ISSN 2959-6130

The Effectiveness of Quantitative Easing: Evidence from Case Study

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Abstract:

This review paper outlines, analyzes and evaluates QE programs implemented by US, UK, and Japan in response to the global financial crisis. By time-lining the critical actions taken by the Federal Reserve, Bank of England and Bank of Japan, the paper describes and compares the motivations and circumstances of each case. The aim of quantitative easing programs is to ease financial conditions by increasing liquidity to drive up economic growth and maintain target inflation rate. Whilst all three countries have conducted several rounds of QE in order to meet the macro-objectives of steady and stable economic growth and inflation around 2%, US and UK inserted a strong focus on expanding the central bank balance sheet by heavily purchasing assets, with particularly the US purchasing the greatest value. Japan, on the other hand, emphasized the increase in lending. BoJ has also been conducting QE, but in a long-term fashion and of a broader purpose, due to the nature of the Japanese population being aging.

Keywords: Quantitative easing; Monetary policy; Assets; Liquidity; Bond price.

1. Introduction

Quantitative easing is an unconventional monetary policy whereby central bank creates digital funds to purchase government bonds and other financial assets, usually in the secondary market, in order to increase liquidity in the financial system to drive economic growth. It is often implemented when conventional monetary policy is no longer effective due to nominal interest rate being at the zero lower bound.

There are three main transmission channels for QE: signaling, portfolio rebalancing, and market liquidity [1]. Signaling channel happens when CB engages in QE, as markets interpret this as a signal of low interest rate for a period of time, hence expectations of government bond yield decline. Portfolio rebalancing occurs when Central Bank purchases assets from private investors. Private investors' portfolios are left with excess cash that yields a low return. To generate returns, investors would rebalance their portfolio by investing in big corporations. This increases demand for a broader range of assets. Market liquidity is when liquidity premium is incorporated in the bond price, reducing the rate of being unable to sell bonds due to unwilling buyers.

In the following sections, the paper will be providing case studies of quantitative easing policies conducted in US by Federal Reserve; England, by Bank of England; and Japan, by Bank of Japan. After each case study, the effectiveness and impacts of the policy from different economic aspects will be evaluated. QE programs are considered to be a less confident policy used by central banks, as the full impacts are unpredictable. Ben Bernanke has famously remarked, "The problem with QE is that it works in practice but not in theory [2]. "

Amongst all the countries that implemented QE, US, UK and Japan were specifically chosen because of the significance of their policies on the economy and globally. For instance, US was the starting point of the Global Financial Crisis, and ultimately the country that was affected most severely, therefore allowing easier effects to be seen in the case study. The UK is the country that stayed in the longest recession amongst the G7, for six consecutive quarters. Prior to the shock of the Great Financial Crisis, UK has been in a so called "nice period", where all main objectives seem to be balanced and achieved and the economy is stable. Hence, by studying the case of UK, more noticeable contrasts can be observed. Japan, on the other hand, was chosen due to the variations in its policy caused by the nature of its economy being an aging population with a generally lower bank rate, inflation rate and growth rate.

2. US

2.1 Federal Reserve – US

The 2008 financial crisis was predominantly catalyzed by the burst of housing market bubble, caused by the collapse of US house prices from subprime mortgage defaults and

increasing risks of investments for mortgage-backed securities, which led to a chain reaction affecting global economies. To combat this great recession, US purchased more than $4 trillion worth of assets between 2007 and 2014.

2.2 What did US do?

The US Federal Reserve has implemented three main rounds of quantitative easing following the 2008 financial crisis.

Following the start of the collapse of economy, the second half of 2008 signified an even tighter financial condition. Lehman Brother, which had assets of $639 billion dollars [3], was forced to file bankruptcy, and it led to critical liquidity crisis for many firms, including those not directed linked to Lehman. American Insurance Group was also under severe financial pressure, requiring the government to provide full financial support. After the meeting in December 2007 and after already lowering the federal fund rate for 3.25%, the Committee agreed on a target federal fund rate of 0 to 0.25%, suggesting a prolonged period of low interest. The Federal reserve announced on November 25th a program to purchase up to $100 billion government-sponsored enterprises as well as up to $500 billion in mortgage-backed securities backed by Frannie Mae, Freddie Mac, and Ginnie Mae [4], which are often referred collectively as 'agencies.'; however, only Ginnie Mae is an agency fully backed by government. These three organizations guarantee most mortgages made in US.

At the March meeting of the Federal Open Market Committee, the Committee agreed to expand its purchases of agency MBS and agency debt as well as to begin buying longer-term Treasury securities to help improve conditions in private credit markets. They announced the action to expand balance sheet by further purchasing up to $750 billion agency MBS, which totalled $1.25 trillion in 2009. The purchase of agency debt would also go up by $100 billion, totalling at $200 billion. In addition, it was decided that within the next six months, $300 billion of longer-term Treasury securities would be purchased [5].

In the monetary report released in July 2010, it can be interpreted that the economy was on a gradual recovery. Although the FOMC anticipated that economic conditions were still likely to result in low levels of federal fund rate, it was decided that the Fed should begin tightening monetary conditions to prevent inflationary pressure. To do so, the Federal Reserve could redeem maturing securities without reinvesting, or sell the securities, which would shrink the balance sheet. Several meeting participants expressed their view which was that the Federal Reserve should eventually hold a portfolio composed largely of shorter-term Treasury securities [6], as it meant more control, flexibility, and short-term stability.

Another round of big asset purchases was estimated to be an addition $600 billion of long-term treasury by the end of the second quarter of 2011 [7]. In the meantime, normalization of stance of monetary policies was also taking place as size of securities portfolio was reduced to the lowest level whilst remaining consistent.

Throughout 2012, MEP, Maturity Extension Program, took place, in which Federal Reserve planned to purchase Treasury securities with remain maturities between 6 to 30 years and sell those less than 3 years, increasing holding of long-term Treasury securities by $267 billion [8]. MEP was conducted to adjust composition of FED balance sheet.

Forward guidance also became more explicit in December 2012 [9]. Instead of vague phrases used before, like "extended period" and "for some time", specific dates and conditions were given. However, in 2013, FOMC used more flexible language so more people were speculating, so to avoid premature tightening of financial condition.

Although close monitoring was needed, it was generally agreed by FOMC participants that the benefits of purchasing additional assets outweighed the costs and risks [10]. The reason why FOMC implemented large scale asset purchases was to press down long-term interest rate in order to stimulate economic growth by easing financial condition.

During its four meetings in the first half of 2014, there was a $5 billion monthly reduction in MBS and longer-term Treasury securities. It was also decided that commencing in July, the pace of adding agency MBS would be decreased from $35 billion to only $15 billion per month; and holding for longer-term Treasuries would be reduced from $40 billion to $20 billion monthly. However, with the still increasing purchases for assets, the Federal Reserve hoped to press down long-term interest rate to ease financial pressures, in hope that inflation would one day return to the 2% objective.

2.3 Is it effective?

Figure 1 shows a graph that concludes FED's assets purchased from 2007 to 2014. As shown from the graph, the Federal Reserve increased its asset purchased from just about 1 trillion to almost 4.5 trillion. Noticeably, the

purchases of agency debt and MBS has raised from $0 to $1707.56 billion. This expansion of balance sheet can be evidence to suggest the success of QE, as it indicates the increase in cash available to lend in the economy.

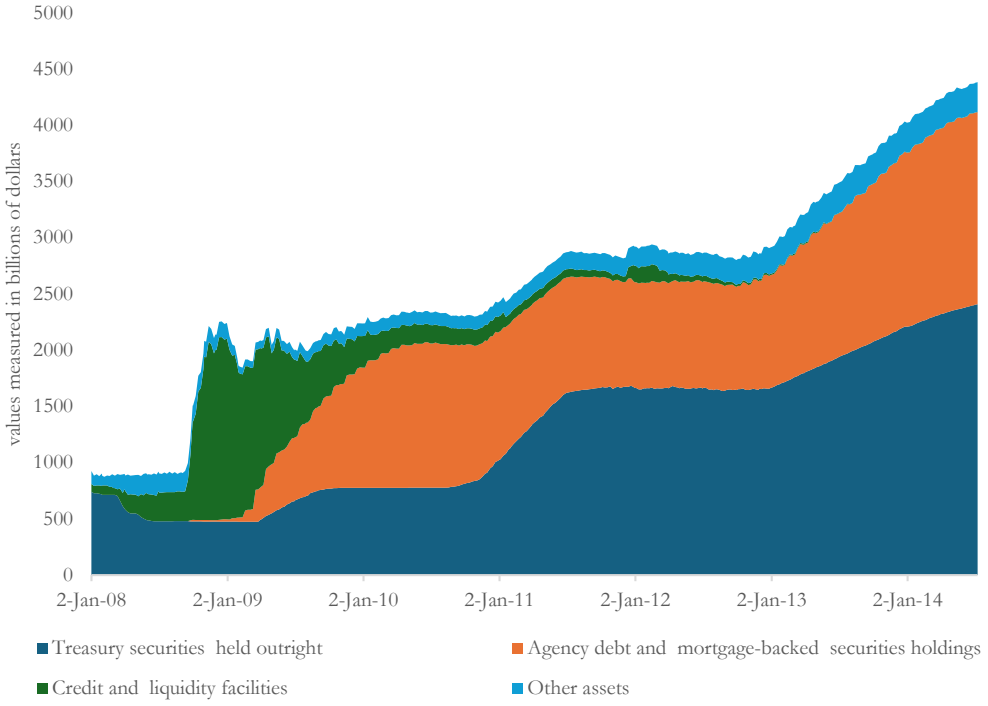

Figure 1 UK Weekly Assets 2008-2014

Data source: Fed Monetary Report [11]

Figure 2 compares the 2- and 10-year Treasury rate to the target federal funds rate, which was set at near zero. One of the main goals of Fed during GFC was to put downward pressure on Treasury rate. As shown by the line graph, the 2-year Treasury rate declined rapidly following QE1 and was around the target since 2011. Although the 10-year rate fluctuated more noticeably, it can be deduced that QE1, which occurred in 2008, significantly reduced yields on intermediate and long-maturity bonds, represented by the sharp fall in the second the end of 2008. There is evidence that this is done through signaling channel [12], affecting specifically bonds of 5 to 10 years. Therefore, in this case, the objective of reducing long term interest rate was achieved in QE1.

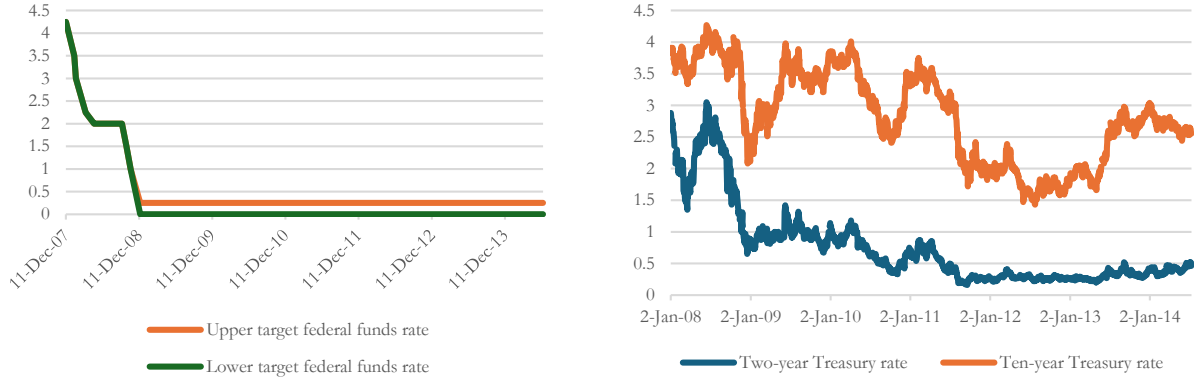

Figure 2 Target Federal Funds Rate + 2 Year and 10 Year Treasury Rates

Data source: FED monetary report [11]

A positive outcome is demonstrated through Figure 3. Economic growth visibly recovered from the significant

negative rate in 2008. It can be observed that GDP and GDI decreased significantly in quarter 1 of 2014, due to fluctuations in net exports, which can be argued to be enhanced by instability of the third-round asset purchasing in 2013. Expansion in GDP post-2008 continued to be supported by consistent job gains and accommodative financial conditions. However, activity in the housing sector was yet to show persistent rises since it slowed due to last year's rise in mortgage rates.

Figure 3: % Change in GDP and GDI

Data source: FED monetary report [11]

One impact that QE had on the US economy was the fluctuations of exchange rate, which could cause an international negative spillover effect, affecting imports and exports; inflation and interest rate; and global trade. During pre-financial crisis, US dollar was depreciating due to the instability in US house market. Therefore, naturally, there was fear of further weakening of USD, which can be destructive if occurred abruptly. However, there was an unexpected high soar of US dollars [13]. One reason could be the change in capital flow, as more investors changed to less risky US government bonds. Another explanation is that many firms outside of US needed US dollar to conduct their business due to USD being a globally used currency. Therefore, foreign currency reserved of central banks was being used up. Hence why Federal Reserve set up swap arrangements with other CBs.

Another negative impact of the program is that it allowed corporations that have made mistakes to survive, for instance AIG. This raised the chance of repeated mistake and was a waste of government budget if government is required to financially provide full support.

Federal Reserve's decision making also had global spillovers, particularly in emerging market economies. Many EMEs criticized US for creating excessive global liquidity, especially policies involving large scale asset purchases [14]. Fed's policies operated pro-cyclically on EMEs, as it led to capital flowing out; whereas for US, policies functioned counter-cyclically, boosting economic activity. QE1 had the effect of increasing investment in US bonds but QE2 had the opposite effect of shifting capital back to EMEs, which could have been due to changing expectations.

3. UK

3.1 BoE – UK

As Global Financial Crisis hit UK, the country dropped into recession, with GDP falling 6% and falling for six consecutive quarters. It is the biggest recession since WW2 and UK was in recession longer than all other G7s. Quantitative easing is a tool that BoE uses to meet the 2% inflation target. Both UK and US have a dual-objective – maximizing employment as well as keeping inflation low and stable at around 2%. In September 2009, policy rate was 0.5%, near the lower bound. In order to encourage spending to stimulate economic growth, BoE bought £895

billion worth of bonds in which £875 billion were UK government bonds and the remaining were UK corporate bonds [15].

The first phase of asset purchasing began on 13th February 2009 and it started with purchases of short-term commercial paper issued by corporations and financed by Treasury bills. Later in March, the MPC voted for a big asset purchase of £75 billion issued by CB's reserves [16]. More than 1 billion money was printed from March 2008 to February 2009. In March, the purchase of gilts and corporate bonds also commenced.

CB's asset purchases injected money into the economy and increased liquidity by providing seller cash. This led to decreased borrowing costs, which ultimately results in more consumption, driving up inflation and economic growth.

In May, August, and November of the same year, subsequent expansions increased assets purchase to $200 billion. GDP began to recover at the end of 2009. Between March 2010 and February 2011, the MPC left monetary policy unchanged, with Bank Rate at 0.5% and the stock of asset purchases at $200 billion [17]. Although small-scale purchases and sales of private sector securities continued, the broad outline of asset purchase remained roughly unchanged since then.

3.2 Is it effective?

There is sufficient evidence to support that the decrease in bond yields of QE stimulated economic activity as it subsequently led to higher equity price as well as lower foreign bond and private bond yields [18]. One evidence that suggests that QE is effective is the 22% rise in FTSE 100 index by the end of 2009 following its lowest point on March 2009. The reasons to explain the increase in stock can be expressed through the efficacy of QE, which reduced borrowing costs by declining interest rate; increased liquidity so that it was easier for investors to buy and sell bonds; and increased consumer/business confidence.

Joyce et al. estimated in 2011 that the first round of QE, which was the purchasing of medium- to long- term UK government bonds of £200 billion led to an average fall in 5-25-year gilt yields by 1% [19].

The Balance sheet of Banking Department also expanded from £147.9 billion to £223.1 billion from February 2009 to February 2010. This is the result of increased lending, which further emphasizes the increase in consumption and the increase in growth caused by assets purchasing. However, from Figure 4, it can be seen that the public sector borrowed significantly more. And there was an overall negative net lending, with continued deficit running, meaning that the aim of increasing lending to increase aggregate demand was not achieved. This is evidence to suggest that the effects of QE might not have been as noticeable, and it affect the macro-objective of budget balance.

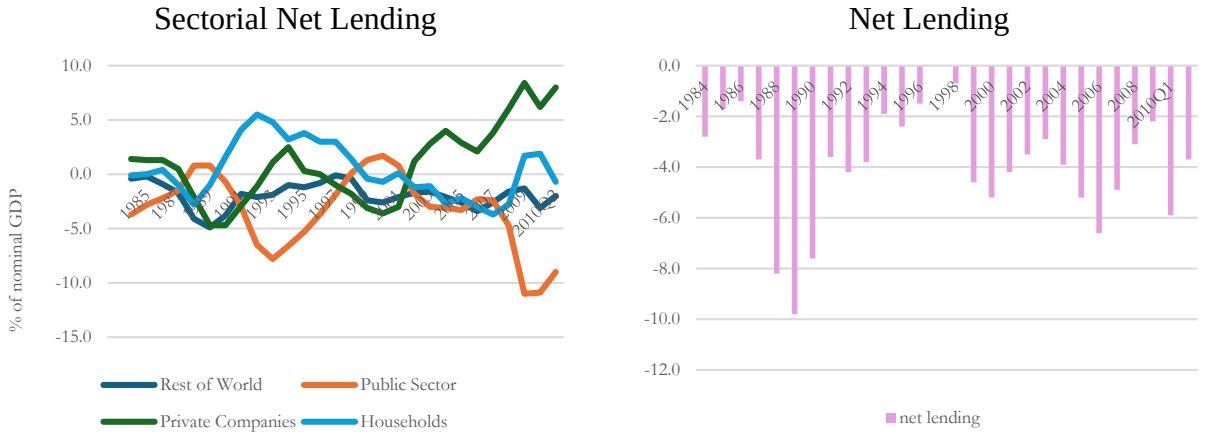

Figure 4 Sectorial Net Lending

Data source: OBR [20]

There suggested a trend of decreasing absolute impact on gilts yield following each round of quantitative easing. In July 2012, when an additional £50 billion extension was announced, the gilt reacted insignificantly [19]. The cause of diminishing reaction of gilt yield could be due to the anticipation of QE. Therefore, investors were expecting further QE and might buy bonds ahead of announcement and yield reduction would have already occurred before QE policy is officially released.

Furthermore, on the whole, the committee found that QE is likely to have exacerbated domestic income and wealth inequalities as QE increases price of assets, benefiting wealthier households who actually owns assets. This is further supported by the data shown in Office for National

Statistics where between the years 2010 and 2020, the rise in private wealth taken into account of inflation was 3 times greater than GDP growth. However, the counter-argument is projected by BoE, who claimed that although it is the older people who owns more financial assets that benefited the most, there was also an increase in availability of jobs and rise in wages, which young people benefited the most. This led to the conclusion from BoE that a greater majority of people benefited from QE.

Globally, it is found that UK QE generally had a greater spillover on western Europe rather than Asia, America and Australia [21]. The effects on Europe include lower government bond yield; appreciation of Euros; and increased capital flow.

From a mathematical point of view, it can be evaluated that according to the model M*V=P*Y, if V (no. of times each unit of currency is spent each year) increases and Y (total output) remains somewhat constant, then the increase in money supply would ultimately lead to price level rising, causing inflation. The next challenge will be how to tighten monetary policy effectively, which is likely to involve Quantitative Tightening, which reverse the entire process of QE.

4. Case Study: Japan

4.1 BoJ – Japan

Unlike FED and BoE, BoJ has a more distinctive approach when conducting QE. It is the first country to introduce QE, in March 2001. In comparison to asset purchases of UK and US which were specifically targeting recovery from global financial crisis, Japan's implementation of QE was more aggressive and long lasting, for about 2 decades, with a total of trillions of yen, as it faces the constant risk of deflation and sluggish growth.

On December 2nd, 2008, BoJ announced that it will lend unlimited funds to banks at policy rate; and two weeks later, BoJ increased the JGB purchases to 1.4 trillion monthly. This has later been further increased to outright purchase of 1.68 trillion yen [22].

In October 2010, Japan introduced the Asset Purchase Program (APP). In contrast to the asset purchases conducted by BoE and Federal Reserve, BoJ's purchases of assets were more wide-spread, including purchases of government bonds, corporate bonds, Exchange-Traded-Funds (ETFs) and Real Estate Investment Trusts (REITs) [23]. BoJ has planned to conduct roughly 190 trillion yen of asset purchase, 76 trillion of which was done through APP. Within the 76 trillion yen, 44 trillion was through JGB, 24.5 trillion in Treasury discount bills, 3.2 trillion in corporate bonds, 2.1 trillion in commercial paper and 2.2 trillion in EFTs and REITs.

In the early 2000s, Japan's QE policies involve purchasing various types of assets, but in their QQE program in 2013, BoJ focused on buying more riskier assets and government bonds [24].

4.2 Is it effective

BoJ's approach to the global financial crisis caused countless debates due to the difference in Japan's economy comparing to that of US and UK. Even before the financial crisis kicked in, between 1991 and 2010, Japan's GDP growth averaged around 0.5% per year, and economy was dominated by stagnation [25]. This period is described as the Lost Decades. Keynesian economist Paul Krugman claimed that Japan was in a liquidity trap, whereby the increase in saving will not be converted to increased consumption, but consumers are holding onto their savings because they fear the economy will get worse, or when there is deflation, consumers naturally wait for longer in hope for an even larger deflation. Monetary policies will no longer be effective because interest rate is near zero; hence money and bonds are essentially substitutes as opportunity cost of holding money is low and uncertainties in investments are soaring [26]. This explains why Japan's growth has been relatively sluggish with the constant risk of deflation both pre and post financial crisis, compared to UK and US.

There would be increased unpredictability and uncertainty when inflation is lower than 1% [27], which Japan experienced countless times during GFC. A stochastic model by Orphanides and Wieland suggests that a small change in policy might not lead to a small change in outcome and due to the zero bound on nominal interest rate, regime shifts need to be valued greatly. Using the Markov Switching VAR frame [28], there was a significant change in the effectiveness of monetary policy when nominal interest rate was near zero.

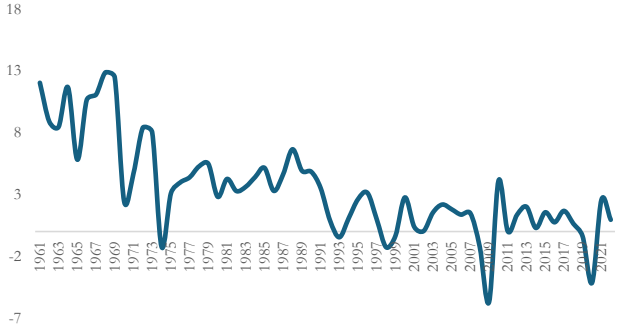

Figure 5 Japan GDP Growth

Data source: World bank [29]

As shown in the figure 5, Japanese economy GDP growth is fluctuating, constantly entering a negative phase, further enhanced by the GFC.

Studies suggest that QE led to significant positive effects on GDP and inflation on Japanese Regional Banks lending to small and medium firms [30]. QE programs led to increased monetary base, lowered long term interest rate and increased price for financial assets, which all contributed to more lending and greater economic growth.

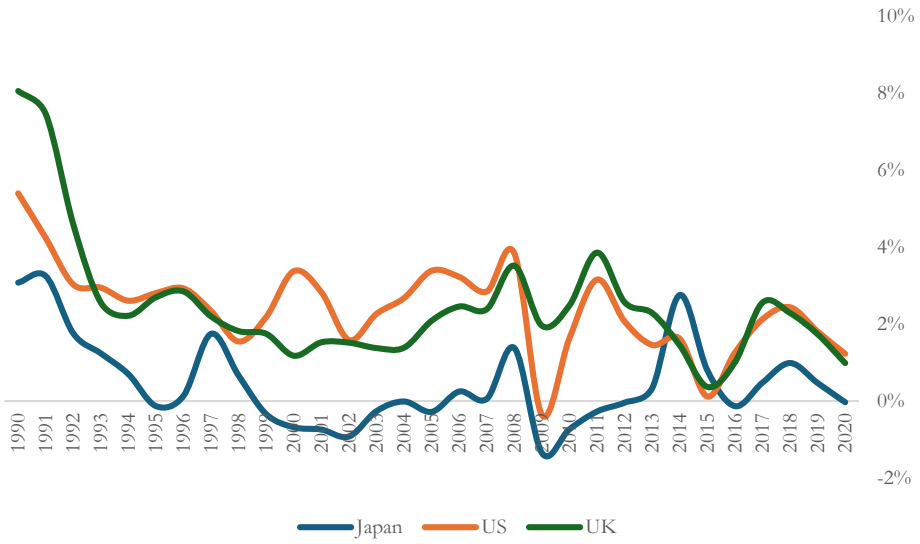

Figure 6 Inflation in Japan, US and UK

Data source: macrotrends [31]

Figure 6 gives a visual comparison of inflation between US, UK, Euro are and Japan. It is obvious that especially during the global financial crisis, Japan suffered from deflation of nearly 3 % and that the trend curve for Japan's CPI was lower than that of other countries. This indicates that Japan risked dipping into recession, which further highlighted how important QE is because interest rate was already below zero. However, as shown also by the massive fluctuations, it can be interpreted that Japan's QE was not very effective at bringing GDP up steadily and stably. Although QE raised reserve by 7% [32], and led to a drop in bond yields and long term interest rate as desired, inflation was not affected to the point for Japan to cease deflation.

In addition, another reason that contributed to the extra difficulty BoJ experiences when conducting QE, resulting in less effects is that considerably less percentage of the population is of working age, meaning consumption on big assets is less likely to be greatly impacted. Saving in Japan is high to finance retirement causing investment and private sector to shrink. This considerably slows economic growth due to lower labour force and government increases spending on subsidies. All these factors together made JoP's QE during financial crisis even less effective, as in general, the population is less sensitive and responsive to changes in policy rate.

5. Conclusion

Japan's QE policies were distinctive from US and UK. Japan put specific focus on targeting deflation, which has been a long-term issue; whereas US and UK only experienced deflation during GFC. Japan is also addressing the long-term stagflation as a result of aging population. In terms of policy, US focused on heavy asset purchasing, whilst Japan emphasized lending large amount of money.

In conclusion, all three countries have implemented several rounds of quantitative easing in response to the global financial crisis in 2007. Although a conclusion of whether QE is effective is extremely difficult to make because no one knows what will happen if QE was never conducted, it can be reflected that purchasing assets did help the recovery of the three economies because GDP growth in all three countries around the 2010 is positive. Perhaps more efficacy was observed in US and UK specifically. However, it is also worth noting that QE was only one of the many monetary policies that was conducted, and there are many other factors that determine a country's growth, like inflation expectation, consumer confidence, CB transparency and communication, meaning that results post-GFC may not be a direct impact of asset purchasing. In the case of QE programs during financial crisis, it is likely that consumer confidence played the biggest role in determining the effectiveness of QE because incentives to consume or invest only come with enough confidence, and without confidence, even if liquidity in economy is maximized, it will end up being a waste of effort. Central Bank's transparency can influence inflation expectation. It is likely that over time, CB's transparency and communication will increase, but during the financial crisis, UK and US implemented QE for the first time, and this introduction and aim of new monetary policy could have initially been vague to the public.

The long-term consequence of conducting QE is yet to be fully examined and there is a lack of evidence to proof the stability and sustainability of this program. Countries are still carrying on with purchasing assets, especially when COVID 19 pandemic has hit the economy in 2020. Although countries are learning from previous attempts, QE still remains to be full of uncertainties. The theory behind QE, specifically the different factors affecting effectiveness can be compared more thoroughly, taking into account more cases of applications. More studies and analyzes could be made in the future regarding the evolution of QE programs in each country in attempt to ease financial conditions.

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