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Currency Interventions: Effective Policy Tool or Shortsighted Gamble?

The Swiss National Bank's January 2015 decision to abandon the Swiss franc's peg to the euro led to short-term chaos in exchange markets and had a dampening effect on the Swiss economy. Some economists suggested Switzerland was poised to enter a sustained period of stagnation à la Japan. The decision also reignited policy debate on the benefits and drawbacks to central bank intervention in currency markets. While such intervention can be justified in certain situations, such as if the market is producing the "wrong rate", it can also impose significant economic costs. The ECB's recently implemented quantitative easing programme has been regarded by many as a thinly disguised attempt to weaken the euro in order to improve the eurozone's competitiveness. However, the euro's recent weakening began well before the ECB announced its programme; moreover, previous rounds of quantitative easing by other central banks have had minimal impact on exchange rates.

Keith Pilbeam

Intervention in the Foreign Exchange Market: Rationale, Effectiveness, Costs and Benefits

Prior to the move to generalised floating in 1973, the adoption of floating exchange rates had long been advocated by eminent economists such as Milton Friedman and Harry Johnson.¹ However, the experience with floating rates over the last four decades has shown that they are not the panacea that many advocates had presupposed. This has led many economists to propose schemes designed to limit exchange rate flexibility, such as John Williamson's target zone proposal.² In practice, central banks have frequently intervened in the foreign exchange market in a bid to influence the exchange rate at which their currency is traded, hence the term "managed" floating.

In this paper we look at the economic rationale behind central bank intervention in the foreign exchange market. We then proceed to discuss the effectiveness of foreign exchange intervention, making the point that the theoretical and empirical literature overwhelmingly suggests that in order to be effective in the medium term, exchange market intervention needs to be non-sterilised, that is, it

must result in a change of the domestic money supply and the short-term interest rate. Sterilised intervention, whereby the impact of the intervention on the money supply is offset by an open market intervention by the central bank, can at best have only a very short-term impact on the exchange rate. Finally, we consider two case studies of foreign exchange intervention and the associated costs and benefits in practice, namely, the cases of the People's Bank of China and the Swiss National Bank.

Managed floating

Since the advent of floating exchange rates in 1973, it has become evident that authorities have not always allowed their currencies to float freely but rather have frequently intervened to influence the exchange rate. A number of rationales have been put forward to justify such intervention. Before examining some of the most frequently used arguments for intervention, it is necessary to assume that the authorities can influence the nominal and/or real exchange rate in their desired direction; without such an assumption, no rationale for intervention can exist. Further, exchange market intervention can only be justified if it can be demonstrated that foreign exchange intervention has a superior benefit-to-cost impact when compared with other policies – or that constraints prevent the use of superior policies. In the following discussion, it should also be remembered throughout that exchange rate management

1 M. Friedman: The Case for Flexible Exchange Rates, in: M. Friedman: Essays in Positive Economics, Chicago 1953, University of Chicago Press; H.G. Johnson: The Case for Flexible Exchange Rates, 1969, in: Federal Reserve Bank of St Louis Review, Vol. 51, 1969, pp. 12-24.

2 J. Williamson: The Exchange Rate System, Institute for International Economics, Policy Analyses No. 5, Cambridge, MA 1983, MIT Press.

can vary in degree from occasional intervention in order to influence the exchange rate to a permanent pegging.

The arguments for some degree of discretionary intervention to some extent overlap, but they fall into three main categories: (i) the authorities can choose an exchange rate more in line with economic fundamentals than the market can; (ii) intervention is required to mitigate the costs of exchange rate “overshooting”; and (iii) intervention is an appropriate instrument for smoothing necessary economic adjustments.

Authorities might be able to produce a more appropriate exchange rate

For a variety of reasons, the exchange rate produced by the market may be the “wrong rate” compared to underlying economic fundamentals. The market may use the wrong model, it may have incorrect perceptions about the future and it will have difficulty in interpreting the implications of news relevant to the exchange rate. However, the fact that the market may produce the wrong rate does not justify intervention by the authorities; it is necessary to demonstrate that the authorities can choose a more appropriate rate.

There exists a case for intervention if the news or information available to the market is efficiently used, but the news itself is either inadequate – increasing risk – or misleading, and the authorities are in possession of superior relevant information. Intervention in such circumstances can prove both stabilising and profitable. However, it could be argued that a superior policy is for the authorities to abstain from intervening and instead release the relevant information to the market. Nevertheless, there may be circumstances under which such an information-release is not considered desirable, and even if the authorities were to release the relevant information, there is no guarantee that the market would believe them.

Connected with the above argument is a far more convincing reason for the authorities to intervene. While it may be the case that the authorities do not know any more than the market regarding the “correct” rate, they should know better and sooner what they themselves are about to do (in most cases!). In other words, the authorities should be more capable than the market in predicting the future course of their policies, and this is of relevance to the correct exchange rate. Given this, intervention in the foreign exchange market may be interpreted by the market as a commitment by the authorities to adopt a given course of action; if this is the case, economic agents may more readily lend their support to the new policy, helping to make it more effective, and more speedily so, than

would otherwise be the case. Thus, there exists a case for official intervention on the grounds that the authorities have better knowledge of their future policy intentions than private market participants. Official intervention in the foreign exchange market can literally “buy credibility”, convincing economic agents that the authorities intend to fulfil their stated domestic policy targets by committing the assets of the central bank in support of its declared future policy. A key postulate of the rational expectations literature is that the authorities will only be able to achieve their short-run inflation objectives painlessly if economic agents are convinced that the authorities intend to carry out their stated objectives. The opportunity to purchase some credibility by intervening in the foreign exchange market could prove to be a useful policy tool.

Intervention to mitigate costs of exchange rate overshooting

The Dornbusch overshooting model shows that a move to monetary restraint can lead to a short-run real exchange rate appreciation, while an expansionary monetary policy can lead to a real depreciation.³ These real exchange rate movements leading to over- and undervaluations in relation to purchasing power parity (PPP) will exert effects on the real economy. In what follows, we shall refer to substantial and prolonged deviations from PPP as exchange rate misalignments.

³ R. Dornbusch: Expectations and Exchange Rate Dynamics, in: Journal of Political Economy, Vol. 84, No. 6, 1976, pp. 1161-76.

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Misaligned exchange rates distort the allocation of resources between tradables and non-tradables as well as consumption patterns between the two. Undervaluation, by raising the domestic price level and placing downward pressure on real wages, may spark inflationary pressures, while overvaluation, by squeezing the tradables sector, may result in increased unemployment. Misalignment complicates and inhibits investment decisions because uncertainty as to the duration of the over- or undervaluation will affect the profitability calculations concerning whether to invest in tradables or non-tradables; such uncertainty is particularly inhibiting to marginal investment decisions.

Misalignments almost certainly exert a ratchet effect on protectionism. In periods of undervaluation of the currency, resources that would ordinarily not be viable enter into the tradables sector, but as the rate corrects itself, they come under increasing pressure and may then seek recourse to protection. Alternatively, if the currency is overvalued, this tends to lead to knee-jerk protectionist cries due to the pressure on the tradables sector. It should also be remembered that undervaluation for one currency involves overvaluation for another and vice versa, so that one could expect protectionism to be a global and persistent phenomenon so long as exchange rates are misaligned. Since an over- or undervaluation must necessarily eventually be corrected, this will involve the various adjustment costs arising because of factor immobility, both occupationally and geographically. Retraining of labour involves costs and time, and aggregate demand cannot be painlessly varied at will.

Foreign exchange intervention designed to reduce the costs and extent of exchange rate overshooting can be justified. It is worth noting that the case for intervention in this instance is not in any way due to inefficiency in the foreign exchange market. The rate produced by the market is the correct rate, but because of “sticky” goods prices, there are short-run real exchange rate changes.

Intervention to smooth the economic adjustment process

There may exist a rationale for intervention in the foreign exchange market to achieve a preferable exchange rate in the short run in order to permit a smoothing of the necessary adjustments that the economy, for various reasons, must undergo. The rationale for smoothing the adjustment process is that it is a painful process for those who have to adjust, and it is more acceptable at a controlled pace than at a market-determined pace, which can be quite abrupt.

Suppose that a country has a persistent balance of payments surplus because the traded goods sector is too

large relative to the non-traded sector. There will consequently be a tendency for an appreciation of the real exchange rate, which will encourage factors to move from the traded goods sector to the non-traded sector. If the authorities are concerned about the possibility of large transitional unemployment resulting from such an appreciation, they may try to moderate the appreciation to allow time for the traded goods sector to contract and the non-tradables sector to expand, so as to avoid what they consider to be excessive transitional unemployment costs. Corden coined the phrase “exchange rate protection” to describe an exchange rate policy whereby a country protects its tradable goods sector relative to the non-tradables sector, for example by preventing or slowing down an exchange rate appreciation that would otherwise take place.⁴ Exchange market intervention can compare favourably to other methods of protection for the purpose of slowing down the necessary adjustment, such as tariff protection. This is because exchange rate protection, which involves influencing the real exchange rate and with it the accumulation of reserves, must necessarily be a temporary method of protection, whereas tariffs and subsidies have a habit of becoming permanent features and, because of their explicit protective nature, tend to invite retaliation.

It is worth emphasising that the adjustment arguments advanced for exchange rate intervention involve smoothing the adjustment process, not preventing it. Ideally, the exchange rate should be allowed to adjust towards its equilibrium rate at an optimum pace. It is the acceptance of the principle of exchange rate adjustment that ensures that the required changes in the economy do take place.

The effectiveness of foreign exchange intervention

There has been much debate in the literature concerning the effectiveness of foreign exchange intervention in both the long run and the short run.⁵ The overwhelming theoretical and empirical evidence suggests that non-sterilised intervention to influence the domestic money supply is far more effective at moving the exchange rate in the desired direction than sterilised intervention. The difference between sterilised and non-sterilised intervention is set out below using hypothetical examples of the Swiss franc and the euro and the Polish zloty and the euro. In so

4 M. Corden: Exchange Rate Protection, in: R.N. Cooper, P.B. Kenen, J.B. Machedo, Y.V. Ypersele (eds.): *The International Monetary System Under Flexible Exchange Rates*, Cambridge, MA 1982, Ballinger.

5 See K. Pilbeam: The Relative Effectiveness of Sterilized and Non Sterilized Foreign Exchange Market Interventions, in: *Journal of Policy Modeling*, Vol. 27, No. 3, 2005, pp. 375-383.

Figure 1
Pegged exchange rate regime with intervention to prevent appreciation



Source: Author's elaboration.

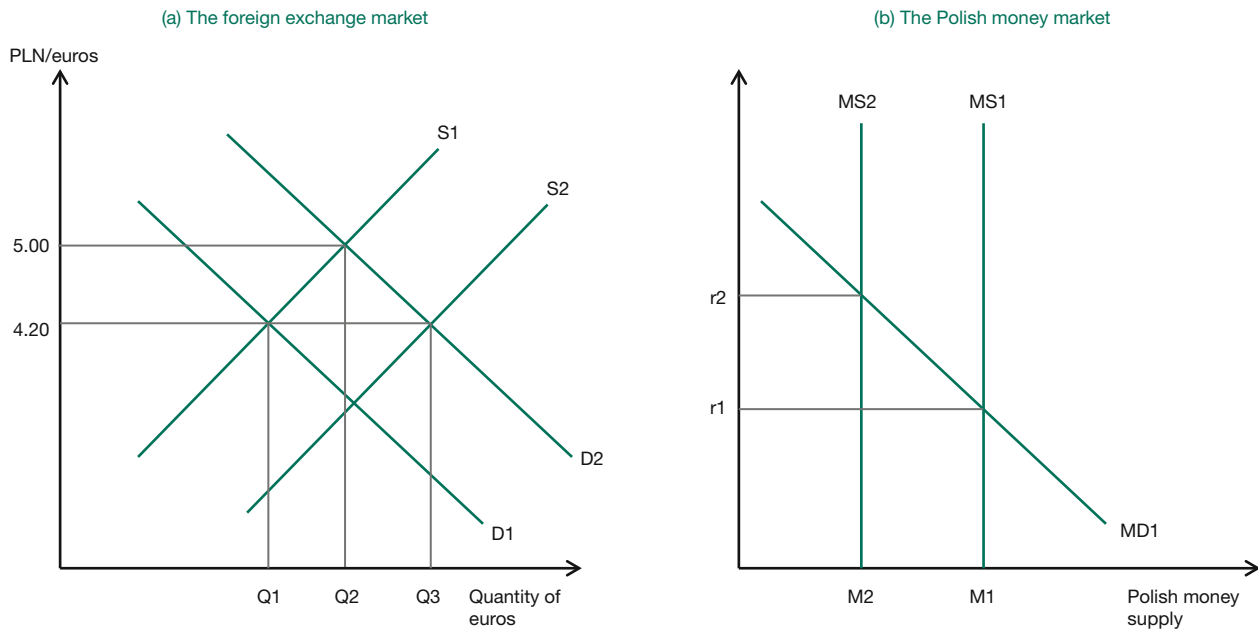
doing, we make a crucial distinction between non-sterilised intervention and sterilised intervention.

In Figure 1, the exchange rate is assumed to be fixed by the Swiss National Bank (SNB) at the point where the demand curve for euros (D_1) intersects the supply curve of euros (S_1). In Figure 1(a), the exchange rate is assumed to be fixed by the SNB at CHF 1.20/€1. If there is an increase in the supply of euros in the foreign exchange market to buy Swiss francs, the supply schedule shifts from S_1 to S_2 and there is a resulting pressure for the Swiss franc to appreciate to CHF 1/€1. To avert an appreciation of the Swiss franc, it is necessary for the SNB to buy $Q_3 - Q_1$ euros. These SNB purchases would shift the demand for euros from D_1 to D_2 . Such an intervention enables the exchange rate to remain fixed at CHF 1.20/€1.

The effect on the Swiss money market of the SNB buying euros in the foreign exchange market is to increase the Swiss money supply from M_1 to M_2 and consequently lower the Swiss short-term interest rate from r_1 to r_2 . Since buying euros in the foreign exchange market has increased the Swiss money supply from M_1 to M_2 , the intervention is of the non-sterilised type. It is likely to be very effective in weakening the Swiss franc back to CHF 1.20/€1 because it increases the amount of Swiss francs in circulation and lowers the Swiss interest rate, both of which work to weaken the Swiss franc to the desired level.

The SNB could implement the actions described above and allow its foreign exchange market intervention to increase the Swiss money supply and lower the Swiss interest rate. However, this would risk causing inflation in property, stocks, and the prices of goods and services, potentially causing the bank to overshoot its inflation target. To prevent this, the SNB might try to sterilise the effects of the increased money supply by selling Treasury bills in an open-market operation, thereby reducing the Swiss money supply in Figure 1(b) from M_2 back to the original level M_1 . The problem with doing this, however, is that the Treasury bill sales will lower the price of Treasury bills and thereby raise the Swiss interest rate from r_2 back to r_1 . The decrease in the amount of Swiss francs and the rises in the short-term interest rate resulting from the sterilisation policy would then tend to once again increase the attractiveness of Swiss francs in the foreign exchange market and induce further selling of euros (i.e. buying of Swiss francs), which by shifting the supply from S_2 further to the right would mean that the exchange rate would tend to go back towards CHF 1/€1. As the Swiss money supply and interest rate return to their levels M_1 and r_1 from prior to the foreign exchange market intervention, it is highly likely the exchange rate would also return to the CHF 1/€1 rate from prior to the intervention. Consequently, sterilised foreign exchange market intervention would be ineffective in achieving the weaker Swiss franc desired by the SNB.

Figure 2
Fixed exchange rate regime with intervention to prevent depreciation



Source: Author's elaboration.

Alternatively, consider the hypothetical case in which the National Bank of Poland (NBP) pegs the zloty to the euro at PLN 4.20/€1 but finds that there is pressure for the zloty to depreciate due to increased demand for euros, which shifts the demand curve from D1 to D2. This results in pressure for the euro to appreciate to, say, PLN 5/€1. To avert such a zloty depreciation, it is necessary for the NBP to sell Q3-Q1 of euros in the foreign exchange market to purchase zloty, as these sales would shift the supply of euros from S1 to S2. Such an intervention would strengthen the zloty against the depreciation pressures and allow the exchange rate to remain PLN 4.2/€1.

This intervention would also have effects on the Polish money market: it would decrease the Polish money supply from M1 to M2 and consequently raise the Polish short-term rate of interest from r1 to r2 in Figure 2(b). Since the sale of euros has decreased the Polish money supply, the intervention is of the non-sterilised type. Such an intervention is likely to be very effective in strengthening the zloty to PLN 4.2/€1 because it decreases the amount of zloty in circulation and raises the Polish interest rate, both of which strengthen the zloty in the foreign exchange market. Non-sterilised intervention of this type that directly affects the money supply and the short-term interest rate is very effective in moving the exchange rate in the desired direction.

The NBP could perform the actions described above and allow its foreign exchange market intervention to decrease the Polish money supply and raise Polish interest rates, but this would risk a recession, a possible fall in stock and property prices, and an undershooting the NBP's inflation target. To prevent this, the NBP might try to sterilise the effects of the decreased money supply by buying Treasury bills in an open-market operation that would increase the money supply in Figure 2(b) from M2 back to the original level M1. However, the Treasury bill purchases would increase the price of Treasury bills and lower the Polish interest rate from r2 back to r1. The increase in the zloty money supply and the fall in interest rates resulting from the sterilisation policy would then tend to shift the demand for euros (D2) to the right, such that the zloty would head back towards PLN 5/€1. As such, it is highly unlikely that a sterilised foreign exchange market intervention would be effective in achieving the stronger zloty desired by the NBP.

This raises the question as to why the central bank would wish to sterilise its foreign exchange market interventions, given that doing so would undermine its ability to achieve its desired exchange rate. Part of the answer is that the central bank may hope to have a psychological impact on market participants whilst maintaining existing monetary and interest rate targets. Moreover, knowledge that a

central bank has been intervening in the foreign exchange market – even if sterilised – might in the very short term make traders reluctant to oppose the bank. Having said this, most traders will tend to quickly discount central bank intervention unless it is of the non-sterilised type, i.e. intervention that will lead to changes in the money supply and money market interest rate.

The policy lesson is clear: if a central bank wants to influence the exchange rate, the most effective type of foreign exchange market intervention would be of the non-sterilised type, because such intervention leads to changes in the money supply and interest rates that reinforce the impact of the intervention. If the authorities decide to sterilise the impact of their interventions via offsetting open-market operations which move the money supply and interest rates back to the levels prior to the intervention, then they will most likely have no lasting exchange rate impact, since none of the fundamentals will have changed.

Intervention in practice

In this section, we briefly review the problems and issues faced by the People's Bank of China and the Swiss National Bank resulting from their attempts to prevent their currencies from appreciating in the foreign exchange market. The two cases are interesting in that the People's Bank of China (PBOC) has engaged in an unprecedented intervention over a long period of time. The SNB, on the other hand, abandoned its attempt to peg the Swiss franc at a minimum of CHF 1.20/€1 after just three years and four months, causing major market disruption in the process. When it ended the peg on 15 January 2015, the Swiss franc briefly jumped to as high as CHF 0.8/€1 before settling at slightly above CHF 1/€1.

The case of the People's Bank of China

The PBOC has been engaged in decades-long currency intervention on an unparalleled scale. Its foreign exchange reserves have risen from \$165 billion in 2000 to over \$3.8 trillion in 2015. This suggests average annual purchases of foreign currencies equivalent to over \$240 billion, and given that there are only around 250 trading days annually, it suggests purchases of close to the equivalent of \$1 billion per day. The main aim has been to prevent too rapid an appreciation of the renminbi, so as to support exports and thus promote employment in the export industries. Because the intervention has been of the non-sterilised variety, there has been a large growth in the Chinese money supply, artificially low interest rates and rapid growth of related credit aggregates. This, in turn, has fuelled a massive increase in investment, which since

2000 has averaged 43 per cent of GDP. This is the greatest amount ever recorded in history, which to some extent has been an objective of Chinese policy makers keen to bolster the Chinese economic growth rate and levels of employment.

There have, however, been serious implications of this massive foreign exchange market intervention both for China and its trading partners. Most importantly, China has become an unbalanced economy that is overly dependent on exports and investment with too little of its economic growth coming from domestic consumption (a mere 34.1 per cent of GDP 2010-14, according to the World Bank). There is also a suspicion that a lot of the domestic investment – possibly as much as a staggering \$6.8 trillion since 2009 – has been largely wasted, according to a recent Chinese study in the *Shanghai Securities News*.⁶ This means there could be a substantial amount of non-performing loans hidden in the Chinese banking system. It has also meant that there is structural surplus in the Chinese current account which has led to frequent trade-related clashes with its main trading partners, particularly the United States. In addition, since many of the dollars that the Chinese have purchased in the foreign exchange market are then invested in US Treasury bonds, it has enabled the US government to finance its record fiscal deficits at lower rates of interest and with greater ease than would ordinarily be expected. It is a strange world in which ostensibly communist China, with a GDP per capita of around \$6,800 in 2013, lends money year after year to the capitalist United States, which had a GDP per capita of \$53,000 in 2013. We have now reached a point at which the Chinese are so heavily invested in US Treasury securities that they are very concerned about programmes like quantitative easing and the ensuing risk of a spike in the US inflation rate and Treasury bond yields, which could mean large capital losses on their holdings of US Treasuries.

The case of the Swiss National Bank

The second case to consider is that of the Swiss National Bank, which became increasingly concerned about the rapid rise of the Swiss franc from CHF 1.67/€1 in November 2007 to CHF 1.10/€1 by September 2011. Such a rapid appreciation was particularly damaging for Switzerland, where over 70 per cent of GDP comes from exports. The SNB announced on 6 September 2011 that with immediate effect the SNB would not tolerate an exchange rate below CHF 1.20/€1 and that the SNB was prepared to intervene in the foreign exchange market to an unlim-

⁶ J. Anderlini: China has 'wasted' \$6.8tn in investment, warn Beijing researchers, in: *Financial Times*, 27 November 2014.

ited extent to maintain that rate. The signal to the market was clear: the SNB would engage in unlimited printing of Swiss francs to buy euros to maintain the new target rate; in other words, the intervention would be of the non-sterilised type. The market reaction was to immediately move the rate above CHF 1.20/€1, where it stayed for three years and four months.

The costs to the Swiss National Bank of trying to peg the exchange rate against the euro have been mainly in the form of a rapid expansion of its monetary base and the lowering of short-term interest rates such that they have even fallen below the zero bound. There has also been a massive increase in foreign exchange reserves, from CHF 255 billion in August 2011 to CHF 510 billion in December 2014. The latter figure is equivalent to over 78 per cent of the Swiss GDP (CHF 650 billion). As such, the benefits of the peg, such as the export-boosting undervaluation of the Swiss franc and artificially low interest rates that inflate property and stock market valuations, have increasingly been offset by the rising costs of the policy.

One major cost is the risk of large capital losses for the SNB from its holding of euro-denominated debt. Due to the SNB's ownership structure, this risk may have been a particular concern. Private shareholders own 45 per cent of the SNB, and the rest is owned by the Swiss cantons. Many of the private individuals receive dividends, and the cantons were already complaining about insufficient cash transfers from the SNB. This ownership structure is very different from most other central banks, which are basically government departments owned by the Treasury and ultimately the taxpayer.

Other costs of the SNB policy included the risk of future inflation from the rapid expansion of the monetary base and the risk that a greater appreciation would eventually be required the longer the policy persisted. The timing of the ending of the peg was undoubtedly influenced by the

fact that the ECB was likely to announce a large-scale quantitative easing programme, which by further weakening the euro would have required even more extensive money creation by the SNB and even larger increases of its foreign exchange reserves of euros.

Conclusions

There are many reasons that may justify intervention in the foreign exchange market, such as the market producing the wrong rate, a desire to reduce the economic impact of real exchange rate overshooting and as a means to slow down the process of economic adjustment. However, as discussed in this paper, it is essential to carefully weigh the costs and benefits of a foreign exchange policy over the short, medium and long term.

The overwhelming theoretical and empirical evidence suggests that foreign exchange policy can only exert significant effects on the exchange rate if it is of the non-sterilised variety. That means changes in the domestic money supply and short-term interest rates are required to exert significant exchange rate effects. In the cases of both China and Switzerland, the costs of their monetary expansions and low interest rates resulting from their foreign exchange interventions have risen over time. One sign of this was when the Chinese ended their peg to the dollar in July 2005, replacing it with a policy of heavily managed floating that was designed to prevent too rapid an appreciation of the renminbi. In the case of Switzerland, a policy designed to prevent the appreciation of the Swiss franc below a minimum of CHF 1.20/€1 became increasingly untenable, eventually resulting in a far more sudden and unexpected appreciation. The loss of credibility to the SNB, which had insisted that it would maintain the peg, may yet prove to be a major watershed, as it has signalled to financial market participants that central bankers cannot be taken at their word.

Arturo Bris

A Strong Franc: Is Switzerland the New Japan?

The decision by the Swiss National Bank (SNB) to abandon the informal peg to the euro in January 2015 was a shock to financial markets worldwide. The Swiss Market Index dropped more than ten per cent in one day, and Swiss companies lost about USD 100bn in market capitalisation as investors quickly priced in the negative impact that the decision would have on Swiss corporates. The

outlook for the economic environment in which firms were going to operate was becoming gloomy and uncertain.

There are three major features of the Swiss economy that emerged in the first half of 2015 as a result of the SNB decision: a strong currency, negative interest rates and deflation. These same features characterised Japan in the

period 1985-1990. Because of a severe appreciation of the yen in the early 1980s, the Bank of Japan implemented a massive quantitative easing programme to counter-balance the foreign pressure on the currency. The effects were devastating: massive inflation and asset bubbles, in particular a real estate bubble, with subsequent corporate defaults and unemployment. Japanese economic stagnation has been long-lasting and policymakers continue to work to overcome it.

In 1993 Japan was the second-most competitive country in the IMD World Competitiveness Rankings, behind only the United States. It also had one of the most efficient governments in the world. By 1999, however, its overall competitiveness ranking had fallen to 24th. In the most recent published rankings, Japan continues to be ranked 24th out of 60 economies. Competitiveness is defined in this context as the ability of countries to generate long-term value for its companies and citizens.

IMD's methodology assesses the competitiveness of a country according to four pillars: economic performance, government efficiency, business efficiency and infrastructure. In 2014 Japan was ranked in positions 25, 42, 19 and 7 in these categories. Thus, despite the country's high-quality infrastructure (both tangible and intangible), the efficiency of the government had deteriorated significantly because of its indebtedness, the burden of a massive pension liability and its inability to grow.

This paper analyses the future of Swiss competitiveness, in particular the prospects that Switzerland is doomed to repeat the Japanese experience from between 1993 and 2015. By 2035, will Switzerland's competitiveness be on par with that of countries similar to Belgium and Thailand currently?

We argue that stagnation is an unlikely scenario for Switzerland. We first analyse the international context in which the SNB decision of January 2015 was made and show that, contrary to what happened in Japan in the 1990s, the Swiss franc conundrum is more the result of imbalances in neighbouring economies, in particular in the euro area. Additionally, Swiss public finances are healthy enough to preserve a path of sustainable economic growth. If anything, the economic consequences of the Swiss franc appreciation (deflation, negative interest rates) will help, not hinder, Swiss competitiveness.

We also show that a sudden appreciation of the Swiss franc is not a black swan and has happened at least once before. Consequently, the Swiss economy has been and will continue to be resilient enough to cope with negative economic cycles of this type.

The Swiss economic environment in 2015

In 2014, the US dollar strengthened against 145 of 175 currencies.¹ That an importing country – in fact, the biggest importer in the world, both in absolute and relative terms – is enjoying the benefits of a strong currency seems an advantageous adjustment of currency markets. Between 2008 and 2013, global currencies have been in disarray, with unnatural relationships between the Swiss franc and the euro, the euro and the yen, the yen and the US dollar, and so on.

What we have witnessed in 2014-2015, however, is not the result of the relative strength of the US economy, but fundamentally the impact of market interventions by central banks in the US, Europe and Asia. In some cases, such interventions were not actually implemented but were only prospective – like in the euro area. Consequently, self-fulfilling market expectations regarding central bank policy have created a scenario of cheap currencies (with the exception of the dollar), massive liquidity and historically low interest rates.

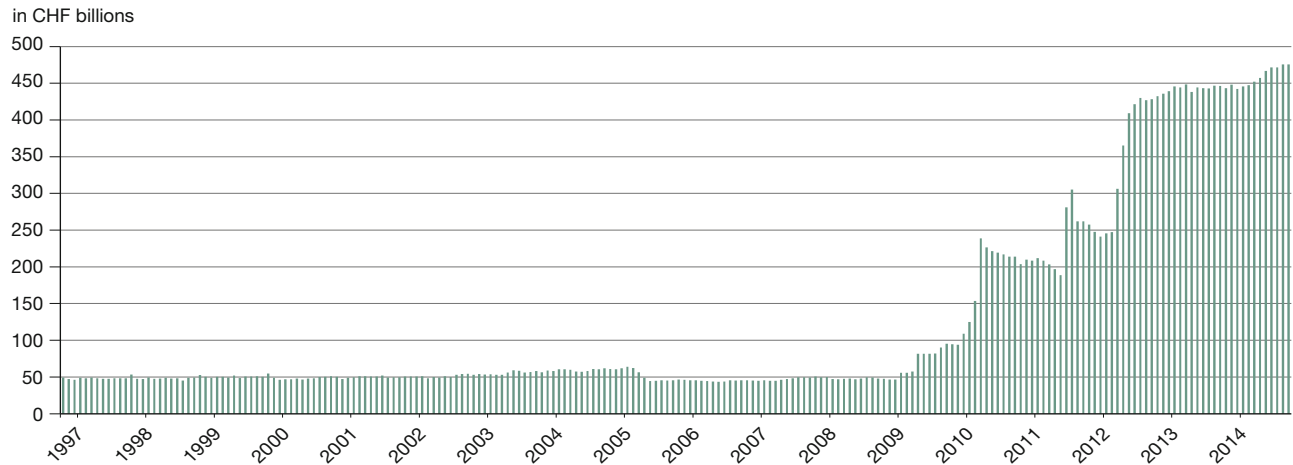
This is the context in which we must understand the decision made by the Swiss National Bank on 15 January 2015. The original peg to the euro, which was decided in September 2011 and set a floor of CHF 1.2 per euro, had forced the SNB to accumulate foreign reserves, mostly in euros. As of the end of 2014, foreign reserves in the SNB's balance sheet amounted to CHF 475bn (see Figure 1).

Most of the SNB's reserves are invested in foreign government securities. Unfortunately, because the SNB does not disclose its investment portfolio, we cannot estimate the impact of market movements on such reserves. During the last few months of 2014, there were three factors affecting the value of Swiss foreign currency reserves: expectations of quantitative easing in the eurozone, the upcoming Greek election and the economic crisis in Russia caused by the drop in oil prices and the international sanctions stemming from its invasion of Crimea.

The impact of these factors in Switzerland was twofold. First, they had forced the SNB to continue purchasing foreign assets/currencies to prevent the Swiss franc from appreciating. Second, they massively reduced the market value of the country's foreign reserves. By the end of 2014, the size of the SNB's balance sheet represented 100 per cent of Switzerland's GDP.

¹ JPMorgan Chase, Striking Facts 2015, January 2015.

Figure 1
Foreign currency reserves of the Swiss National Bank, 1996-2014



Source: SNB.

It is therefore understandable that the Swiss National Bank decided to stop supporting the Swiss franc through its purchases of foreign securities.

The impact on Swiss competitiveness

We describe above how the IMD World Competitiveness Center assesses the competitiveness of countries. The economic performance of a country, ultimately materialised in GDP per capita growth, is the result of a combination of three other factors.

The starting point for a competitive economy is an efficient government. The government's economic role should be to collect taxes, provide social services to the population, and facilitate business creation through the promotion of inclusive institutions and efficient regulation. In countries with an efficient government as well as proper infrastructure (roads and airports, but also a health system that promotes welfare and an education system that matches the needs of the labour market), companies will find an environment in which innovation and entrepreneurship are rewarded. The result is job creation, prosperity and value creation.

In this context, what are the effects of the strength of the Swiss franc on the Swiss pillars of competitiveness? As of March 2015, the Swiss economy can be characterised by three phenomena:

- Deflation. The inflation outlook has declined significantly since January 2015. The SNB forecasts inflation for 2015 of -1.1 per cent vs. a forecast of -0.1 per cent last

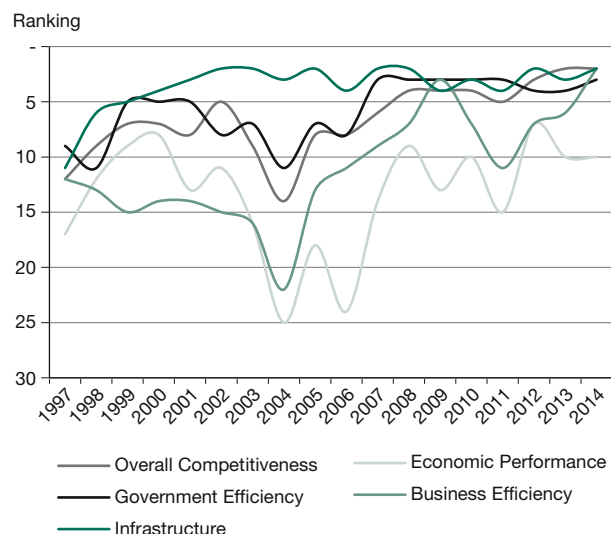
year.² It is also expected that inflation will reach its low point in the third quarter of 2015 at -1.2 per cent. Thereafter, inflation will not become positive until 2017 (0.4 per cent). Deflation is detrimental for competitiveness, as it reduces consumption and investment, negatively impacts stock markets, and reduces economic growth.

- Negative interest rates. While imposing negative rates on Swiss franc-denominated deposits is a reasonable intervention to prevent a further appreciation of the currency, it has multiple effects on competitiveness. For example, negative rates prompt institutional investors and pension funds to invest in potentially unprofitable instruments. Negative rates may also spur an increase in credit, potentially leading to real estate bubbles. On the positive side, negative interest rates encourage investors to channel Swiss francs into foreign-denominated investments, and this helps to prevent the Swiss franc from appreciating. It is also noteworthy that an environment of negative interest rates and deflation can still result in positive real rates.
- The strong franc. Switzerland is by and large an exporting, manufacturing economy. The largest Swiss exports are gold (19.92%), packaged medicaments (11.31%), and human and animal blood (6.21%).³ These are all high value-added products.

² Introductory remarks by Thomas Jordan, Chairman of the Governing Board of the Swiss National Bank, Media News Conference of the Swiss National Bank, Zurich, 19 March 2015.

³ Observatory of Economic Complexity.

Figure 2
Swiss competitiveness, 1997-2014



Note: Switzerland's ranking out of 60 countries.

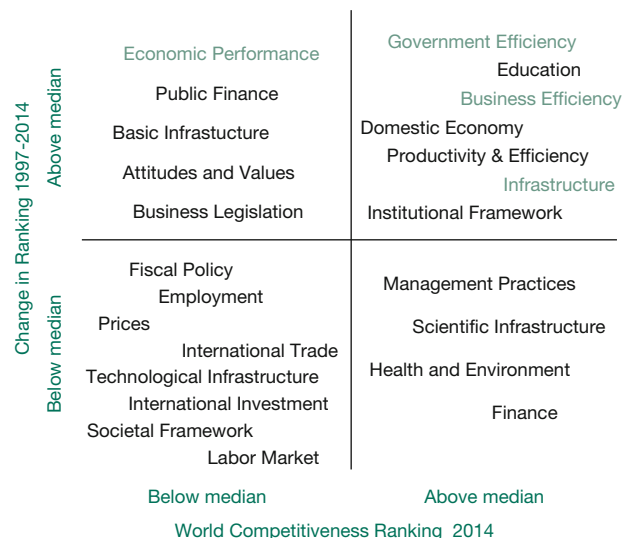
Source: IMD World Competitiveness Yearbook, 1997-2014.

To assess the economic impact of a combination of deflation, negative interest rates and a strong currency, we have collected information at the sub-factor level from the IMD World Competitiveness Yearbook from 1997 through 2014. Each of the four primary factors has five sub-factors:

- Economic Performance: Domestic Economy, International Trade, International Investment, Employment, Prices
- Government Efficiency: Public Finance, Fiscal Policy, Institutional Framework, Business Legislation, Societal Framework
- Business Efficiency: Productivity, Labor Market, Finance, Management Practices, Attitudes and Values
- Infrastructure: Basic Infrastructure, Technological Infrastructure, Scientific Infrastructure, Health and Environment, Education.

For each sub-factor, the IMD World Competitiveness Center collects data to assess and rank 60 economies. These indicators (consisting of 333 criteria in 2014) include both hard data variables (67 per cent of the indicators) and indicators from a large survey conducted among 4,000 executives worldwide.

Figure 3
Swiss competitive landscape by factor



Source: IMD World Competitiveness Yearbook, 1997-2014.

Figure 2 plots the history of Swiss competitiveness between 1996 and 2014.⁴ It can be observed how the competitiveness model is built upon a strong government and a reliable infrastructure, and in particular a high quality education and health systems.

Figure 3 summarises the results of our analysis of the strengths and weaknesses of the Swiss economy. For the period 1997-2014, we classified factors and sub-factors according to their performance relative to the median indicator of the Swiss economy. Similarly, we focused solely on the 2014 ranking and classified factors and sub-factors according to their performance relative to the median indicator of the Swiss economy. We show that Government Efficiency, Business Efficiency and Infrastructure are the drivers of the Swiss economy. All three factors improved above the median Swiss economic performance in the period 1997-2014, and they are also the indicators on which the Swiss economy outperformed in the most recent ranking.

Note that Figure 3 also details the strengths of the Swiss economy in regards to competitiveness sub-factors (Domestic Economy, Productivity & Efficiency, Education, and Institutional Framework). Conversely, the figure highlights that there are improvements required in the following sub-

⁴ Although the IMD World Competitiveness Rankings have been produced since 1990, data collected with the current methodology is only available since 1997.

Table 1
Weakest indicators of the Swiss economy

| Indicator | Rank | Change 2013-2014 |
|---|------|---------------------|
| Direct investment flows inward (\$bn) | 59 | -32 |
| Direct investment flows inward (%) | 57 | -22 |
| Cost-of-living index | 57 | -1 |
| Compensation levels (\$) | 57 | 0 |
| Remuneration of management (\$) | 56 | 0 |
| Exchange rates | 50 | 5 |
| Portfolio investment liabilities (\$bn) | 50 | 4 |

Source: IMD World Competitiveness Yearbook 2013, 2014.

factors: Fiscal Policy, Employment,⁵ International Trade, Prices, Technological Infrastructure, International Investment, Societal Framework and Labor Market.

To the extent that the relative strength of the Swiss franc will incentivise Swiss consumption abroad, it will weaken the domestic economy and exert downward pressure on prices. This will result in a more productive and efficient economy in the long run. Besides, despite the traditional orientation of the Swiss economy towards foreign markets, we observe that international trade and investment have not improved on par with the rest of the economy during the last few years. In the absence of other adjustments in the economy, we should therefore expect a further deterioration of these metrics.

The importance of Figure 3 is that it clearly shows that the competitiveness of Switzerland is based on solid pillars which are relatively unaffected by economic fluctuations and short-term shocks: education, infrastructure, productivity and efficiency.

In Table 1 below, we show the indicators (which are the constituents of the sub-factors described above) on which Switzerland ranked the lowest in 2014, together with the change in ranking from the previous year. It can be observed that even if the Swiss franc appreciation led to a further deterioration of the flows of capital into Switzerland, it could not do much worse (it was already ranked 59th out of 60 countries in 2014). A similar observation applies to Exchange Rates (a survey indicator that assesses whether exchange rates “help the competitiveness of the country”). Additionally, and to the extent that deflation will be prevalent in the months to come, we should only expect that the

⁵ Employment in the World Competitiveness Yearbook refers to the percentage of the population working relative to the total population, so it should not be interpreted as an inverse measure of unemployment.

cost-of-living indicator, compensation levels and the remuneration of managers (which are currently drags of Swiss competitiveness) will improve.

In summary, our assessment for Switzerland within the 2015-2016 IMD World Competitiveness Rankings is not particularly pessimistic. While several indicators of the country’s economic performance will deteriorate, others will improve. And in any case, Switzerland’s competitiveness rests on pillars that are independent of economic fluctuations.

Old Switzerland vs. New Switzerland

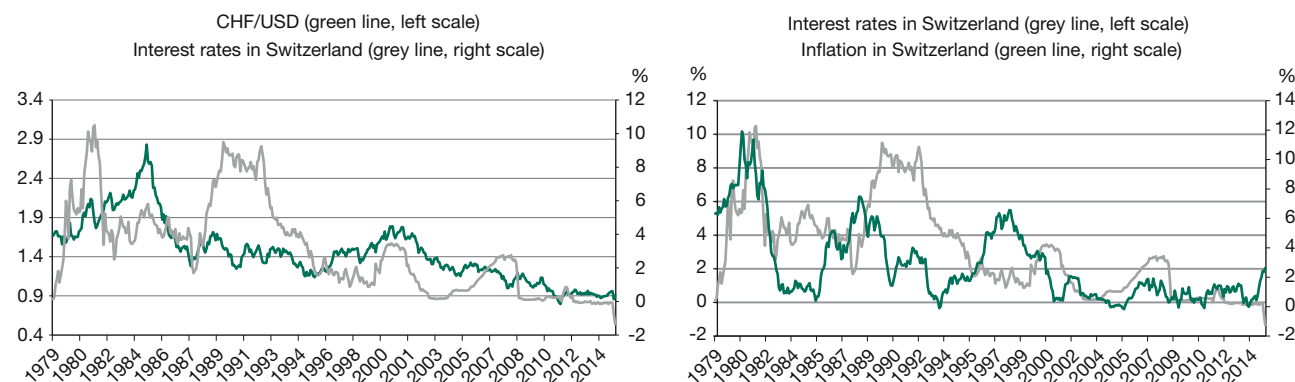
Our discussion above has described the prospects of the Swiss economy in the context of the extraordinary circumstances of the world economy. In this section we show that, except for the fact that interest rates have never been negative in the history of the Swiss National Bank, the current economic circumstances are not exceptional.

Figure 4 depicts the performance of exchange rates, interest rates and inflation in Switzerland in the period 1979-2014. Between September 1979 and January 1985, the Swiss franc appreciated from USD 1.55 to USD 2.67. This followed a massive quantitative easing programme by the SNB coupled with lower interest rates, ultimately triggering a severe property bubble, which in turn forced the SNB to raise interest rates to ten per cent by 1990. The property bubble was of course accompanied by massive inflation, which peaked at more than seven per cent in 1989, as shown on the right side of Figure 4.

In other words, the Japanisation of the Swiss economy already occurred, but in 1985, not in 2015. More importantly, instead of following the path that Japan followed in the 1990s, the Swiss economy was resilient enough to restructure itself. By 1997 Switzerland was already ranked 12th in the IMD World Competitiveness Rankings, up from the 20th position in 1990.

Figure 4 can also be read in the context of the macro events of the last five years. As the SNB has stated several times in the last few months, when the decision to intervene and maintain an exchange rate floor of CHF 1.2/EUR 1 was announced in September 2011, the international context was much worse than it is now. Ireland had been bailed out in December 2010, and the US Federal Reserve had begun its second quantitative easing programme. Therefore, the pressure on the Swiss franc at that time was coming from both sides of the Atlantic (and not just from eurozone). Nonetheless, the question of whether the current conditions would be better had the SNB not intervened remains open.

Figure 4
Exchange rates, interest rates and inflation in Switzerland, 1979-2014



Source: Datastream.

Conclusion

This paper argues that Switzerland is suffering the effects of a currency war in which Switzerland is not one of the combatants. Currently, in an environment of a strong dollar and a weak euro, the US is partly satisfied because this allows oil prices – which are priced in dollars – to remain low (which gives the US a geopolitical advantage vis-à-vis Russia and Saudi Arabia) and makes imports of raw materials to the US inexpensive. For the eurozone, a weak euro is great for exporting countries, such as Germany, and it will allow Southern European economies to improve their domestic demand. Moreover, a strong euro is not sustainable in the long run if it requires higher interest rates and leads to a loss of competitiveness. Switzerland is caught in the middle because it prefers a strong euro (which allows it to be more competitive with respect to its major trading partner) and a weak dollar (Switzerland is an oil importer).

Any monetary intervention by the Swiss National Bank in the near future is currently unlikely, since the SNB has clearly lost its credibility by abandoning the Swiss franc's peg to the euro. Given the size of the Swiss economy, Switzerland is not in a position to start a currency war with the US. The Swiss franc is not yet a “big currency” in world markets, especially compared to the dollar, euro, yen and renminbi. Therefore, the chances of the Swiss franc destabilising currency markets are slim.

Consequently, the near-term prospects for the Swiss economy are deflation and a slowdown, at least in 2015. For the most part, companies will resort to cost-cutting and trying to become more efficient rather than shedding staff. Switzerland has proven to be an innovative country and should weather this storm in the long run. Unlike Japan in 1985-1995, the prospects of a prolonged stagnation of the Swiss economy are slim.

Cinzia Alcidi, Mikkel Barslund, Willem Pieter De Groen and Daniel Gros

The Fall in Long-term Interest Rates: Quantitative Easing Effect or Trend?

When it was finally announced in January, there was little suspense left: the ECB will pursue quantitative easing (QE) starting March 2015 to the tune of €60 billion per month for at least 19 months. The announcement had been expected for some time, even if the size of the intervention was somewhat larger than expected. It follows through on President Mario Draghi's intentions, laid out in September 2014, of adding €1 trillion to the ECB's balance sheet. The ECB now joins the central banks of

other major developed currencies in what can no longer be called “unconventional measures”. The Bank of Japan (BoJ) has conducted monetary policy this way in several rounds since 2001. The US Federal Reserve embarked on the first of its three QE rounds in 2008 with its programme of large-scale asset purchases aimed at driving down the yields at longer maturities. In the spring of 2009, the Bank of England began transactions within its asset purchase facility programme.

The motivation for the recent ECB actions have been largely debated and should be found in the eurozone's prolonged weak recovery and very low inflation, with headline numbers entering the territory of outright deflation. With short-term policy rates already at the zero lower bound (or lower) and a disappointing take-up of the cheap bank funding under the longer-term refinancing operations programme, the outright purchase of government and private securities, that is QE, was a logical – if not uncontroversial – next step.

The question commanding the most attention now is: will it have an effect on the real economy?

The initial impact (i.e. news effect and/or discounting expectations) on financial markets appears substantive for both long-term interest rates and currency exchange rates. A lower value of the euro relative to other large currencies will benefit European companies in international competition. However, the euro began its slide against the dollar in the fall of 2014, making it unclear how much of the recent drop is the doing of QE. Lessons from previous episodes of QE are diverse. The dollar nominal effective exchange rate appreciated around the announcement of the initial QE in the US, while the moves later on were ambiguous and significantly smaller: depreciations around the announcements of QE2 and QE3, and appreciation around the announcement of the “operation twist”. The most recent Japanese announcement of quantitative and qualitative monetary easing caused the yen to depreciate, but past episodes of QE had no unambiguous effect on the currency. The impact of the Bank of England's asset purchases was also ambiguous. The first QE was associated with a small depreciation of the pound sterling, while a small appreciation materialised at the time of the second QE.

In general, in a context of high policy “activism”, it is quite natural to attribute asset price movements to changes in the monetary stance. However, in reality they may also merely constitute a swing around fundamental trend values. This piece focuses on this point. We start with the observation that when looking at global trends for long-term interest and exchange rates over a long period, it emerges that large asset purchase programmes led by the US Federal Reserve and the Bank of England have not resulted in fundamental shifts in financial prices. In particular, a downward trend in long-term interest rates has been present since the early 1990s. This is to some extent at odds with economic literature focusing on episodes of QE which suggests that QE policies in Japan, the US and the UK had an impact on long-term interest rates and hence on key macroeconomic variables – although the findings indicate that the magnitude of the ef-

fect is very small in some specific cases and in general uncertain.

The transmission channels of QE

Broadly speaking, QE can be said to work directly by flattening the yield curve. In particular, the purchase of longer-dated government or private securities will compress long-term interest rates. Lower interest rates should induce private spending, thereby affecting income and inflation expectations. The effect of QE programmes on interest rates can be channelled by different transmission mechanisms, which in some cases can have a direct effect on the real economy, e.g. equity prices. Figure 1 illustrates these channels, which include expectations (confidence), learning about future policies (policy signalling), reallocation of portfolios towards alternative assets (portfolio rebalancing), direct injection of liquidity, increase in money through the credit multiplier and exchange rates.¹

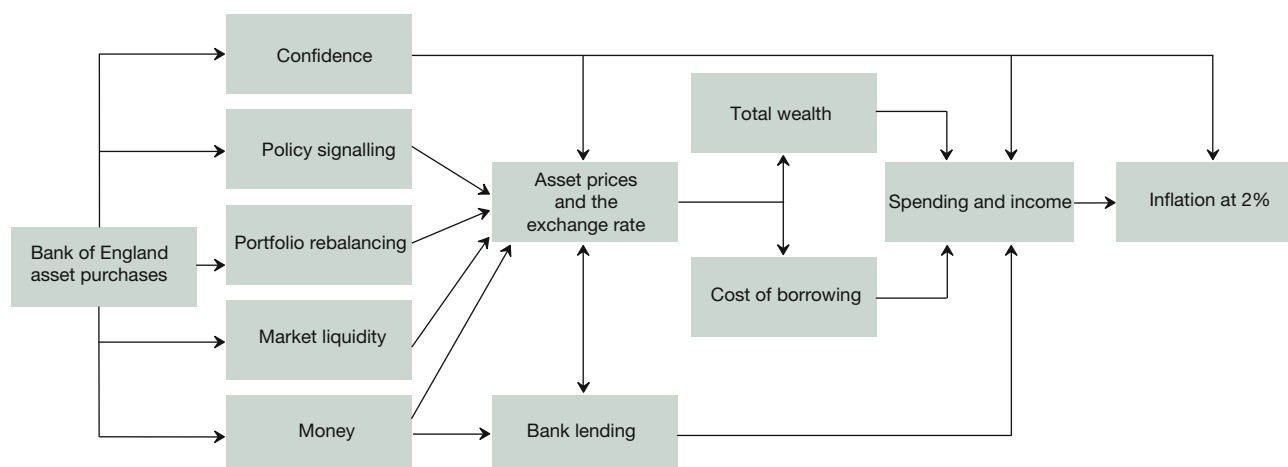
To what extent has QE had an effect? A survey of the literature

In practice, it is very difficult to disentangle the effects of QE on prices, i.e. interest and exchange rates, and even more difficult to assess its wider macroeconomic effects. Unscrambling causal effects is complicated by two factors which have to do with timing: first, there may be substantial lags in the transmission from financial market variables (say, long-term interest rates) to increased spending and general effects on the real economy. Second, expectations play a significant role in determining prices on financial markets. Some effects of QE on prices may show up well before the policies are instated if financial markets anticipated a QE programme before it was formally announced. This explains why the literature on the topic has flourished in recent times but has remained focused on specific episodes, despite the fact that the debate on unconventional monetary policy operations has become global.

As illustrated by the overview of the literature presented below, the size of the impact of QE on the real economy varies significantly across countries or regions, depending on the time of its implementation, and is characterised by high uncertainty. There are two main sources of uncertainty when trying to estimate the effects of QE on the economy. First and foremost, a host of factors will have been affecting the economy during the crisis period (when most QE programmes are launched). It is extremely

¹ M. Joyce, A. Lasaosa, I. Stevens, M. Tong: The Financial Market Impact of Quantitative Easing in the United Kingdom, in: *International Journal of Central Banking*, Vol. 7, No. 3, 2011, pp. 113-161.

Figure 1
QE transmission channels



Source: Adopted from M. Joyce, A. Lasaosa, I. Stevens, M. Tong: The Financial Market Impact of Quantitative Easing in the United Kingdom, in: *International Journal of Central Banking*, Vol. 7, No. 3, 2011, pp. 113-161, here p. 201.

difficult to disentangle them and isolate the effects of unconventional monetary policy. Second, most estimation methods require “heavy” assumptions (e.g. about transmission mechanisms at work) that can dramatically affect the results.

Before looking into specific findings, it is worth noting that a lot of emphasis in the QE literature is on long-term rates. Besides the fact that reducing long-term interest rates is an explicit objective of certain central banks’ QE policies (e.g. those of the BoJ and the Fed), such rates are key transmission channels between QE policies and the real economy. In relation to this point, Rudebusch et al. show that although there is no structural relationship between the term premium and GDP; a reduced-form empirical analysis supports the existence of an inverse relationship between the term premium and real economic activity.²

The main findings of the literature are summarised below by looking at the experience of individual countries.

The impact of QE in Japan

Japan was the first to introduce a QE programme in 2001, and it has had a long experience with QE. During the period 1999-2001, before the introduction of QE, the BoJ had followed a zero interest rate policy. However, when the dotcom bubble burst, the Japanese economy was hit by another negative shock and the risk of deflation emerged

again. At that moment, it seemed necessary to respond to it with some policy innovation. The BoJ embarked on the purchase of Japanese government bonds as the main instrument for increasing reserves of financial institutions. The BoJ exited QE in March 2006 amid signs that deflation risks were fading. It is interesting to note that during that period, the central bank directly purchased only a limited amount of government securities. The largest amount of these securities was bought by the postal offices, which at that time were owned by the government. As a response to the global financial crisis, in 2008 the BoJ re-launched its government bond purchases and adopted a number of unconventional measures to promote financial stability. In October 2010, the BoJ introduced its comprehensive monetary easing policy, which differs from the typical QE programmes of other central banks by including purchases of risky assets in an effort to reduce term and risk premia and to respond to the re-emergence of deflation and a slowing recovery. The most recent and largest asset purchase programme was started in 2013 as the second arrow of “Abenomics”. Despite such a long reliance on this policy tool, the jury is still out on QE. Research on the effectiveness of Japan’s quantitative easing experiences has yielded mixed results, and most of them point to very limited effects on economic activity.

Ugai offers an interesting survey of the empirical studies looking into Japan’s QE experiences.³ His overview suggests that there is a certain consensus that QE helped reduce yields, but its effect on economic activity and infla-

2 G.D. Rudebusch, B.P. Sack, E.T. Swanson: Macroeconomic Implications of Changes in the Term Premium, in: *Federal Reserve Bank of St. Louis Review*, Vol. 89, No. 4, July/August 2007, pp. 241-69.

3 H. Ugai: Effects of the Quantitative Easing Policy: A Survey of Empirical Analyses, *Monetary and Economic Studies*, March 2007.

tion was found to be small in all studies. The survey also indicates that the BoJ's commitment to maintain the QE policy shaped expectations towards a lasting zero interest rate, thereby lowering the yield curve. By contrast, the results are mixed as to whether an expansion of the monetary base and changes in the composition of the BOJ's balance sheet led to portfolio rebalancing. Moreover, those studies focusing on QE's transmission channels find that QE created an accommodative environment for corporate financing, in particular by containing financial institutions' funding costs and staving off funding uncertainties. Nonetheless, the effects on demand and inflation are found to be limited, most likely due to a dysfunctional banking sector, which impaired the functioning of the credit channel, and to the banks' deleveraging.

Berkmen revisits the question of whether QE and other unconventional monetary easing measures in Japan have been effective, extending the period of analysis to 2010.⁴ His empirical analysis shows some evidence that between 2008 and 2010 monetary easing supported economic activity only feebly and that it supported inflation to an even lesser extent. Similarly to Lam,⁵ Berkmen finds that QE in 2008-2010 had no statistically significant impact on inflation expectations. While the impact on demand was weak, it appears that this episode was more effective than the previous experience, possibly due to improvements in the banking and corporate sectors. This finding is consistent with the results from Baumeister and Benati, who suggest that the monetary policy transmission mechanism may have been stronger relative to the early 2000s, but Japan's stable inflation expectations and relatively flat Phillips curve inhibited the effect of monetary measures on the real economy.⁶ Berkmen also points out that no evidence emerges that the 2008-10 QE had an effect on the exchange rate, leading to the conclusion that other channels transmitted the effect to the real economy.⁷

The impact of QE in the US

Between December 2008 and March 2010, the US Fed purchased more than \$1.7 trillion in assets as part of the so-called QE1 programme. This represented 22 per

cent of the \$7.7 trillion stock of longer-term agency debt, fixed-rate agency mortgage-backed securities (MBS), and Treasury securities outstanding at the beginning of the programme. In November 2010, the Fed announced a programme to purchase \$600 billion of long-term Treasury securities. The programme's goal was to boost economic growth and bring inflation to levels more consistent with the Fed's maximum employment and price stability mandate.

As explained earlier, the long-term interest rate is the key variable which enables the linking of the QE policy to the real economy. Using this as a starting point, Gagnon et al. measure the amount of duration the Fed removed from the market by rescaling the Fed purchases using the concept of "ten-year equivalents", or the amount of ten-year par Treasury securities that would have the same duration as the portfolio of assets purchased.⁸ Between December 2008 and March 2010, the Federal Reserve purchased more than 20 per cent of the total stock of ten-year equivalents across the three asset classes mentioned above (longer-term agency debt, fixed-rate agency MBS and Treasury securities) outstanding at the beginning of the programmes. This reduced the supply to the private sector of assets with long duration and increased the supply of assets (bank reserves) with zero duration. This affected the risk premium on the assets being purchased and triggered portfolio rebalancing effects.

Gagnon et al. stress that the purchases of MBS posed the greatest operational challenge to the Fed, owing to their more complex nature and their heterogeneity compared to Treasuries, but most likely also produced the most important results.⁹ As the purchases of MBS and agency debt began at a time when liquidity in these markets was poor and the spreads of their yields to Treasury yields were unusually wide, the Fed's purchases helped to improve market liquidity by providing a large buyer for these securities on a consistent basis. As a result, yields narrowed relative to Treasury yields. The authors conclude that the overall size of the reduction in the ten-year term premium appears to be somewhere between 30 and 100 basis points. While the effects appear to have spread from Treasury securities to corporate bonds and interest-rate swaps, the most noticeable impact was in the mortgage market, and the effect was even more powerful on longer-term interest rates on agency debt and agency MBS.

4 S.P. Berkmen: Bank of Japan's Quantitative and Credit Easing: Are They Now More Effective?, IMF Working Paper No. 12/2, International Monetary Fund, Washington DC 2012.

5 R.W. Lam: Bank of Japan's Monetary Easing Measures: Are They Powerful and Comprehensive?, IMF Working Paper No. 11/264, International Monetary Fund, Washington DC 2011.

6 C. Baumeister, L. Benati: Unconventional Monetary Policy and the Great Recession: Estimating the Macroeconomic Effects of a Spread Compression at the Zero Lower Bound, in: International Journal of Central Banking, Vol. 9, No. 2, 2013, pp. 165-212.

7 S.P. Berkmen, op. cit.

8 J. Gagnon, M. Ruskin, J. Remache, B. Sack: Large-Scale Asset Purchases by the Federal Reserve: Did They Work?, Federal Reserve Bank of New York, Staff Report No. 441, March 2010.

9 Ibid.

Baumeister and Benati assess the effect of a compression in the long-term yield spread, on both output growth and inflation, induced by central banks' asset purchases within an environment in which the policy rate is constrained at the zero lower bound.¹⁰ In the case of the Fed's initial QE programme, the model simulations, based on a counterfactual analysis, suggest that in the absence of policy interventions, the US economy would have been in deflation until the third quarter of 2009, with annualised inflation rates as low as -1 per cent. Real GDP would have been 0.9 percentage points lower, and unemployment would have been 0.75 percentage points higher, reaching a level of about 10.6 per cent in the fourth quarter of 2009.

Chung et al. find effects which are also not negligible.¹¹ Based on counterfactual model simulations, they find that the past and (at that time) projected expansion of the Federal Reserve's securities holdings were roughly equivalent to a 300 basis point reduction in policy interest rates (from 2009 through 2012). Model simulations suggest that such stimulus kept the unemployment rate 1.5 percentage points lower by 2012 than what it would have been absent the purchases. The authors also argue that the asset purchases probably prevented the US economy from falling into deflation.

Liu and Mumtaz, by using a change-point VAR model, estimate that the Fed's first asset purchase programme reduced ten-year spreads by an average of 90 basis points over the crisis period.¹² Without the programme, they estimate that the unemployment rate would have been 0.7 percentage points higher and inflation, on average, one percentage point lower in 2010.

Chen et al. focused only on the second large asset purchase programme (QE2) and, based on simulations run in an estimated medium-scale DSGE model, conclude that the effects of the policy on GDP growth and inflation were moderate but had a lasting impact on GDP.¹³ They argue that the reason asset purchase programmes are in principle effective at stimulating the economy is the existence of limits to arbitrage and market segmentation between short-term and long-term government bonds. Indeed, unlike QE1, the QE2 period did not ex-

perience the high financial turbulence that could encourage stronger financial segmentation. Accordingly, their data provide little support that such frictions are pervasive. For this reason, the overall effects on GDP growth are estimated not to exceed half a percentage point, and the inflationary consequences of asset purchase programmes are even smaller. In the exercise, the authors also assess the effect of higher financial fragmentation. Their results indicate that this would have a larger impact on real GDP, but it is much smaller than the results found in the studies by Baumeister and Benati and Chung et al., which use different methods and assumptions regarding the risk premium.¹⁴ In particular, Cúrdia and Ferrero find that the effect of QE1 on GDP growth and inflation increases significantly when combined with a commitment to keep interest rates low for some period of time.¹⁵ This would suggest that the magnitude of programme effects depends greatly on expectations for interest rate policy. They also add that these effects are weaker and more uncertain than the effects of conventional interest rate policy. This would imply that communication about future rates could have stronger effects than guidance about the exit from QE.

The impact of QE in the UK

When looking at that experience of the UK, most of the existing studies have tried to estimate the impact of QE following model-based approaches and have focused on the first round of purchases, up to 2011. They quantify the impact on GDP and inflation, simulating the effect of a fall in longer-term government bond yields or of an increase in the money supply. The Bank of England provides an overview of the studies on the subject matter and adds some new results.¹⁶

The common starting point is that the peak impact of QE on ten-year gilt yields is estimated at about 100 basis points. In econometric models like structural VAR and times series approaches, this translates into an increase in the GDP of about 1.5 percentage points and around a one percentage point increase in inflation. In the context of a monetary approach, the Bank of England asset purchase programme also leads to a one percentage point increase in inflation but to larger estimated increases in GDP of about two percentage points. Lastly, when trying to account for the portfolio rebalancing effect induced by monetary easing, the effect on asset prices and thus demand translates into a peak impact on GDP of 1.5-2.5

10 C. Baumeister, L. Benati, *op. cit.*

11 H. Chung, J-P. Laforde, D. Reifschneider, J.C. Williams: Have We Underestimated the Likelihood and Severity of Zero Lower Bound Events?, unpublished paper, Federal Reserve Board and Federal Reserve Bank of San Francisco, 2011.

12 P. Liu, H. Mumtaz, K. Theodoridis, F. Zanetti: Changing Macroeconomic Dynamics at the Zero Lower Bound, manuscript, 2013.

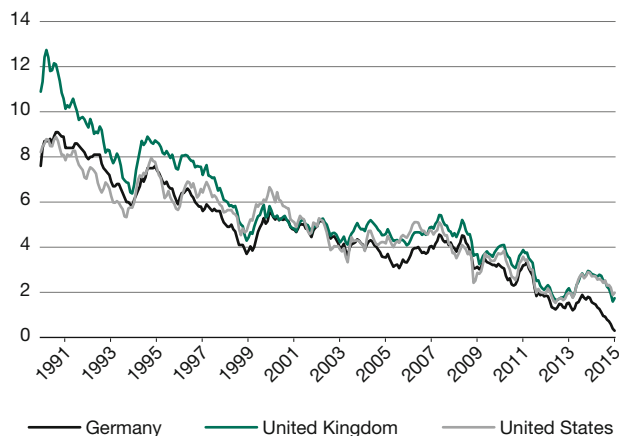
13 H. Chen, V. Cúrdia, A. Ferrero: The Macroeconomic Effects of Large-Scale Asset Purchase Programs, Federal Reserve Bank of San Francisco Working Paper 2012-22, October 2012.

14 C. Baumeister, L. Benati, *op. cit.*; H. Chung et al., *op. cit.*

15 V. Cúrdia, A. Ferrero: How Stimulatory are Large-Scale Asset Purchases?, Federal Reserve of San Francisco Economic Letters, August 2013.

16 M. Joyce et al., *op. cit.*

Figure 2
Ten-year government bond yields, 1990-2015



Source: OECD.

percentage points. As clearly acknowledged by Joyce et al., while all estimates are significant, they are also highly uncertain, as none of the methods are able to capture in a proper fashion the transmission channels at work.¹⁷

Baumeister and Benati proposed counterfactual estimates of QE for the year 2009, for which they assume that the spread was 50 basis points higher than it has historically been. They find that without QE, the UK would have fallen into deflation (-4 per cent) and in recession with a trough of -12 per cent at an annual rate in the first quarter of 2009.¹⁸

It is interesting to note that the literature above focuses only on the first period of QE. The UK did not have clearly distinguished rounds of QE like the US, but in October 2011 the programme was expanded after about a year of maintenance. If the findings of Chen et al. about different rounds of QE in the US were to apply also to the UK, one could argue that the significant impact on the real economy is not independent from the conditions in financial markets in 2009.¹⁹

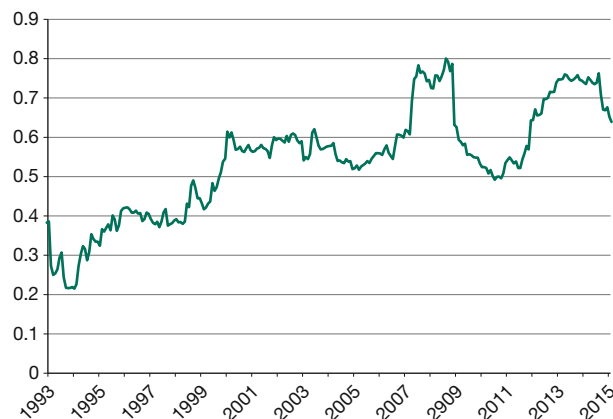
To summarise, in the case of Japan it emerges that the first QE was ineffective vis-à-vis the real economy, and the second QE had just a very small effect on demand and none on inflation. In the case of the US, evidence suggests that QE1 was the most effective in terms of unemployment and inflation, while QE2 was far less ef-

¹⁷ M. Joyce et al., op. cit.

¹⁸ C. Baumeister, L. Benati, op. cit.

¹⁹ H. Chen et al., op. cit.

Figure 3
Correlation of monthly yield changes between US treasuries and German bunds



Note: Correlations are calculated on a three-year rolling basis ending at the date shown.

Source: Own calculations based on OECD.

fective. In the case of the UK, most studies seem to suggest that the effects were economically significant both on GDP and inflation in the first phase of the programme (until 2011), but the uncertainty around the magnitude of the impact is considerably high.

Development of long-term interest rates

As noted above, inferences about the effects of QE are highly uncertain. However, based on the literature review, an effect on the long-term interest rate of no more than 100 basis points seems to be a central figure which shows up in the assessments of QE in both the UK and the US. In order to have a longer-term perspective of the behaviour of interest rates and highlight the shock induced by QE policies, Figure 2 plots the yields of ten-year government bonds for the UK, US and Germany beginning in 1990 and covering the “Great Moderation” period and the financial crisis until the present.

Three findings stand out. First, there is a clear secular downward trend, which has reduced the yield on German bunds from around nine per cent in 1990 to close to zero today. On average, long-term interest rates have fallen by approximately 40 basis points per year during the period shown. This implies that the impact of QE should appear as a reduction larger than the average trend rate of reduction. Secondly, note that Germany was already close to the zero lower bound for longer-dated government bonds before the start of the ECB purchase programme. Thirdly and most importantly, until rather recently long-term in-

interest rates in the three regions moved in lock-step with one another. This is particularly the case for the periods in which the US Fed and the Bank of England have intervened with asset purchases. As shown in Figure 3, the correlation between the monthly changes in the yields of German bunds and US treasuries increased from 2009 through early 2014.

Hence a natural question arises: if QE was successful in compressing long-term interest rates, should not one have observed a divergence between US and German rates? In order to address this question, a systematic and thorough econometric analysis is needed, yet such a fact could provide an explanation for the behaviour in exchange rates. The limited impact of QE on US yields relative to German yields, given the existing long-term trend, may help to explain why QE had no uniform impact on exchange rates. A widening of the differences in yields would be expected to affect exchange rates. In reality, the dollar effective exchange rate moved little, the yen depreciated and the pound sterling appreciated. The view that QE had little impact on yields in the US, the UK and Japan (relative to Germany) is also compatible with the observation that inflation rates have not increased in a sustained manner after QE.²⁰

Conclusion

It is too early to make an assessment of the effect of the ECB's decision to undertake a QE programme. The initial impact has apparently been successful in achieving the goals of reducing long-term interest rates and of an exchange rate depreciation. Nonetheless, it is not clear how much of it is a direct effect of QE. The euro's path of depreciation precedes the ECB's QE announcement. Lessons from individual QE episodes in Japan, the US and the UK do suggest that the long-term effects of such policies are positive. However, a comparative look at the behaviour of long-term interest rates in the US and Germany indicates that the Fed's QE had little effect on US long-term yields relative to German yields. A similar observation holds for exchange rates. The case of the recent ECB asset purchase programme, which is being associated with a depreciation of the euro and falling long-term rates relative to those of the US, seems to suggest a different story. If this is the first time QE succeeds in shifting expectations permanently, it would be quite welcome.

²⁰ C. Alcidi, W.P. De Groen, D. Gros: Lessons from Quantitative Easing: Much ado about so little?, Paper prepared for the European Parliament, 2015.