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Appreciation Pressures and Real Depreciation: The Experience with the Swiss Franc-Euro Exchange Rate Floor

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Abstract

We study the course of the Swiss price level during the recent episode where Switzerland enforced a floor on the Swiss Franc exchange rate relative to the Euro. Given the strong nominal upward pressure on the Swiss currency the introduced limit of 1.20 Francs per Euro led to a quasi-fixed exchange rate from 2011 until early 2015. This measure was specifically aimed at helping the firms of the Swiss export sector to compete internationally. A further reason for imposing this floor was the Swiss National Bank's concern with deflationary pressures. Interestingly, it turned out that during the episode with a quasi-fixed exchange rate the Swiss price level came under downward pressure. We offer an analysis that helps to understand this depreciation of the Swiss currency in real terms which in fact contributed to the exchange rate floor being eventually abandoned. The article thus clarifies some intricate mechanisms affecting the choice of exchange rate policies which are so important for firms in the export sector. As a theoretical contribution (complementing the well-known Balassa-Samuelson analysis) the article presents a computable equilibrium model that explains real exchange rate variations with diverging trends in the productivity growth of the non-traded goods sectors of economies.

Keywords: exchange rate floor, nominal appreciation and real depreciation, deflation

JEL-Classification: F31, E31, E52

1. Introduction

Business is strongly affected by developments of exchange rates. Exporting firms, e.g., directly experience changes in their competitive position as exchange rates vary, with an appreciating currency leading to revenue losses. However, the links between exchange rates and exchange rate policies, on the one hand, and business considerations, on the other hand, are much more complex. Switzerland's recent experience can help to highlight some of the more intricate links and considerations. A key variable that Swiss monetary policy has to consider in its strategy choices is the real exchange rate of the Swiss Franc relative to its major trading partners. In recent years the Swiss Franc price of Euros adjusted for the developments of the price levels in different economies has been at the center of monetary policy debates.

To start with, the Swiss Franc has been a floating currency since 1973. In the wake of the financial crisis which began in 2007 significant upward pressures on the Swiss Franc developed. This development gained momentum as tensions in the Eurozone increased and the European Central Bank entered a commitment to fight the threat of a breakup of the Eurozone (Shambaugh, 2012). The appreciation of the Franc (by 23 percent in real terms between the end of 2007 and the end of 2010) dramatically worsened the competitive position of the Swiss exporters.[1] This development led to major interventions by the Swiss National Bank (SNB). The central bank's purchases of vast amounts of Euros resulted in a quadrupling of the official currency holdings within two years. These interventions – while slowing the ascent of the international Franc value – were not sufficient to stop the Swiss Franc's general tendency to appreciate. In consequence the SNB experienced very considerable losses on its foreign exchange holdings (valued at 19.2 billion Francs in 2010). Given the continuing upward pressure on the Swiss Franc, the SNB, on September 6, 2011, introduced a minimum exchange rate of 1.20 Francs against the Euro.

[1] See Simon and Hausner (2012) for a description of events and effects concerning the Swiss export sector and the currency situation. Frieden (2015) offers a more general discussion of the issues involved in policy decisions regarding exchange rate regimes.

The SNB was successful at communicating the necessity of this measure as well as at enforcing this lower limit (see IMF, 2013). This regime of a quasy-fixed exchange rate came to an end in January 2015 when the SNB decided to let the Swiss Franc fluctuate once more.[2] Figure 1 documents the course of the Swiss Franc-Euro exchange rate of recent years. As is apparent the period with the exchange rate floor stands out as a period of a relatively stable nominal rate both preceded and followed by nominal appreciation.

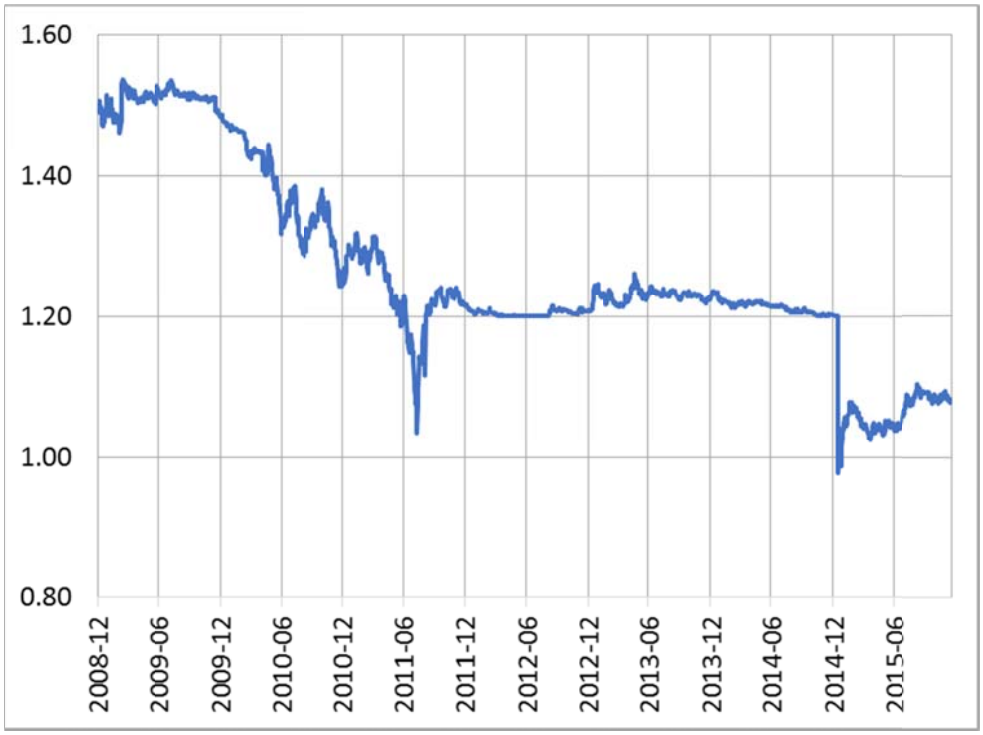

Figure 1. The Swiss Franc-Euro exchange rate

One element of central bank communication that was used to motivate this unusual measure warrants further attention and analysis. The Swiss monetary authority explained the need for a lower floor for the Euro price of its currency by the threat of recession as well as by the "risk of deflation" (SNB, 2011, p. 7). However, the Euro exchange rate floor failed to prevent a downward trend of the Swiss price level. Actually, and to the surprise of many, in real terms the Swiss Franc depreciated during the period with the Euro exchange rate floor. This paper offers an explanation of this phenomenon.

2. The Historical Account of Inflation Differentials under Fixed Exchange Rates

The issues discussed here are more easily understood if we take the definition of the real exchange rate as a starting point:

$$e^r \equiv e^n \frac{P^f}{P^d} \tag{1}$$

Here, e^n stands for the nominal exchange rate (i.e., units of domestic currency per unit of foreign currency, in

[2] Towards the end of 2014 it became quite clear that the ECB was going to flood the Eurozone with even larger amounts of Euros. In statements by Mario Draghi the willingness to stimulate European economies became ever more apparent. The primary goal driving the quantitative easing to be pursued by the ECB was to push up Eurozone inflation toward its target of 2 percent. However, stagnating outputs in several southern European economies and increasing levels of public debt additionally motivated a majority of ECB decision makers to ease monetary policy. Facing such an international environment it was a question of time before the Swiss National Bank would be forced to react. Nevertheless, the fact that the SNB chose such a radical strategy as to abandon its exchange rate floor altogether came as a surprise. In fact many investors, both domestic and international, were shocked by this course of action. As a result of abandoning the exchange rate floor after more than three years the Swiss Franc underwent an immediate and strong appreciation. On average over the first 12 months after the abolition of the Franc-Euro floor the exchange rate appreciated by more than 11 percent. See also Bernholz, (2015) for a critical assessment of the return to a flexible exchange rate.

concrete terms Swiss Franc per Euro) and P^f and P^d stand for the foreign (German) and the domestic (Swiss) price level as captured by the respective CPI measures. A decrease in e^n means a nominal appreciation of the Franc. In a situation with a fixed nominal exchange rate a real depreciation of the Swiss Franc occurs whenever P^f / P^d rises i.e., when inflation is higher in Germany than it is in Switzerland. This is the case we will be studying here.

When looking for historically relevant information on the likely course of inflation differentials under a system of fixed (or quasi-fixed) exchange rates it is advisable that earlier episodes under the same exchange rate regime are taken into consideration. The argument in favor of leaving out evidence from times of flexible exchange rates is twofold: In principle we could draw on all data from inflation differentials if we corrected the inflation differentials from times with flexible exchange rates with the changes in the nominal exchange rate. However, the thus computed adjusted inflation differential – which in fact is the growth rate of the real exchange rate – is known to be highly volatile under flexible exchange rates (see Sweeny, 2006). Strong reactions of flexible exchange rates (tendencies to over- or undershoot the equilibrium level) to news about monetary policies or the economic outlook of countries tend to induce exchange rate fluctuations that in turn lead to a biased prediction of future inflation differentials.

Hence, in order to assess likely variations in inflation differentials when nominal rates are fixed, the first years with the floating Euro-Franc exchange rate as well as the period with the floating DM-Swiss Franc rate do not qualify as a precedent. Accordingly, we need to turn to historical evidence regarding international inflation differentials during times of fixed exchange rates. For this purpose we look at inflation differentials between Switzerland and Germany over the period of 1955 to 1970 under the system of Bretton Woods. Figure 2 shows the ratio of the two price levels over that period. It appears reasonable to assess inflationary or deflationary trends by looking at a medium range horizon. Hence, we choose annualized rates over two-year windows. The thus computed annual inflation differential between Germany and Switzerland lies between 1.6% and -2.2% (with an average of -0.3%). So what is a central bank to expect – the SNB's position in 2011 – that considers imposing a fixed (or quasi-fixed) exchange rate? In the case at hand it should consider a range for the resulting inflation differential between ±2 percentage points to be reasonable. Clearly, this proposition rests on the assumption that what held for the relationship to Germany during Bretton Woods holds for current conditions with Germany as part of the Eurozone.

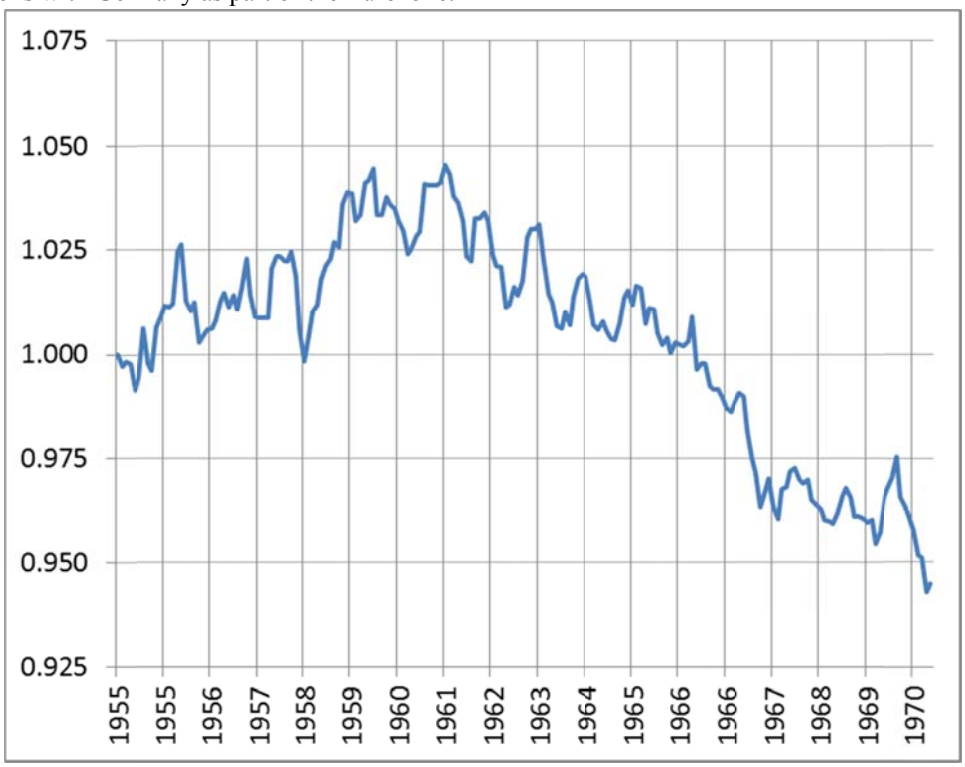

Figure 2. The ratio of the German price level to the Swiss price level: 1955-1971

Let us now look at the outcome in terms of inflation during the period of the Swiss Franc-Euro floor. Figure 3 shows the same ratio as before, i.e., the ratio of the German CPI to the Swiss CPI. Clearly, the period of the quasi-fixed Swiss-Franc Euro rate led to a decline of Swiss prices relative to German prices. On average over the period with the Euro-floor the German inflation was higher than Swiss inflation by 1.5 percent points on an annual basis. When comparing this period with the earlier period of fixed exchange rates this outcome should not have come as too much of

a surprise. Positive inflation differences between Germany and Switzerland (i.e., rates of real depreciation of the Swiss Franc) which were in the same range as during the most recent experience had been experienced earlier in history. In particular, the years 1958 to 1961 had seen a quantitatively similar trend of lower Swiss inflation, i.e., a depreciation of the Swiss Franc in real terms.

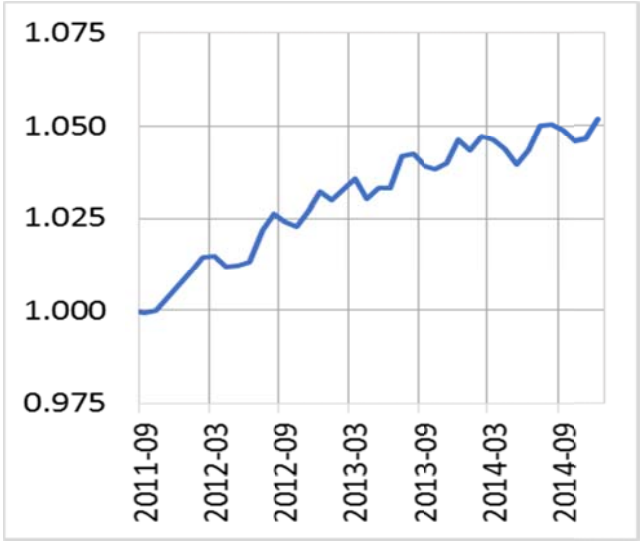

Figure 3. The ratio of the German price level to the Swiss price level: 2011:09-2014:12

3. International Inflation Differentials under a Fixed Exchange Rate

This section presents a theoretical model that suggests possible explanations for the observed negative price level trend (i.e., the real depreciation of the Swiss Franc) during the latest experience with a quasi-fixed exchange rate. The most prominent approach to explaining real exchange rate movement is the so-called Balassa-Samuelson effect (Balassa, 1964, Samuelson, 1964). The analysis suggested by Balassa and Samuelson points to international differences in productivity growth in the tradable goods sector as drivers of real exchange rate movements. The country with the higher increase in productivity tends to see domestic wages rise relative to foreign wages which in turn raises the price of non-tradables and drives up the domestic price level relative to the foreign price level. The accumulated empirical research regarding the described effect has generated mixed evidence (Peltonen and Sager, 2009). Particularly with respect to the course of the exchange rates between industrialized countries the Balassa-Samuelson approach does not offer a good explanation. Hence, we follow a different approach introducing country-specific tradable goods. Drozd and Nosal (2010) offer an account and empirical evaluation of models in this tradition.

The specific model developed here has the advantage of leading to explicit and transparent results. We consider two economies 1 and 2 – with 1 the domestic and 2 the potentially larger foreign economy possibly consisting of the several nations making up a currency zone – each producing two goods. The good indexed by 1 is the tradable good and we take each country to produce a distinct tradable good which it consumes and which, in turn, is also consumed by foreigners. Goods indexed by 2 are non-tradable goods. Thus, we have four different goods indexed by 11, 12, 21 and 22, where the first number identifies the country of origin. Utility of consumers – assuming symmetry in order to limit the number of coefficients – for the two countries is given by

$$U_1 = C_{1,11}^{\alpha} C_{1,12}^{\beta} C_{1,21}^{1-\alpha-\beta}$$

and (2)

$$U_2 = C_{2,21}^{\alpha} C_{2,22}^{\beta} C_{2,11}^{1-\alpha-\beta}, \text{ where } \alpha, \beta < 1.$$

Production uses a factor L (land or labor) available in a fixed quantity of 1 in country 1 and quantity n in country 2:

$$Q_{11} = a_{11}\sqrt{L_{11}} \quad \text{and} \quad Q_{12} = a_{12}\sqrt{1 - L_{11}}$$

and (3)

$$Q_{21} = a_{21}\sqrt{L_{21}} \quad \text{and} \quad Q_{22} = a_{22}\sqrt{n - L_{21}} \; .$$

Hence, we abstract from intertemporal trade and from capital as a factor of production. Maximizing profits in both countries determines the equilibrium levels of output and prices. Since the equilibrium prices are relative prices we are free to set the absolute price of one good and make this good the numeraire. For our purpose we choose $P_{12} \equiv 1$. The fact that prices in the model are determined up to a multiplicative constant (here chosen to be 1) implies that only the difference in inflation rates between the two countries is determined (i.e., not each country's inflation rate).[3] The equilibrium prices are

$$P_{11} = \frac{a_{12}}{a_{11}}\sqrt{\frac{2\alpha}{1-2\alpha}} \; , \quad P_{12} \equiv 1$$

and (4)

$$P_{21} = \frac{1}{\sqrt{n}}\frac{a_{12}}{a_{21}}\sqrt{\frac{2\alpha}{1-2\alpha}} \quad , \quad P_{22} = \frac{1}{\sqrt{n}}\frac{a_{12}}{a_{22}}\sqrt{\frac{2\alpha}{1-2\alpha}} \; .$$

The corresponding quantities are

$$Q_{11} = \frac{a_{11}^2 P_{11}}{\sqrt{a_{11}^2 P_{11}^2 + a_{12}^2 P_{12}^2}} \; , \quad Q_{12} = \frac{a_{12}^2 P_{12}}{\sqrt{a_{11}^2 P_{11}^2 + a_{12}^2 P_{12}^2}}$$

and (5)

$$Q_{21} = \sqrt{n}\frac{a_{21}^2 P_{21}}{\sqrt{a_{21}^2 P_{21}^2 + a_{22}^2 P_{22}^2}} \; , \quad Q_{22} = \sqrt{n}\frac{a_{22}^2 P_{22}}{\sqrt{a_{21}^2 P_{21}^2 + a_{22}^2 P_{22}^2}}$$

Whereas quantities and prices depend on the size of economy 2 relative to economy 1 (i.e., on parameter *n*) there remains no effect of the size *n* when we compute growth rate differentials for the real GDPs and the CPIs of the two countries. For the calculation of the real GDP growth and inflation rates we use the concept of the Laspeyres index.

In order to evaluate inflation differentials and their connections we consider changes in sector-productivities as drivers. In concrete terms, we model technical change in the four sectors as $a_{11} = a_{11}^0 e^{g_{11}t}$, $a_{12} = a_{12}^0 e^{g_{12}t}$, $a_{21} = a_{21}^0 e^{g_{21}t}$, and $a_{22} = a_{22}^0 e^{g_{22}t}$. When expressing the results derived from the model in terms of inflation differentials we find the following[4]

$$\Delta \ln P_1 - \Delta \ln P_2 = (1-2\alpha)(g_{22} - g_{12}) \; . \tag{6}$$

Hence, a positive inflation difference between country 1 and country 2 (i.e., a real appreciation of country 1's exchange rate) only occurs when there is a difference in the two countries' productivity growth in their sectors producing non-tradable goods. In contrast to the Balassa-Samuelson effect, the inflation differential is not affected by diverging developments in the productivity of traded goods but in the non-traded goods sectors. The country with the lower

[3] In order to economize on notation we take the share in consumption of the domestic and the foreign tradable good to be the same, i.e., $\alpha = 1 - \alpha - \beta$ and thus $\beta = 1 - 2\alpha$.

[4] E.g., inflation of country 1 is $\Delta \ln P_1 = \frac{\alpha C_{1,11,t-1}P_{11,t} + (1-2\alpha)C_{1,12,t-1}P_{11,t} + \alpha C_{1,21,t-1}P_{21,t}}{\alpha C_{1,11,t-1}P_{11,t-1} + (1-2\alpha)C_{1,12,t-1}P_{11,t-1} + \alpha C_{1,21,t-1}P_{21,t-1}} - 1$ where $C_{1,11,t} = \alpha \frac{Q_{11,t}P_{11,t} + Q_{12,t}P_{12,t}}{P_{11,t}}$.

For the sake of completeness, real GDP growth, e.g., of country 1 is $\Delta \ln Y_1 = \frac{Q_{11,t}P_{11,t-1} + Q_{12,t}P_{12,t-1}}{Q_{11,t-1}P_{11,t-1} + Q_{12,t-1}P_{12,t-1}} - 1$.

productivity growth in its non-tradable goods sector sees its inflation run higher than the other country. The country with the higher productivity growth sees its price level sink relative to that of the other country. This mechanism offers a plausible explanation for the course of the real Swiss Franc-Euro rate. In the light of historically poor Swiss productivity in the non-tradable goods sector compared with EU countries and in response to the financial crisis and the recession of 2009 several economic policies were implemented in Switzerland in order to increase productivity, particularly in the domestic sector. Productivity in the sector producing non-tradable goods of the Swiss economy was spurred by several measures. Notable political measures that were taken concerned agriculture, the health services and the construction industry (Schweizerische Eidgenossenschaft, 2013, 2015). An increase in the productivity of the domestically oriented part of the Swiss economy by 1.5 percent more than the growth in Germany is thus plausible. This is the extent of the average annual real depreciation of the Swiss Franc during the time with the Euro-floor.

4. Conclusions

The Swiss National Bank took an unorthodox measure in 2011 and introduced an exchange rate floor to prevent a further appreciation of the Swiss Franc relative to the Euro. The introduction of the Swiss Franc exchange rate floor was mainly driven by a concern for the Swiss exporting sector and the jobs involved. This step successfully stopped recessionary pressures on the Swiss economy for three years. Under the pressures invoked by the ECB's looming program of quantitative easing the Swiss National Bank in January 2015 gave up supporting a lower floor of its exchange rate relative to the Euro. The key argument by the SNB in favor of a renewed floating of the Swiss Franc was the likely prospect of a massive necessary increase in the SNB's purchases of Euros under the alternative of maintaining the exchange rate floor. This paper points to another challenge of the quasi-fixed Euro-Swiss Franc rate. Given the low inflation in the Eurozone even a currency that is subject to strong appreciation pressures can experience a real depreciation. In fact, Swiss inflation during the period of the exchange rate floor ran markedly below German inflation. We show that based on historical and analytical arguments Swiss deflation in an international environment of low inflation must be seen as a possible scenario. How, then, can the abandoning of the exchange rate floor in early 2015 which negatively affected Swiss exporters be explained in this light? We see this latter choice as driven at least in part by the deflationary pressures that built up under the exchange rate floor which, upon reflection, could have been anticipated at the time when the measure was first considered. The paper also offers a theoretical contribution with a simple computable equilibrium model of the real exchange rate. In contrast to the contributions of Balassa (1964) and Samuelson (1964) our model puts emphasis on the effects of productivity growth in the non-traded goods sectors of economies.

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Data sources: OECD, Federal Reserve Bank of St. Louis