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Deflation and Monetary Policy: A look into Japan and the Euro Area

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Abstract

With more than two decades of weak economic performance since the bubble burst in the '90s, the Japanese deflationary scenario has become the economic fate every developed economy fears to become. As the euro area continues to experience sustained low inflation, studying the Japanese monetary policy may shed light on how to prevent persistent deflation. Using an SVAR methodology to understand the monetary transmission mechanism, we find some evidence that the euro area may possess characteristics that would eventually lead to a deflationary scenario. The extent of whether it would suffer the same Japanese fate would depend on how macroeconomic policies are timely coordinated as a response to its liquidity problem and increasing public debt across member states.

Keywords: deflation, monetary policy, svar, zero interest rate policy, quantitative easing policy

1 Introduction

For the past 20 years, Japan has been characterised by slow growth, rising unemployment, and deflation. This deflationary phenomenon continues to stimulate debates of what went wrong in Japan, whether monetary policy has become impotent in improving the country's economic performance and how to escape from stagnation. Therefore, this study aims to understand the Japanese monetary policy in light of its deflationary experience by evaluating its interest rate targeting policy and quantitative easing (QE) policy after the bubble burst of the '90s.

Meanwhile, the recent decline of inflation measures across the euro area[1] has increased fears of a deflationary spiral[2], just as the Japanese case. The region continues to struggle in reviving its stagnating economy since the aftermath of the 2008 global financial crisis followed by the euro debt crisis. A recent report from the Organization for Economic Cooperation and Development (OECD, 2014) articulated that deflation risks in the euro area have risen, and the European Central Bank (ECB) should keep its interest rates at near zero over the medium term to cope with it. Likewise, BBVA's 2015 first quarter global economic outlook found that the European Monetary Union (EMU) has a greater risk of experiencing a deflationary spiral than the US by comparing the debt-deflation tension indicators[3] of the two economies with Japan. Using a money-based early warning model in analysing the risk of a low inflation regime in the euro area, Japan, and the US, Amisano et al (2014) found that risks of a low inflation regime in the euro area have been increasing in the last six quarters of the sample from 1992 to 2012.

As the euro area continues to fall short of its inflation rate target, measures to accommodate monetary policy away from a sustained deflationary scenario is an important aspect policymakers should look into, as well as strengthening other macroeconomic policies that would harness a stable and continuous economic recovery. The Japanese economy is evidence that once the economy is posed to a deflationary scenario, the process to economic growth will be difficult to reverse. On the other hand, the United States deflation case (during the Great Depression and the Great Recession) has shown that it is possible to avoid a Japanese-style deflation. Therefore, this study also aims to look at whether the similarities or differences

[1] The aggregated euro area official statistics have used different definitions of the euro area as an entity. However, the euro area wide model database (Fagan, Henry and Mestre, 2001) we used employs a fixed composition (using the same group of countries throughout all periods) of the euro area with 19 members including Belgium, Germany, Ireland, Greece, Spain, France, Italy, Cyprus, Luxembourg, Malta, the Netherlands, Austria, Portugal, Slovenia, Slovakia, Finland, Estonia, Latvia, and Lithuania.

[2] Deflationary spiral, coined by Irving Fisher (1930), refers to the persistent combination of deflation and stagnation in economic activity and employment (BBVA, 2014).

[3] Debt-inflation tension indicator is a combination of two other indicators: the debtor inflation index, which captures the general change in wage, the prices of goods and services, and the price of assets; and the bank intermediation index, which synthesises the evolution of credit flows and the probability that debtors will comply with their commitments approximated by the compliance rate (BBVA, 2014).

between macroeconomic variable responses to monetary policy shocks in the euro area and Japan are sufficient to dismiss or to act upon the possibility of a long-term deflation.

The paper is presented as follows: Section 2 presents an overview of the path that led to Japan's current deflationary situation and some literature on deflation and monetary policy, Section 3 describes the methodology used, Section 4 presents the main results and comparison between Japan and the euro area, and Section 5 provides conclusion and recommendation.

2 Literature Review

2.1 Bubble and Burst

A number of empirical research have studied and analysed the historical path (Ahearne et al, 2002; Ito and Mishkin, 2004; Harvey, 2014) that led to Japan's lost decades. The asset bubble of the 1980s is linked to the Japanese deflation spiral. Asset prices peaked at the end of 1989, followed by a fall of more than 50% in the stock market over the next two years. Moreover, the value of land prices fell in 1992 and continued to remain at lower levels. Despite the collapse in money supply growth, the real economy did not immediately feel the burst of the asset bubble. Meanwhile, nominal gross domestic product (GDP) continued to grow until 1997; unemployment did not exceed 3% until 1995; and the consumer price index (CPI) remained positive until September 1998 (Harvey, 2014).

While asset prices were doubling and tripling during the bubble period, the inflation rate remained at 2.5% on the average, prompting a difficult choice for the Bank of Japan (BOJ) of when to tighten monetary policy or remain at ease. The sharp appreciation of the yen in February 1995 until the summer of 1996 caused a recession due to a slump of exports and imported disinflation (Ito and Rose, 2006), considering that Japan is an export-oriented economy. It was also in that time that the 1997 Asian financial crisis made it harder for the Japanese economy to recover. To help stimulate the economy, interest rates were lowered in

1996[4] to prevent too much appreciation of the yen. However, the problem of implementing an appropriate monetary policy from the BOJ during the 1980s stemmed from low levels of inflation[5], while the stock and land prices were increasing at an annual rate of 30%. The low inflation rate, which is below the typical inflation target of around 2%, suggests that there is room for monetary easing. On the other hand, stopping the asset price inflation requires tighter monetary policy. Tightening monetary policy would endanger a deflationary scenario, considering an inflation rate at par with the target, while loosening monetary policy would further encourage the rapid increase in asset prices that may lead to successive inflation. Thus, not one single solution for the monetary policy can be obtained to pursue both consumer price stability and asset price stability at the onset of the bubble burst. Where then does the BOJ stand on the appropriate monetary policy strategy to pursue?

On the other hand, looking at the historical path of the euro area aggregates, particularly inflation, output, and short-term nominal interest rate, the average inflation continue to decline the last 25 years; the average short-term nominal interest rate declined from 1992 onwards; GDP growth rate continues to struggle since the 2008 global financial crisis. However, Europe's asset price crash was brought by an international crisis. It was Europe's exposure to global trade that caused a major decline in economic activity since the Lehman collapse[6], and further exacerbated by the sovereign debt crisis. Moreover, the scale of the stock index drop, measured by equity prices, was of a similar case to Japan. The EURO STOXX 50 Index[7] has increased since 2013 and has reached levels above convention before the debt crisis.

[4] Interest rates have been lowered from 2% (1995) to 0.50% (1996); prior to the bubble (from 1990 to 1995), interest rates are averaged at 8%.

[5] CPI from 1991 to 1992 was 2.5% on the average; it was lowered to 1.5% in 1993. Inflation was lower than the target from 1994 to 1998 (with a slight pick up during the three quarters of 1997) at 0.5% on the average. Meanwhile, negative inflation was evident starting at the end of 1998 (until the present).

[6] On September 15, 2008, Lehman Brothers Holdings, Inc filed for bankruptcy, initiating the largest proceeding in US history. Lehman was the fourth largest US investment bank at the time of its collapse. Lehman's demise was the largest victim of the US subprime mortgage-induced financial crisis that swept through global financial markets in 2008. See Wiggins, Piontek, Metrick (2014) for further analysis of the Lehman collapse.

[7] It is Europe's largest leading blue chip index for the euro area. The index covers 50 stocks from 12 euro area countries: Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, and Spain. It is licensed to financial institutions to serve as underlying for a wide range of investment products such as exchange traded funds, futures and options, and structured products worldwide (visit https://www.stoxx.com/index-details?symbol=sx5e).

2.2 Deflation and Monetary Policy

Deflation is defined as "a sustained decline in an aggregate measure of prices such as the CPI or GDP deflator". Technically, one or two quarters of price declines constitute a deflation that is still manageable. However, according to Kumar et al (2003), even mild but continuous deflation "may increase economic uncertainties, distort resource allocation, entail distributional consequences, and lead to subpar growth performance". Likewise, as noted by Greenspan[8], "deflation can be detrimental for reasons that go beyond those that are also associated with inflation. Nominal interest rates are bounded at zero[9]; hence deflation raises the possibility of potentially significant increases in real interest rates."

The impact of large asset price declines on balance sheets and aggregate demand is often associated with deflation – a phenomenon evident in the case of Japan and the US. In particular, the US stock market crash in 1929 threatened a period of widespread bankruptcies and collapse in demand and prices, and resulted in the Great Depression (Kumar et al, 2003). In the early 1990s, the decline in Japanese equity and land prices has been associated with a prolonged slide in activity and deflation. According to Kiyotaki and Moore (1997), asset price declines have a severe impact on credit-constrained firms which can spill over from one sector to another, and the effects can persist over time and become magnified (as Japan is experiencing at present). However, not all declines in asset prices constitute a deflation – as the ECB articulates, the euro area is not facing a Japanese-style deflation – but rather, price level declines occur across a significant number of countries, across a significant number of goods, and in a self-fulfilling[10] way (Eurobank Research, 2014).

[8] From Problems of Price Measurement, remarks at the Annual Meeting of the American Economic Association and the American Finance Association, Chicago, Illinois, January 3, 1998

[9] To the extent that both inflation and deflation hamper economic performance and are otherwise equally undesirable, the zero-bound constraint effectively renders the risks of deviating from inflation rate of zero asymmetric (Coenen et al, 2003).

[10] Self-fulfilling deflation is defined by Woodford (2003) as "inflation that is perpetually lower than the target rate that eventually leads to actual deflation, which represents an equilibrium only because even lower inflation is expected in the future". Along such a path, interest rates are constantly being lowered in response to the decline in inflation, but because expected future inflation falls at the same time, real interest rates are not reduced, and continue to be high enough to restrain demand despite falling prices (Piazza, 2015).

Ito and Mishkin (2004) explain that when the economy falls into deflation, there is a problem that arises from the zero bound of nominal interest rate. Lenders will not accept a negative interest rate since hoarding cash provides a higher return. Investment will be curtailed and may trigger a slow pace of growth. Thus, nominal interest rates cannot go below zero because the economy may face a disequilibrium situation – an argument that started from Hicks's interpretation of the Keynesian liquidity trap. Summers (1991), as cited by Hunt and Laxton (2001), stated that in a period in which interest rates are already at low levels, the zero interest rate floor might significantly reduce the monetary authority's ability to further loosen monetary policy when output and inflation objectives are threatened by adverse deflationary shocks.

According to Bordo and Filardo (2004), "if a shock were to cause the price level to fall below target, then the central bank would take an accommodative monetary stance to put upward pressure on prices until the price level returned to target. If, however a shock were to cause the price level to exceed the target, the central bank would respond by tightening monetary conditions to return to target. If the central bank were sufficiently patient towards achieving its target, the return of the price level could be achieved without engendering deflation, or at the very least minimising the need to engender deflation."

3 Methodology

3.1 SVAR Model

To understand the monetary policy transmission mechanism, we adopt a structural vector autoregression (SVAR) model by imposing just enough restrictions to identify exogenous policy shocks, without having to specify a complete model of the economy. Since the pioneer work of Sims (1980), SVAR methodology has been widely applied to measure the effect of monetary policy (see van Arle et al, 2003; Monticelli and Tristani, 1999; Ehrmann and Wehinger, 2000). According to Bernanke, Boivin, and Eliasz (2005), SVAR models are widely

used to study the impact of monetary policy on macroeconomic variables and the "identification of the effects of monetary policy shocks requires only a plausible identification of those shocks (…) and does not require identification of the remainder of the macroeconomic model". Moreover, Bernanke and Blinder (1992), emphasise the role of short-term interest rate as the significant factor of monetary policy with recursive identification frameworks for SVAR. Results from SVAR models are known to be quite sensitive. However, a simple but standard specification can contain a minimum set of variables necessary to deliver sensible impulse response functions that is consistent with literature results (Boivin and Giannoni, 2003).

3.2 Empirical Structure

The SVAR is described in two components of the economy and the monetary policy, as adopted from Boivin and Giannoni (2003):

$$\begin{pmatrix} Z_t \\ R_t \end{pmatrix} = c + A(L)\begin{pmatrix} Z_{t-1} \\ R_{t-1} \end{pmatrix} + u_t$$

The non-policy block (Z_t) is composed of the output and inflation rate. Output is measured as the GDP growth rate. Inflation rate is the rate of change in CPI and harmonised index of consumer prices (HICP), for Japan and the euro area respectively[11]. The monetary policy block (R_t) is described by the policy instrument[12] used by the BOJ and the ECB, which is the uncollateralised call rate and short-term nominal interest rate, accordingly. Moreover, $u_t = A^{-1}B\varepsilon_t$ relates the reduced-form u_t disturbances to the underlying structural shocks ε_t.

Monetary policy shocks, as defined in Rotemberg and Woodford (1998), are exogenous stochastic shifts in the feedback rule used by central banks to set their interest rates. The focus on these shift effects is not derived from the belief that "they have played an important role in

[11] Data description is provided in Appendix 1.
[12] We limit the identification of shocks to conventional monetary policy instruments stated above (as Ahearne 2002), while further measure of non-conventional policy instrument was only explored in evaluating the quantitative easing policy in Japan which is defined in the succeeding section. For studies using non-conventional measures, see Krugman (1998); Goodfriend (1997, 2000), Bernanke (2000); Clouse, Henderson, Orphanides, Small and Tinsley (2000); Svensson (2001); Ueda (2001).

the generation of fluctuations in either output or inflation", but rather "they can be econometrically identified without having to commit to detailed assumptions about the true structural relations that determine output and inflation". Moreover, monetary policy rules are explicitly estimated in SVAR models. The focus is not on the rules but on deviations from the rules, which is an argument to the criticism that VAR approaches view central banks as 'random number generators', "since only when central banks deviate from their rules it becomes possible to collect information on the response of macroeconomic variables to monetary policy impulses" (Favero, 2001).

Meanwhile, Christiano et al (1998) have explored various strategies in isolating monetary policy shocks. One of the strategies proposed is that assumptions must be made about the nature of the interaction of the policy shock with the variables in the interest rate (ie, the policy shock is orthogonal to these variables), which is referred to as the recursiveness[13] assumption.

Therefore, our identification restriction can be obtained from a timing scheme for the shocks. Similarly, we adopt a just-identification scheme proposed by Sims (1980), based on the Choleski decomposition of matrices, where the identification of structural shocks depends on the ordering of variables. It corresponds to a recursive economic structure, with the most endogenous variable ordered last. Thus, under the recursiveness assumption, the SVAR can be expressed as:

$$Z_t = b + \sum_{i=1}^{P} B_i^Z \, Z_{t-i} + \sum_{i=1}^{P} B_i^R \, R_{t-i} + u_t^Z$$

$$R_t = \emptyset^0 + \sum_{i=0}^{P} C_i^Z \, Z_{t-i} + \sum_{i=1}^{P} C_i^R \, R_{t-i} + u_t^R$$

[13] It assumes that the structural errors are orthogonal and the contemporaneous relations matrix between the variables in the VAR is block diagonal. The assumption is sufficient to identify the column of the VAR associated with the monetary policy instrument, which is enough to determine the response of all the variables to a monetary policy shock. However, this does not permit us to determine the response of different variables to any other structural shock (Raddatz and Rigobon, 2003).

Adopted from Leigh (2004) and Boivin and Giannoni (2003), output (Y) and inflation (P), under the non-policy block (Z_t), are ordered before the monetary instrument (R) on the assumptions that the monetary authority acknowledges current output and inflation when it decides the level of monetary instrument, and that output and inflation respond to a policy shock with a lag. Consistent with the recent SVAR analyses, the policy reaction function and the policy shocks from the VAR specification are based on the assumption that the non-policy block of the economy responds only with a lag to changes in the interest rate, which constitutes an unrestricted specification of the policy reaction function and can be estimated directly by Ordinary Least Squares. Therefore, monetary policy shock at date *t* has no effect on either output or inflation during period *t*, which accounts for decision lags as an identifying assumption (Rotemberg and Woodford, 1998).

3.3 Model Extension

Majority of previous studies about the assessment of monetary policy in Japan has commonly used the uncollateralised call rate as the BOJ's operating variable, except in the period of QE policy[14]. However, this does not mean that the BOJ limits its policy decision from other variables. As stated by Nakahira (2009), although appropriate guidance of the short-term money market rate through market operations is the main concern of the central bank in the short run, it would also be important to observe what happens with information variables, such as the money stock[15], in achieving the central bank's goal of price stability. As cited by Nakahira (2009), Shioji (2000) suggested that, "if the monetary authority does not fully

[14] Under the QE policy, the BOJ used the purchases of Japanese government bonds as the main instrument in reaching their operating target of current account balances held by financial institutions at the BOJ (bank reserves) (Berkmen, 2012). Adopted from Berkmen (2012) and Nakahira (2009), we use the current account balances at the BOJ (in percent of GDP) as our monetary policy measure under our QE policy evaluation.

[15] Another extension of this model is including an index of sensitive prices in order to capture the response of the policymaker to anticipated inflation (Demiralp et al, 2012). This specification allows us to cope with the price puzzle coined by Eichenbaum (1992), associated with a persistent price increase given a contractionary monetary policy shock. We use the wholesale domestic price index for Japan, as investigated by Mihira and Sugihara (2000), and the commodity price index for the euro area, as suggested by Sims (1992). However, we no longer present the results, as price responses from our estimation do not suffer from the price puzzle and the inclusion of the commodity price index exacerbates the price puzzle dilemma instead.

accommodate demand for reserve or monetary base[16] immediately, the policy reaction curve is not always horizontal. In such a case, the central bank may not perfectly adjust the short-term interest rate level to the target level all at once because of the need to avoid abrupt fluctuation in bank reserves and monetary base".

To further understand the Japanese monetary policy following the unexpected state of the economy after the bubble burst – where the BOJ implemented two different types of monetary policy: the zero interest rate policy (February 1991 to August 2000) and the QE policy (March 2001 to March 2006) – we depart from a five-variable SVAR model. A five-variable VAR[17] is run using growth rate, CPI, interest rate policy instrument, monetary base (defined by the reserve requirement rate change adjusted M_t), and current account balances of bank reserves[18] (RS_t). As suggested by Favero (2001), using narrower monetary aggregate measure[19] makes it easier to identify shocks that are driven mainly by the behaviour of the central bank. Although there is no explicit treatment of the zero lower bound on the interest rate, the contemporaneous impact of the changes in the quantitative monetary policy measures on interest rate is assumed to be zero, adopting the recent study of Berkmen (2012).

4 Results and Discussion

The regressions for Japan were done for the period of 1990-2008, which covers the period of the end of the bubble economy; the zero interest rate policy from 1999 to 2000; the QE period between 2001 and 2006; and the period prior to the Lehman collapse in 2008. Meanwhile, the sample period for the euro area is restricted from 1995:Q1 to 2008:Q4[20].

[16] Although the neutrality and superneutrality of money proposes that changes in this measure do not affect real variables, the inclusion of a monetary base can be integrated into the analysis. The Sidrauski model introduces money into the analysis, where utility depends not just on consumption but also on the holding of real money balances (see Sidrauski, 1967; Groth, 2011).

[17] The system is identified with the restrictions previously mentioned using the order of variables presented above: growth rate, CPI, uncollateralised call rate, monetary base, and current account balances.

[18] This measure is adopted from the study of Nakahira (2009) and Berkmen (2012), which is reflected as the operating variable under the QE policy regime, and measured in rates.

[19] Therefore, we follow Nakahira's (2009) measure of the money stock as the monetary base.

[20] The sample period accounts only the time where the EMU has been set to place, including a few years prior to its official commencement. We also try to extend the sample until 2014, given the available data, and find no fundamental change in the impulse response functions.

4.1 Baseline Model[21]

Looking at Japan, Figure 1 shows that a contractionary monetary policy shock (shock 3) appears to raise output[22] but lower inflation measure. However, output seems to contradict the stylised fact[23] to a contractionary monetary policy shock response but eventually follows a decreasing trend. This may explain how the real economy did not immediately adjust to the bubble burst despite the collapse in money supply growth, where nominal GDP continued to grow until 1997; unemployment did not exceed 3% until 1995; and consumer price inflation remained above zero until September 1998.

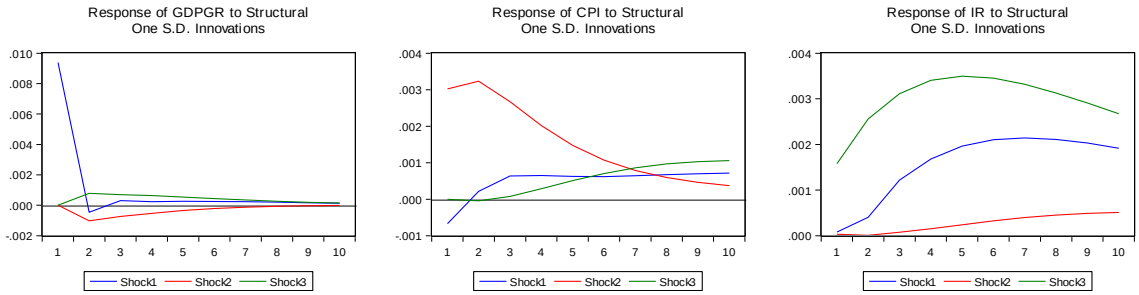

Figure 1. JAPAN: Impulse response functions of output, inflation and interest rate to structural one S.D. innovations

Households see price increases as rather temporary so they adjust their expectations accordingly, given the central bank's commitment to price stability. Moreover, the collapse in money supply may be an evidence of a tight monetary policy from the BOJ – a view that is in agreement with the finding of Bernanke and Getler (1999) that the BOJ implemented tighter monetary policy from 1992 to 1995. An abrupt monetary policy easing was not an option for the BOJ given the historical behaviour of its interest rates, which are already at lower levels, and the advent of the asset price bubble, which can further increase inflation.

[21] A series of tests have been conducted in order to determine the adequacy of the model, which were no longer presented elaborately. Residuals of the series appear to be of white noise, although the CPI measure has a period overlapping the mean zero. Correlograms and roots of the characteristic polynomial analysis show that autocorrelation is not a problem and that no root lies outside the unit circle. LM autocorrelation tests also suggest that there is no serial correlation. Lag length used is based on the Schwarz criteria which identify one or two lags.

[22] Although we take caution in interpreting the response as output is not statistically significant.

[23] A contractionary monetary policy shock leads to an initial rise in short-term interest rates, a decrease in aggregate output and a relatively small decrease in aggregate price level. Furthermore, the following shock terminologies used throughout the paper are as follows: shock 1 denotes an exogenous output (demand) shock; shock 2 denotes an exogenous inflation (supply) shock; and shock 3 denotes an exogenous monetary disturbance. In addition, shock 4 denotes an exogenous monetary base shock, while shock 5 denotes an exogenous bank reserves shock.

We now look at the impulse responses in the euro area as seen in Figure 2. The response of output, prices and interest rate with a contractionary monetary policy shock (shock 3) is in congruence with the stylised fact aforementioned, similar to the Japanese response. It appears that an unexpected positive shock in the interest rates curtails economic activity and decrease inflation, but prices tend to increase after four quarters. In line with the view of Monticelli and Tristani (1999), we may find an evidence of 'Eurosclerosis'[24] since the effect on output takes time to materialise with a weak impact in boosting economic activity. Price response further suggests inflation in the medium to long run, implying that a restrictive policy may not be conducive to a disinflationary pressure. In the long run, deflation may not be a problem as prices eventually increase, suggesting that short-term expectations lean toward consistently lower prices while long-term expectations positively lean toward reaching the inflation target.

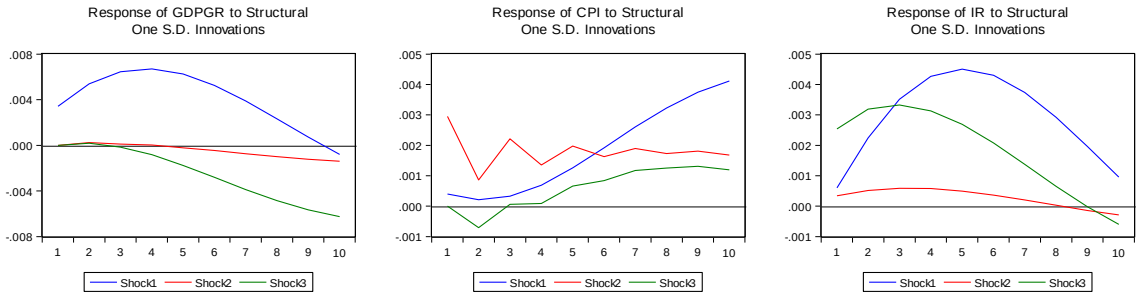

Figure 2. EURO AREA: Impulse response functions of output, inflation and interest rate to structural one S.D. innovations

However, recent annual rates of change for the euro area headline inflation issued by Eurostat show a -0.1% rate in September 2015. This low inflation, according to the International Monetary Fund (IMF), coincides with weak domestic demand in the euro area. According to the findings of Kilian and Manganelli (2005), there is an increasing risk that the euro area will fall into deflation. But Mario Draghi, President of the ECB, described deflation as "a situation where price declines across a significant number of countries", and the euro area is far from

[24] A term introduced by the German economist Herbert Giersch referring to Europe's slow job growth and slow pace towards European integration. Currently, it is used to describe economic stagnation due to the adaptation of overly generous social benefits and government overregulation.

that scenario. Although longer-term inflation expectations are stable, the fall in short-term expectations is something to be vigilant about, as the first four quarters of price response is negative or zero.

As argued by IMF authors (2014), "one should not take too much comfort in the fact that long-term inflation expectations are positive" as they may change overnight. This has been the case in Japan where long-term inflation expectations where reassuringly positive. Shiratsuka (2003) articulated that it was excessive optimism and not consistent projection of fundamentals that mainly supported temporarily higher asset prices. Prevailing expectations in Japan during the 1980s at the onset of the asset price bubble was due to an era of growing economic development that corresponded with an optimistic expectation for potential growth, a trajectory that was not able to forecast an economic downturn. Therefore, it was short-term expectations that became troublesome in the economy which then led to drops in prices and wages, enabling deflation to exist. In addition, there is passivity in the Japanese financial system, where almost 90% of its household keeps its financial assets in bank accounts or life insurance (Posen, 2003), reflecting a risk averse society. Like Japan, the euro area has higher household savings rate than household investment rate[25]. More so, these savers[26] hold their money into bank accounts curtailing investment growth.

Moreover, the Japanese deflationary slump was not predicted by policymakers or macroeconomic forecasts, and the euro area should take caution in the short run given the economic outlooks. The euro area may be far off from an eventual deflationary spiral, as Mario Draghi would insist, but monetary policy should be able to cushion expectations strengthening average inflation in surplus countries enough to compensate for the adjusting countries. Expectations are crucial to the allocation of resources, where households decide how much to

[25] See Eurostat News release Euro Indicators (2015)
[26] For instance, Germany's deposit-to-GDP ratio is the highest in Europe and total deposits have grown larger in the last 20 years, while the economy only grew by about 60% (Posen, 2003).

consume and save which in turn determines capital accumulation and sequence of factor prices (Blanchard and Fischer, 1989). As Blanchard and Fischer (1989) point out, "when the divergence between actual and expected events causes households to revise their expectations, they will choose a new path that is optimal given their expectations", and that may be different from expectations set forth by the monetary authority.

4.2 Model Extension

We further explore the model with the inclusion of the money stock as an investigation of what happens with such information variables in achieving the central bank's goal of price stability. We estimate a four-variable SVAR with the inclusion of the monetary base measure. We no longer present the results for Japan[27], since the results of the second specification follow a similar response from the baseline model.

Instead, we look further at the euro area results. A positive shock to interest rates (shock 3) appears to slow down economic activity and price response seems to be disinflationary in the medium to long run. In addition, the response of the monetary base appear to suggest a liquidity puzzle[28] (see Figure 3), wherein a contractionary monetary policy increases the monetary base when it should hold a negative relationship, implying that dealers are shutting down and banks are short on capital. Moreover, this may imply that the ECB has a declining ability to supply the liquidity needed by the financial system, which then fails to satisfy the equilibrium demand for liquidity resulting in cases of liquidity deficits. This liquidity risk[29] can be manifested in the inability of the market to sell an asset, driving its market price lower or undetermined.

[27] The monetary base increases with a contractionary monetary policy shock by a negligible value, and does not suffer from a liquidity puzzle.
[28] According to Leeper and Gordon (1992), "the response of interest rates to a money growth innovation frequently becomes positive and is never negative when the correlations are conditioned on past interest rates, money growth, prices, and output."
[29] There are two kinds of liquidity risks: market liquidity risk (the risk that the market liquidity worsens when you need to trade), and funding liquidity risk (the risk that a trader cannot fund his position and is forced to unwind) (see the Centre for Economic Policy Research Policy Portal by Pedersen, 2008).

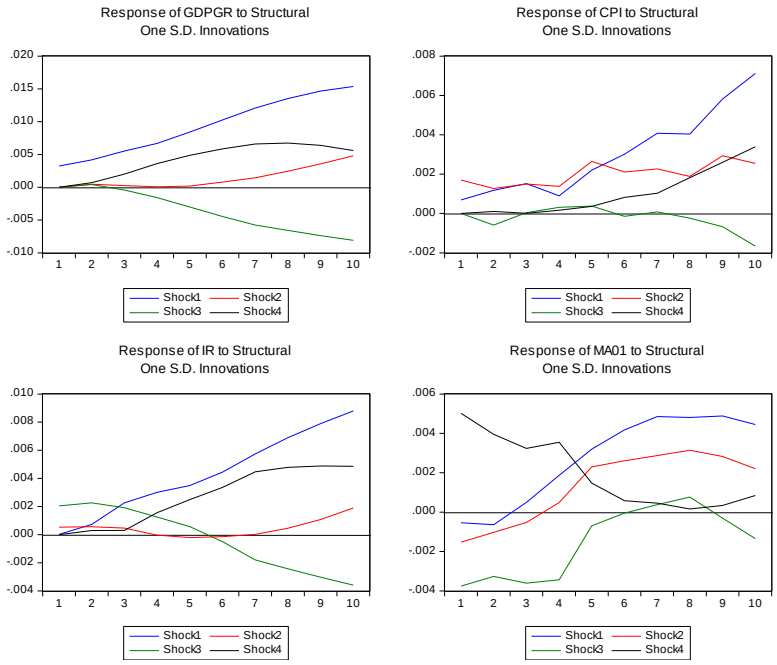

Figure 3. EURO AREA: Impulse response functions of output, inflation, interest rate and monetary base to structural one S.D. innovations

In addition, the long-run liquidity problem evident in the impulse response function may explain why euro policymakers see an issue of liquidity. Since the 2008 global financial crisis, euro area long-term government bond yields have been rising. From the rescue of the largest Irish banks, Greece's severe fiscal problems, and expansion of budget deficit, sovereign spreads rose sharply for most of the euro area countries (De Santis, 2012). Growth levels of the majority of loans made to both governments and private organisations failed to materialise, thus the problem of repaying and servicing debts became problematic. Loss of confidence in countries such as Portugal, Ireland, Greece, and Spain has led to rises in the bond yields required on their government debt. Such skepticism extends to the inability of their respective governments to service their debt.

Moreover, the liquidity problem may be a result of a looming deflation. Bernanke, Laubach, Mishkin, and Posen (1999) note that persistent deflation can lead to liquidity and solvency problems that might aggravate contractions (Reifschneider and Williams, 2000). Similarly, Japan's economy experienced a liquidity crisis in 1997-1998 as well as the failure of its financial institutions that led to its loss in international credibility (Ueda, 2001), which was

further exacerbated by a decline in bank lending and spending. Therefore, the liquidity problem from our results may be indicative of a looming deflation possibility in the euro area considering a similar liquidity crisis in Japan.

In addition, the Fisher debt effect[30] emphasises the adverse effect of lower prices on debtors through increased real debt burdens, which can then lower the aggregate demand because debtors have a higher propensity to spend than creditors (Palley, 2008). The EU's Stability and Growth Pact creates room for destabilisation on the assumption that the larger the recession, the more likely it is for an economy to fail the 3% deficit cap. Failure of the mandate would require euro area countries to increase taxes or cut spending to avoid necessary penalties – a measure to rapidly revert back to the 3% deficit will be detrimental in terms of tightening monetary policy as growth and tax revenues start increasing. This creates room for burdening taxpayers, who in turn cut their spending to accommodate further increase in taxes.

When there is a lot of money in the system, it should be observed that interest rate goes down. However, a positive shock to the monetary base (shock 4) follows an increasing response of the interest rate. This may be a case where expected deflation increases the demand for real money balances because deflation increases the real value of money balance[31]; households shift the consumption of their portfolios towards money that may curtail spending and investment. Increase in deflation lowers the aggregate demand and output because it increases money demand, leading to lower nominal and higher real interest rates (Palley, 2008). This result adds more weight to the possibility that the euro area may be facing a deflationary scenario, dragging output and inflation downside. But whether it is headed to the most avoided Japanese stagnation would depend on how monetary policy stance in the euro area is conducted and how quick it is to loosening monetary policy. Other than the ECB's mandate of ensuring price stability, it

[30] The Fisher effect states that the real interest rate equals the nominal interest rate minus the expected inflation rate. Therefore, real interest rates fall as inflation increases, unless nominal rates increase at the same rate as inflation. Irving Fisher (1932) named two dominant factors that played a more important role during the great booms and depressions in the economy, "… the debt disease and the price level disease are more important causes than all others put together".

[31] As explained by the Mundell-Tobin effect

should also account for the risks brought by deflation. As articulated by Ahearne et al (2002), when inflation and interest rates have fallen close to zero, and the risk of deflation is high, "fiscal and monetary stimulus should be flexible beyond conventional targets set by future inflation and economic activity forecasts." This provides an avenue for the euro area to strengthen its fiscal policy in coordination with monetary policy reducing the need to rely on a single policy and moderating drawbacks from policy overuse, creating a strong foundation of its macroeconomic policies.

4.3 Japanese Monetary Policy

As the deflationary scenario continues to persist in Japan, we try to evaluate the Japanese monetary policy in its response to generate economic activity and inflation through the interest rate targeting policy and QE policy, and extract possible lessons from this experience.

Japan conducted the zero interest rate policy by guiding the uncollateralised overnight call rate as close as zero percent, while it implemented the QE policy by guiding the outstanding balance of the private financial institutions' current reserve account held at the BOJ (Nakahira, 2009). We therefore, dissect the sample period accordingly, which we define in the next section, with the different policies and adopt the model structure specification[32] of Nakahira (2009) to evaluate the interest rate targeting policy and of Berkmen (2012) for the reserve targeting policy of the BOJ.

4.3.1 Interest Rate Target Policy

Departing from the second specification to evaluate the interest rate targeting policy, we restrict the sample period from 1991:Q1 to 2000:Q4. We further make two different periods to

[32] Restriction matrix is further identified in the Appendix section.

investigate the period from the end of the bubble economy[33] to the quarter just before the introduction of the zero interest rate policy (1991:Q2 to 1999:Q1) and the period from the end of the bubble economy to the termination of the zero interest rate policy (1991:Q2 to 2000:Q3).

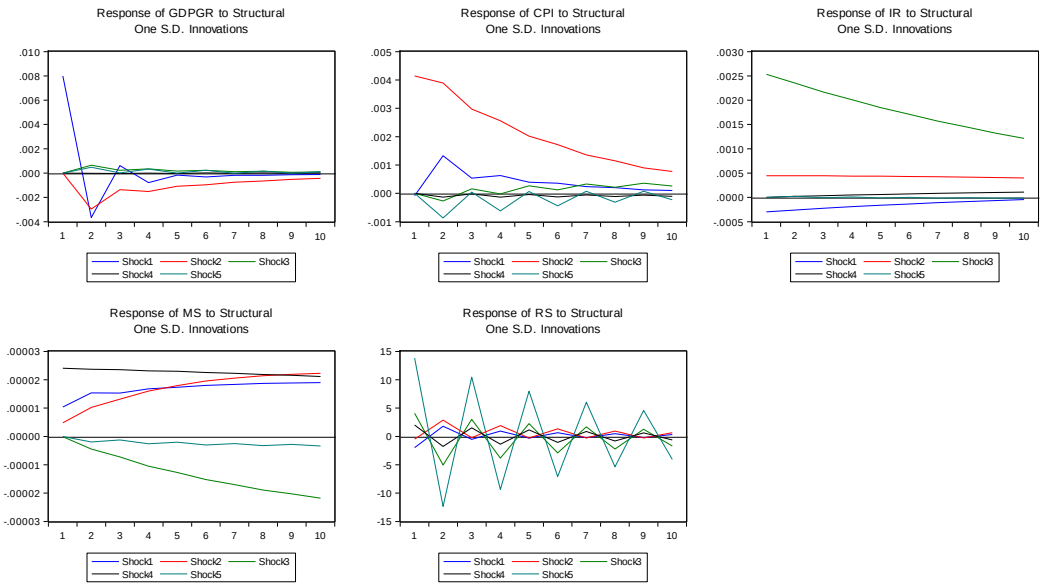

Figure 4a. JAPAN: Impulse response functions to structural one S.D. innovations, period from the end of the bubble economy to the quarter just before the introduction of the zero interest rate policy

Figure 4a shows that restricting the sample period to account for the period from the end of the bubble economy to the quarter just before the introduction of the zero interest rate policy and including the monetary base and bank reserves appear to have weaker impact relative to the prior model. Although a positive shock to monetary policy (shock 3) and bank reserves (shock 5) appear to have a weak impact in boosting economic activity and increasing price levels, shocks to the interest rates appear to have more impact relative to shocks to the bank reserves. Ruling out the price puzzle is suggestive; the model does not suffer from a liquidity puzzle as the monetary base gradually declines with a positive monetary policy shock.

Extending the sample period until the termination of the zero interest rate policy, Figure 4b depicts a weak response of output and inflation measure with a monetary policy shock (shock 3), implying that interest rate policy may not be sufficient to stimulate economic activity and

[33] For the purpose of this study, we use the Cabinet Office's estimates following Nakahira (2009). As determined by the Working Group of Indexes of Business Conditions at the Economic and Social Research Institute, end of the bubble economy is February 1991.

prices. Both the money stock measures, which are monetary base and bank reserves, show a decreasing response. However, the response of macroeconomic variables with the inclusion of the zero interest rate policy is quite stronger prior to its implementation, which implies that the economy may have responded by further lowering the interest rates.

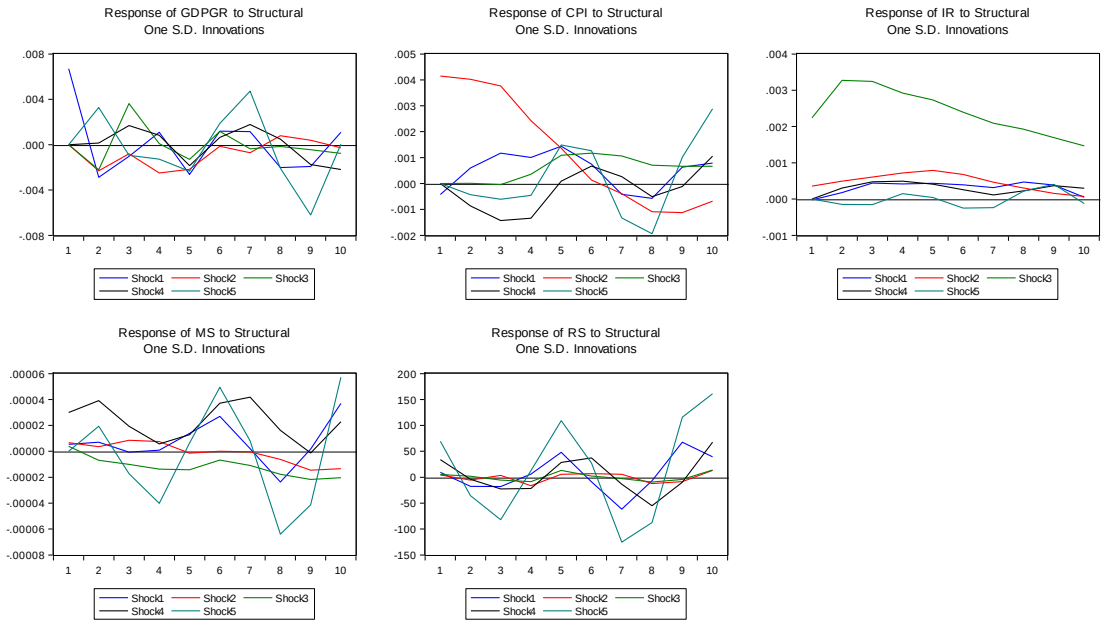

Figure 4b. JAPAN: Impulse response functions to structural one SD innovations, period from the end of the bubble economy to the termination of the zero interest rate policy

Because the BOJ aimed at factoring market expectations under the premise that monetary easing would be maintained over time and that the zero interest rate policy would continue until deflationary pressure is ruled out, increase in the money stock hampers inflation expectations since the market fails to recognise that the natural rate of interest will likely be positive in the future. As stipulated by the BOJ (2001), the marginal utility of holding money is zero given that interest rates are artificially set at zero. In this case, further monetary stimulus becomes ineffective because the nominal interest rate is bounded at zero.

From the estimation results, the shocks to the interest rate can be seen as having relatively more impact on the variables compared with the shocks to the bank reserves in boosting economic activity and inflation. This may be an implication that the BOJ's interest rate targeting policy under the call rate operating variable is acceptable in addressing the shocks to the

economy. Likewise, Ahearne et al (2002) articulated that the Japanese monetary policy during 1991-1995 appeared appropriate based on the economic expectations that time[34], although loosening monetary policy was not enough to escape deflation, thus the weak impact to improve economic performance. However, implementing the zero interest rate policy in 1999 until 2000, coupled with adverse asset price and interest rate expectations that make holding money attractive (Palley, 2008), may have triggered the economy into a liquidity trap which deems monetary policy ineffective. The nominal interest rate is stuck at its floor level, which adds more pressure in the deflationary scenario.

This becomes problematic in the sense that increases in the deflation rate no longer generate offsetting declines in the nominal interest rate through price level effects on the real money supply. The sluggish response to a contractionary monetary policy shock of output and prices may be an implication of the zero interest rate policy that became more detrimental to the economy in a way that people would rather hold money than invest in interest-bearing assets, curtailing investment growth that would rather improve economic activity. Deflation expectations in this sense give households the incentive to delay consumption and investment expenditures today in order to benefit from lower prices in the future. These future prices are extrapolated based on their deflation expectations, where intertemporal substitution effects reduce current spending. Likewise, this adds more to deflationary pressures given the passiveness of the Japanese households[35]. Moreover, Posen (2012) argues that the Japanese population "appears to fear major changes in established relationships more than economic stagnation at their current high level of wealth".

[34] However, inadequate allowance for downside risk was built into monetary policy, as evidenced by the fact that once actual inflation and growth numbers came in weaker than expected, interest rates ended up being higher than were called for under the Taylor rule (Ahearne et al, 2002).

[35] A recent article by *The Japan Times* stated that "Japanese companies and households prefer to sit on their cash rather than spend it", which is an implication of a society being accustomed in the stagnating economy.

4.4 QE Policy

To evaluate the QE policy, we restrict the sample period from 2001:Q2 to 2008:Q4[36], as shown in Figure 5. A positive shock to bank reserves (shock 5) appears to improve economic activity, albeit with a relatively small impact, while inflation appears to be on the downside. This response may be an explanation of the deflationary pressure during the early 2000s and an outcome of Japan's lost decade during the 1990s, where prices started to pick up after seven quarters given the QE policy.

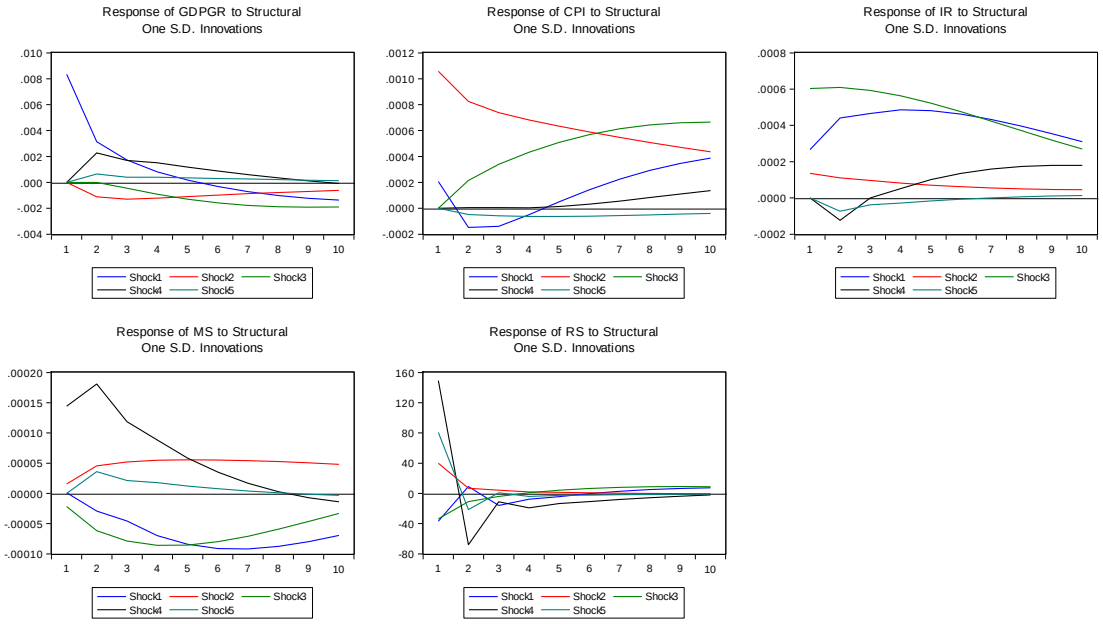

Figure 5. JAPAN: Impulse response functions to structural one S.D. innovations, period of QE policy

As prices start declining, particularly due to a demand shock, risk of adverse dynamics increases and nominal interest rates will likely decline. As long as households believe that money supply will be changed in the future, they will not respond to increases in money supply today which they see as temporary changes (Krugman, 1998). Households would prefer to hold money instead of interest-bearing financial assets as they derive utility from the liquidity of money. Thus, when interest rates are artificially at zero levels, the marginal utility of holding

[36] Although the initial QE policy ended in 2006, we extend the sample period until 2008 to account for the lag effect of the policy as well as the period prior to the 2008 global financial crisis.

more money is likewise almost zero. The classic liquidity trap presupposes that monetary policy becomes less effective since demand for money is more likely or less infinitely elastic at interest rates close to or at zero.

On the other hand, a study by Berkmen (2012) agrees with our finding that the QE policy does not seem to boost economic activity and inflation. As Krugman (1998) states, additional monetary easing would be less effective when interest rates are almost zero; the monetary base and bonds become perfect substitutes. Even if the BOJ increases its money stock given the declines in prices, economic activity would not jump off because nominal interest rates are already at zero and can no longer be reduced further. This can be suggestive of the validity and effectiveness of the policy measure, where Japan was the first proponent of an unconventional monetary policy in solution to its deflation and economic growth dilemma. It has been using dramatic numbers of bond purchases as part of a massive experiment[37] to wrestle the economy out of its long slump.

According to a research by the Mizuho Research Institute (*The Japan Times*, 2015), the BOJ will probably be forced to stop its qualitative and QE policy by 2020 because it will have bought most of the long-term Japanese bonds held by banks. Yukio Noguchi, an adviser to the Institute of Financial Studies of Waseda University in Tokyo (2015), stated that "monetary easing is not working. It has not increased money stock as much. There is an apparent lack of fund demand in the economy, banks have only increased the balance of their own current accounts, but not using them to increase loans to business that would expand the economy." Monetary stimulus does not seem to trickle down at the household level that would then boost domestic demand or firms.

[37] The series of burst of bond buying is the first arrow of Abenomics, a planned launched by Prime Minister Shinzo Abe in April 2013 that consisted of raising inflation to a 2% target, fiscal stimulus and structural reforms to escape its stagnant economic growth. However, a recent article by *The Japan Times* (2015) have reported that the QE policy is becoming unsustainable.

Unlike Japan, the euro area, which has been indecisive on monetary policy easing, may have to speed up its QE policy as it continues to face average growth and near-zero inflation. The euro area may be running a current account surplus but a further downturn in China's growth may pose a threat considering that its economy is overly dependent on external demand (*The Japan Times*, 2015). The euro area should be able to counter such decrease by generating domestic demand, within and among member states.

According to Eggertsson and Woodford (2003), to credibly promise to raise the price level – in the present and the future – is one of the fundamental challenges faced by policymakers in a deflationary environment. Thus, another policy option, the duration effect, can be employed under the commitment to maintain near zero interest rates far into the future or to make it a permanent supply of liquidity as suggested by Krugman (1998). Such commitment, as Ueda (2001) states, "will contain expectations of a future rise in short-term interest rates", and households would then revise their expectations towards increasing prices, thus, the need to spend now that leads to reviving inflation and improving economic activity.

However, then BOJ Governor Masaru Hayami (1998) stated that "the BOJ's policy is to seek stable prices, not inflation or deflation"[38], implying a credibility problem of its policy stance. Therefore, households do not see further price increases which then impede increases in domestic demand and continuous slack in economic activity. More so, there has been an uncoordinated deflationary macroeconomic policy in Japan. The Ministry of Finance and BOJ have been passive in dealing with financial regulators, pointing to who needs to act first. In relation, Posen (2003) argues that "Japan's economic troubles are the result of politically driven and economically self-defeating policy decisions that turned the normal recession into a severe and accelerating decline".

[38] An implication that the BOJ is comfortable with a sustained zero inflation

Similarly, this lack of coordination is quite the case happening in the euro area today. Posen (2003) sees how the ECB fails to loosen monetary policy or believe that stronger growth is sustainable with inflation until structural reforms are met by member states. In addition, there is difficulty in dealing with euro area members with significantly diverging performance when it comes to lowering interest rates and meeting its harmonised inflation rates. Posen (2003) argues three inherent difficulties of the ECB's 2% inflation target: (1) the 'or less'[39] target creates room for deflationary bias, where the ECB is more aggressive in offsetting price rises than declines; (2) target level is too low for a euro area average[40]; and (3) some countries will suffer from divergence between ECB policy and their own cyclical needs[41]. Studies such as Reifschneider and Williams (2000), Blinder (2000), Kato and Nishiyama (2001) and the IMF (2003) would likewise suggest to set targets that provide 'buffer zones' against deflation risks leaning towards increasing inflation rate targets. Hunt and Laxton (2001) adds that as the inflation rate target increases, the probability of reaching the zero bound would decline significantly.

5 Conclusion

Posen (2003) articulated that "it is possible for an advanced economy to have a bad time but still not fall into a Japanese-style ongoing stagnation". Looking at Posen's (2003) identification of the characteristics[42] of Japan's 'negative economic syndrome', we see similarities in the variable responses to a contractionary monetary policy shock, which may suggest similarity of the path the euro area may take if it will not be vigilant on how monetary policy is conducted given its past and current situation, as well as the future implications of its action or inaction

[39] As long as the inflation target is above 2%, implying that lower is always better, even near or below the 2% target
[40] Smaller and structurally reforming EU economies should have higher inflation, and larger and developed economies could be less than 2%.
[41] Given the lack of sychronisation between the business cycles of euro area economies and fiscal transfers among the economies; especially with countries like Ireland, the Netherlands, and Spain on sustained trends of improvement and unemployment, while countries like Germany and Italy are on secular growth downtrends, monetary policy will not simply balance out over time.
[42] The four elements would include: incomplete financial liberalisation, macroeconomic policy and division and deflationary bias, financially and politically passive households, and a lack of openness to trade or capital flows or foreign ideas.

today. Monetary easing would result in stronger demand for goods and services that would push wages and other costs higher, which may influence the rate of inflation. However, monetary tightening can be pursued to limit inflation but severe tightening would result in deflation, when sustained price declines may result in layoffs or bankruptcies from the lack of business profit.

In addition, with the continuous debt situation in the euro area, the link of debt and deflation causes complicated disturbances in the interest rate, particularly a fall in the nominal interest rates and a rise in the real interest rates. Given the sustained weakness on private spending and budget shortfalls, fiscal and monetary policy coordination can be sufficient to boost economic activity and keep inflation at positive rates. Likewise, the stability of its financial system should be further strengthened allowing for improved credit worthiness of firms and households.

On the other hand, an important avenue for future research is to look at how the demographic composition of these two entities affects monetary policy effectiveness. For example, Carvalho and Ferrero (2014) argue that demographic transition puts downward pressure on the natural real interest rate, which some monetary policy rules do not internalise to capture the effect of an increase in life expectancy. Although the euro area, on the average, has not yet reached an ageing population similar to Japan, a graying society in the recent years is becoming evident in Italy, Portugal and Spain with a shrinking population, while Germany holds the lowest birthrate in the world.

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