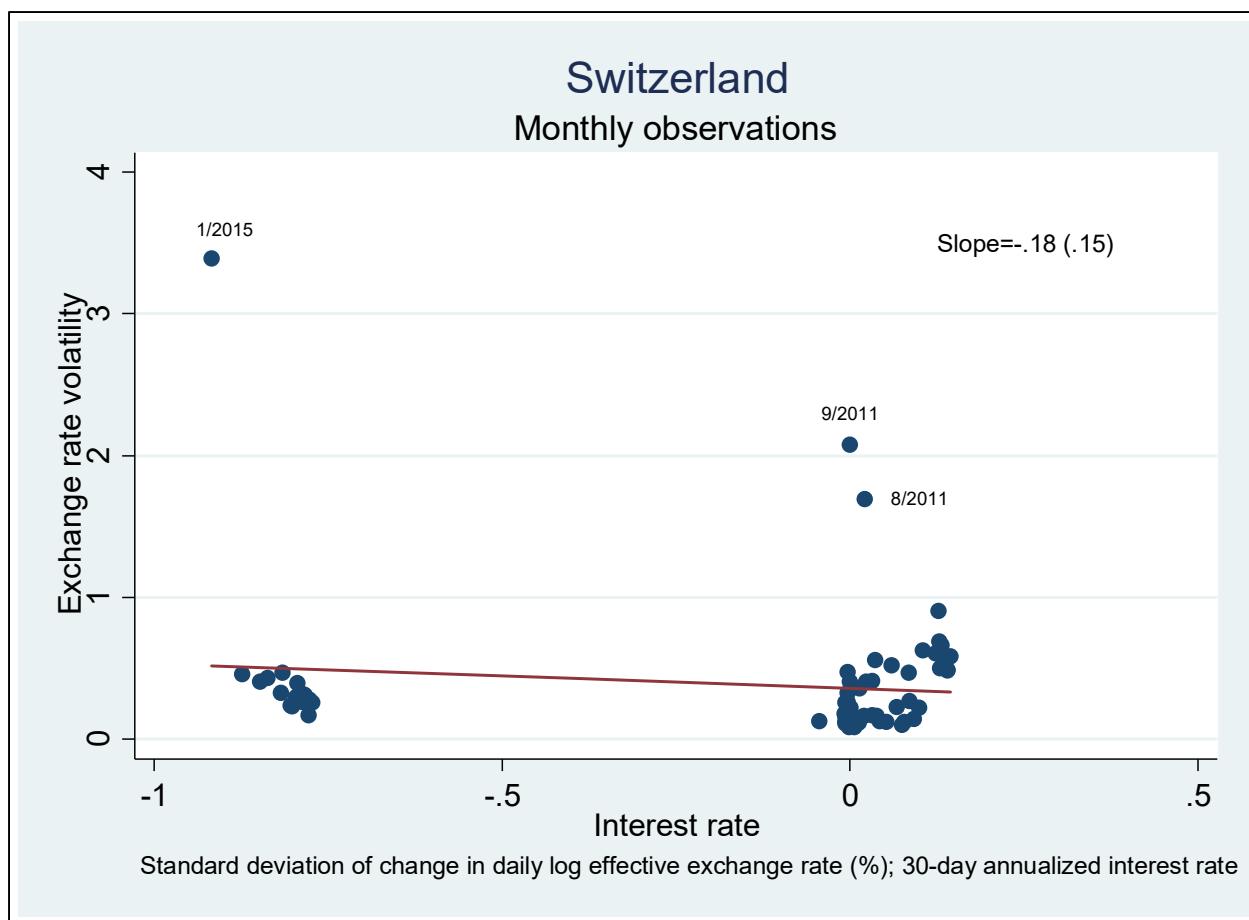


Figure 2

Figure 3 consists of graphs analogous to Figure 2, one for each of the four major currencies (the American dollar, Euro, Yen and pound sterling) as well as a pair for the other economies that have experienced negative interest rates (Denmark and Sweden). Each graph scatters effective exchange rate volatility against the domestic interest rate; least squares regression lines are also included. In no case, is there a strong linkage between exchange rate volatility and the interest rate level. All of the major economies kept interest rates low during the entire period, while the two Scandinavian economies used somewhat wider ranges. But the negative interest rates experienced by four economies seem unassociated with either higher or lower exchange rate volatility. More rigorous work in our paper bears this intuition out statistically.

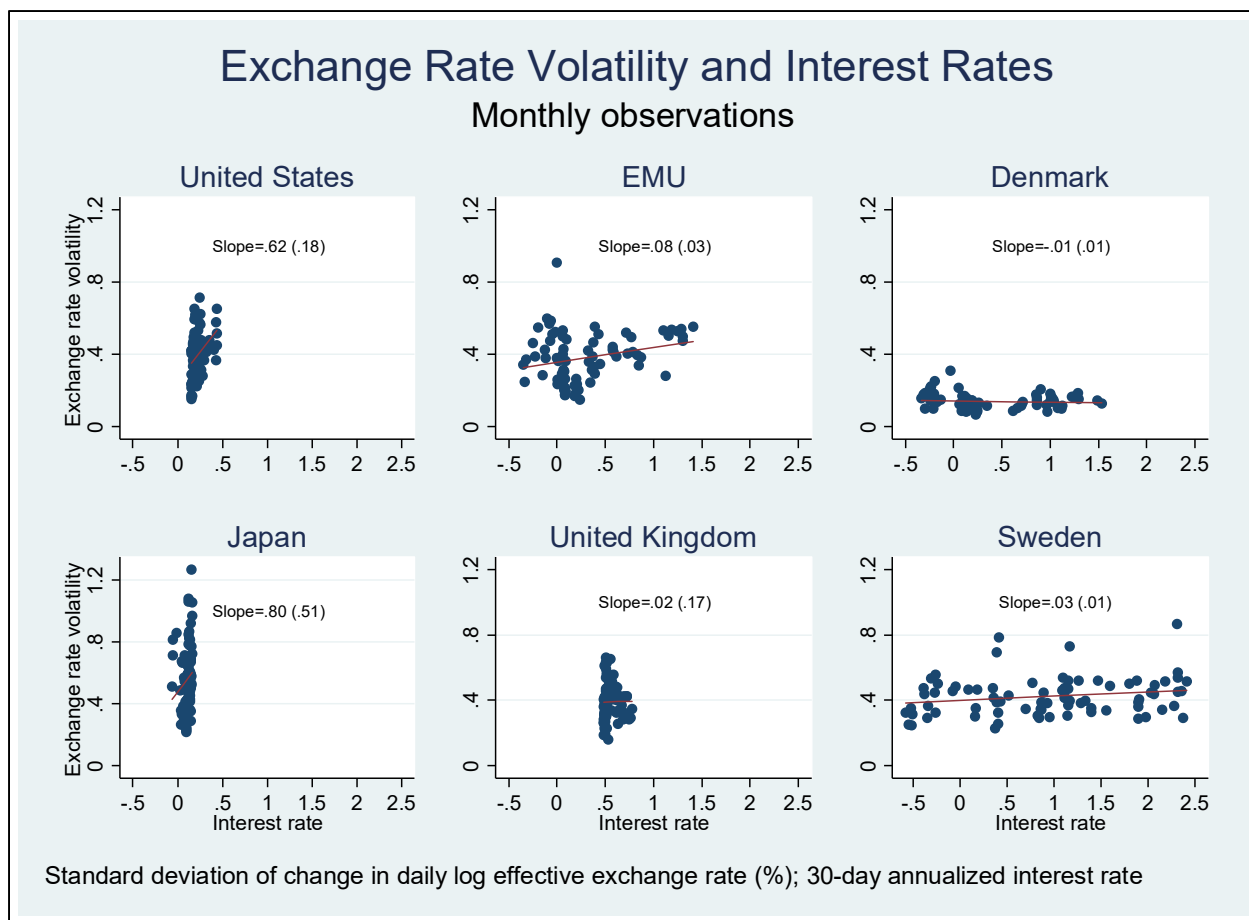


Figure 3

Succinctly, there appears to be no strong relationship between exchange rate volatility and the level of nominal interest rates, at least for this sample of data. In particular, negative nominal interest rates are not associated with noticeably more or less exchange rate volatility.

3. The Relationship between *Ex Post* Exchange Rate Changes and the Forward Premium

Exchange rates and interest rates are tightly linked in theory through interest parity conditions. *Covered* interest parity (CIP) is an arbitrage condition linking the forward premium – the spread of

forward exchange rates over spot – to the interest rate differential. *Uncovered* interest parity (UIP) is a speculative condition that links expected or actual exchange rate changes to the forward premium (or equivalently, in the presence of CIP, the interest differential). Have interest parity relationships changed during the era of negative nominal interest rates?

In Figure 4, we scatter the *ex post* one-month change in the bilateral Euro exchange rate against the corresponding forward premium (the percentage difference between the 1-month forward and spot exchange rates). Since both one-month exchange rate changes and forward premia are highly auto-correlated at the daily frequency, we graph only one bilateral observation for each business month; more on this below. Since bilateral exchange rate changes are correlated across economies, considerable cross-observation dependency remains (when the Euro appreciates against the Japanese Yen, it is likely to appreciate against the Korean Won).

We split our sample into four parts. The top-left graph scatters exchange rate changes against the forward premium when Euro interest rates are positive and at least 1.25%. The bottom-left graph portrays the same relationship but when the Euro interest rates is substantially *negative* – at least -.25%. Both graphs are cloudy and show a similar non-pattern. Still, the more interesting evidence is contained in the two graphs on the right-hand side of the figure. Both scatter *ex post* exchange rate changes against forward premia; the top-right graph portrays observations where the Euro interest rate is small and positive (between 0 and .05%), while the analogue below presents the data when the same interest rate is small and negative (between 0 and -.05%). The pair of graphs on the right look similar.

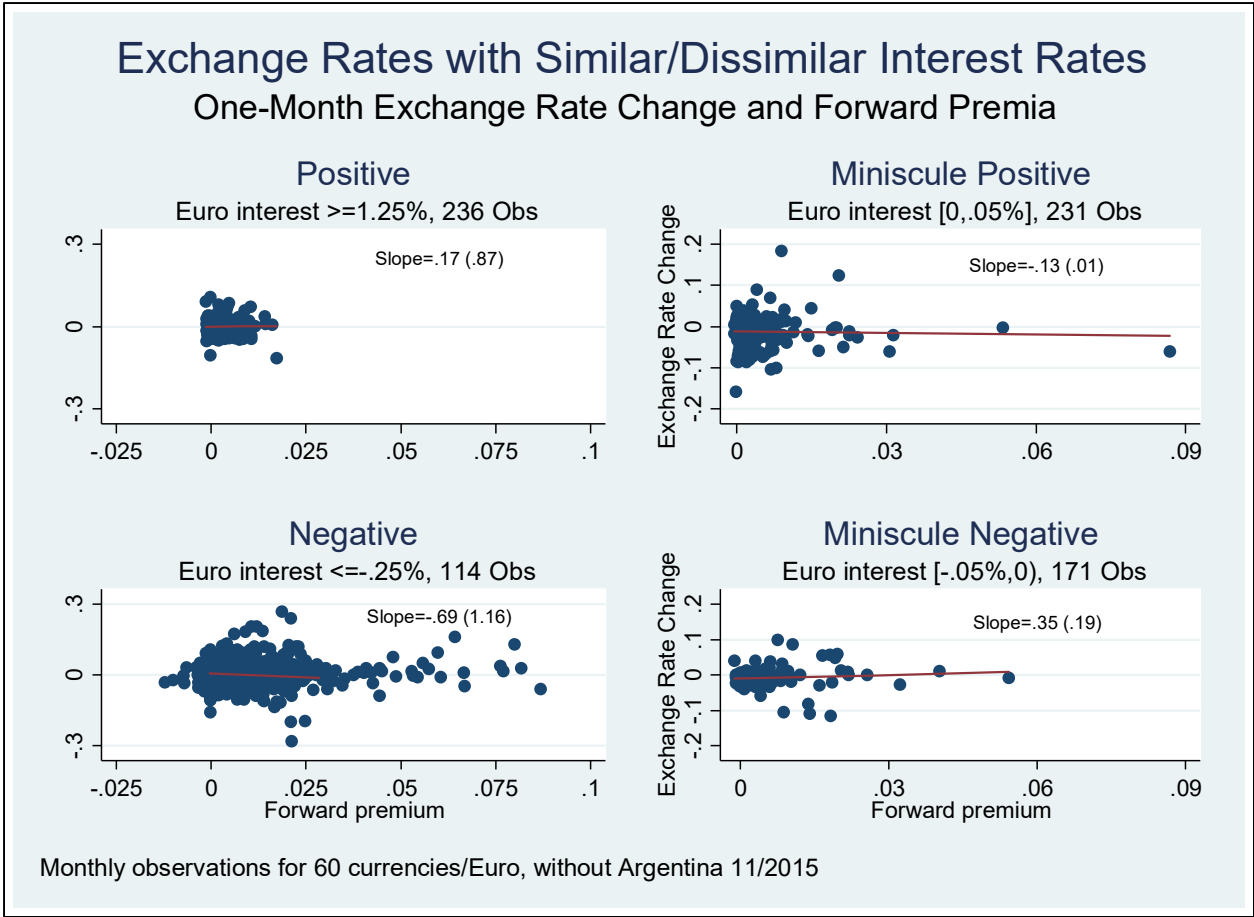


Figure 4

4. Conclusion

Negative nominal interest rates are a distressing and new feature of the economic landscape. While central banks manifestly think they are advantageous, the consequences for the financial sector are largely unknown, and may be larger in the long run than in the short run. We have ignored all such considerations in our short run focus on exchange rate behavior. And negative nominal interest rates have only affected a small number of economies for a short period of time, so a conservative conclusion seems appropriate. But the data we have do not indicate that negative nominal interest rates have had substantive consequences for exchange rate behavior.

References

Arteta, Carlos, M. Ayhan Kose, Marc Stocker and Temel Taskin (2016) "Negative Interest Rate Policies: Sources and Implications" *CEPR Discussion Paper* DP 11, 433.

Hameed, Allaudeen, and Rose, Andrew K. (2016) "Exchange Rate Behavior with Negative Interest Rates: Some Early Negative Observations" *CEPR Discussion Paper* 11,498.

Viñals, Jose, Simon Gray and Kelly Eckhold (2016) "The Broader View: The Positive Effects of Negative Nominal Interest Rates" <https://blog-imfdirect.imf.org/2016/04/10/the-broader-view-the-positive-effects-of-negative-nominal-interest-rates/> .