Asset Purchase Program (UK)

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Abstract

On March 5th, 2009, in the wake of the fallout from the Global Financial Crisis, the Monetary Policy Committee (MPC) of the Bank of England announced a new, unconventional policy measure: quantitative easing. The MPC determined that simply cutting the Bank Rate in the face of a recession would not be enough to boost spending and increase inflation to meet the Bank's goal of a 2% CPI target in the medium term. Rather, over the course of the next year, the Bank would purchase £200 billion of assets – primarily gilts – in reverse auctions through a newly created Asset Purchase Program. After just under one year of purchases and a brief hiatus, the Bank revisited the program again in 2011 and purchased an additional £175 billion of assets, bringing the total to £375 billion. For the most part, studies hold that these two episodes of purchasing – QE1 and QE2 – were successful, as gilt and other asset prices increased and the program had an impact on inflation and GDP. However, it is hard to conclusively assert the impact of QE on the economy, as the unconventional policy was implemented concurrently with other measures in the United Kingdom and around the world.

Keywords: Quantitative easing, large-scale asset purchases (LSAPs), gilts, portfolio rebalancing

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Asset Purchase Program (UK)

At a Glance

Summary of Key Terms	
Purpose: To stimulate the economy, boost nominal spending, and increase inflation to meet the 2% target.	
Announcement Date	March 5, 2009
Operational Date	March 11, 2009
Expiration Date	November 9, 2012f
Legal Authority	
Peak Utilization	£375 billion in assets
Participants	Bank of England

At the beginning of 2009, economic forecasts for the United Kingdom predicted a recession worse than that of the 1990s. To offset this, the Bank of England employed conventional monetary policy and slashed the Bank Rate to its effective lower bound, but predictions remained grim, and so in March 2009 the Bank introduced the first episode of its Asset Purchase Program. The stated aim of this program was to increase nominal spending and bring inflation back to its 2% target.

The Asset Purchase Program involved the practice of quantitative easing – in this case, large-scale asset purchases primarily of government bonds ("gilts") that targeted non-bank financial institutions, such as insurers and pension funds. These purchases were made during reverse auctions; at first, there were two each week, and then three every two weeks to accommodate more flexible standards for asset eligibility. The Bank concluded its first episode of purchases in just under a year at which point the purchase amount was roughly equal to 30% of gilts held by the private sector.

In October 2011, the Bank revitalized the program in what is referred to as QE2 – "quantitative easing two" – when concerns arose about the status of some Eurozone economies, inflation, a shrinking GDP, and a need for confidence and growth. QE2 was an explicit continuation of QE1 and focused on countering the effects of the GFC; it expanded the Bank's asset purchases from £200 to £375 billion.

Summary Evaluation

The Asset Purchase Program is generally seen as effective, but isolating the impact of the quantitative easing policy on the United Kingdom's economy is difficult given concurrent domestic and international recovery programs. However, the program did have a tangible impact: purchases lowered the yields of medium to long-term gilts by approximately 100 basis points, and studies show that the gilt markets reacted to QE announcements. More generally, there was a consistent increase in asset prices. Estimates of the program's impact on inflation range from 0.75 to 2.5 percentage points and GDP estimates range from just under 1.5% to 2.5%.

I. Overview

Background

The United Kingdom's economy felt the fallout of the Global Financial Crisis. BBC reported dire figures in January 2009: GDP fell by 1.5% at the end of 2008, after a drop of merely 0.6% in the preceding quarter, which signified that the UK formally entered a recession – a period characterized by "two consecutive quarters of negative economic growth" (BBC 2009). The stark drop in GDP between the two quarters was the largest on record since 1980. Sterling "soared to a 24-year low against the dollar," and the FTSE 100 index experienced its worst year ever by the end of 2008 (BBC 2009). Manufacturing fell by 4.5%, and by the start of 2009, unemployment reached 1.92 million people. The housing market and retail sales suffered; nominal spending, confidence, lending and production fell substantially. Forecasts did not predict a respite, indicating that the recession would continue into 2010 (BBC 2009).

Program Description

In an attempt to remedy this situation, after its meeting on March 5th, 2009, the Bank of England's Monetary Policy Committee announced two policy changes. First, it cut the bank rate to 0.5% - the lowest policy rate in the Bank's 300-year history. The MPC also decided that, due to the extreme circumstances, cutting the policy rate alone would not enable the British economy to reach its 2% CPI inflation target in the medium term, and so it implemented a second, unconventional policy: quantitative easing (QE) (Fisher 2010).

The policy of QE entailed large-scale asset purchases financed by the Bank of England to stimulate the economy and reach the inflation target. The Asset Purchase Program (APP) was created in January 2009 to purchase assets funded by Treasury bills, but would now be used as a tool of monetary policy transmission (Benford et al. 2009).

Under the program, the APP primarily purchased UK government bonds, or "gilts," and purchases were targeted towards assets held, predominantly, by non-bank financial institutions, such as insurers and pension funds (Joyce et al. 2011).

The gilts were purchased via reverse auctions conducted by the Asset Purchase Facility. These auctions were multiple-price (discriminatory) reverse auctions "with both competitive and non-competitive elements," meaning that "competitive" bidders "could submit multiple bids of both price and quantity. The noncompetitive bids were allocated in full at the weighted average accepted price set in the competitive auction; purchases through this noncompetitive process were comparatively very small and accounted for only 1% of the total [gilts purchased]" (Joyce and Tong 2012).

Purchases proceeded with two auctions each week. The first of these auctions dealt with gilts with a residual maturity between 5-10 years and the second dealt with gilts with a residual maturity of between 10-25 years. The Bank bought gilts of £4 billion or more in issue size "except those that had been or would be issued by the Debt Management Office within 7 days" (Joyce and Tong 2012).

On March 5th, 2009, the MPC announced that the APP would purchase £75 billion of assets over the course of the next three months. These purchases began on the 11th with gilts, followed by the first purchases of corporate bonds on the 25th. In May 2009, and then again in August 2009, the MPC announced that the APP would buy an additional £50 billion of assets. By the end of June, "the Bank began to exclude from the auctions gilts where holdings were at or near 70% of the free float so as to not negatively impact trading conditions and liquidity" (Joyce and Tong 2012). In November, the MPC announced that the total amount of purchases made under the QE program would reach £200 billion (adding in the announcement that there would be a final three-month purchasing period of £25 billion to wrap up the program). The Bank stopped its purchases in February 2010 after almost one full year (Joyce and Tong 2012). At a press conference on February 10th Mervyn King noted that future QE was a possibility and whether or not the program was revived would depend on the "outlook on inflation."

At its meeting held over August 5th and 6th, 2009, the Bank decided to extend its purchases to all gilts with a residual maturity of more than three years. In order to deal with the increased purchasing capacity of the APP, it added a third auction, which meant there was now a 3-10 year auction, a 10-25 year auction, and a 25+ year auction. It also began a gilt lending program with the Debt Management Office (Joyce and Tong 2012).

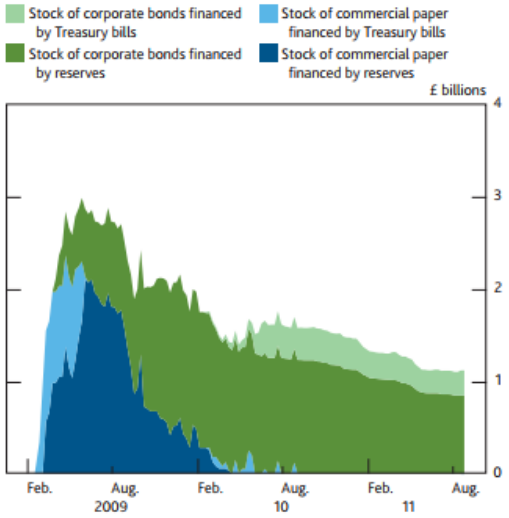
In November 2009, the Bank spread these three auctions over two weeks rather than one until it reached £200 billion of purchases in January. By the end of the program, the APP had facilitated 92 reverse auctions. "The size of the auctions reduced over time…Cover was generally higher for the shorter maturity auctions than for the longer maturity ones, and there was a decline over time in the spread between the maximum and minimum yields accepted in each auction. The asset purchases at the end of the first episode (QE1) represented almost 30% of the amount of outstanding gilts held by the private sector" (Joyce and Tong 2012).

In reaction to concerns about "macroeconomic imbalances" in the Eurozone, and in order to offset a forecast of plunging inflation and shrinking GDP[2], the Bank of England restarted the QE program (termed QE2) from October 2011 until July 2012 with a revised purchase target of £375 billion (total, including QE1) (Haldane et al. 2016).

Throughout the second episode of QE, the Bank remained focused, as it had during QE1, on purchasing from non-bank financial institutions by targeting assets typically held by these institutions. However, "it also made smaller-scale purchases of high-quality commercial paper and corporate bonds, acting as a 'backstop' buyer and seller to improve the market. Thus, the Bank's purchases were not primarily targeted at managing liquidity, but rather to boost the prices of assets, particularly on bonds issued to finance lending to households and companies" (Joyce et. al. 2011). The following figures break down the Bank's purchases of gilts, commercial paper, and corporate bonds.

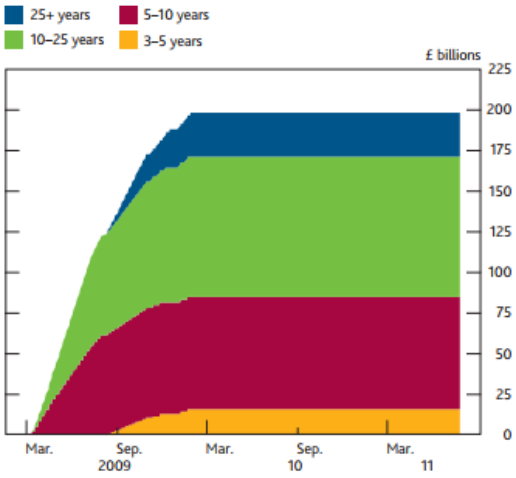
[2] Track down specific citation for this.

Figure 1: Cumulative purchases of commercial paper and corporate bonds



Source: *Joyce et al. 2011*.

Figure 2: Cumulative gilt purchases by maturity



Source: *Joyce et al. 2011*.

Outcomes

After the end of QE1 during 2009-2010, the Bank of England's balance sheet showed three times the amount of GDP compared to pre-crisis levels, and the amount of assets purchased during the first episode came to about 14% of the UK's GDP. By the program's end, CPI inflation hovered at 3%, compared to 5.2% in September 2008 and 1.1% in September 2009, according to the Office for National Statistics (Tucker 2017). GDP began to rise at the beginning of 2009 "and follows that trend to date" (Scruton 2017).

QE2 was conducted between October 2011 and June 2012. The Bank purchased an additional £175 billion of purchases – roughly 11% of GDP at the time. By the end of this second installment, CPI inflation was at 2.6% and GDP was increasing (Tucker 2017, Scruton 2017).

II. Key Design Decisions

1. The purpose of the Asset Purchase Program was to improve liquidity in credit markets that were not functioning normally and offset a predicted recession.

At the beginning of 2009, economic forecasts for the United Kingdom predicted a recession worse than that of the 1990s. To offset this, the Bank of England employed conventional monetary policy and slashed the Bank Rate to its effective lower bound, but predictions remained grim, and so in March 2009 the Bank introduced the first episode of its Asset Purchase Program. The stated aim of this program was to increase nominal spending and bring inflation back to its 2% target.

Therefore, on March 5th, 2009, the MPC announced that the APP would purchase £75 billion of assets over the course of the next three months.

2. Asset purchases targeted non-bank financial institutions.

More specifically, the purchases were primarily targeted at life insurance companies and pension funds, which were known for holding long-term gilts. However, these gilts only represented a small amount of the institutions' portfolios, "which indicated that they might be prepared to reinvest money from gilt sales into other assets"; this would lead to the Bank's portfolio rebalancing channel (Joyce et al. 2011).

The Bank's plan for quantitative easing involved five channels through which QE would impact the economy: money, liquidity, portfolio rebalancing, policy signaling, and confidence, which would operate in tandem to achieve the program's desired results (Joyce et al. 2011).

Additionally, by operating in this way, QE avoided directly targeting banks, as "any impact on banks was thought likely to be small due to the desire to deleverage" (Haldane et. al 2016, Joyce et. al 2011, Joyce 2013).

3. Purchase announcements occurred every three months during QE1.

The Bank periodically disclosed how much it would continue to purchase through the program, which helped to maintain order in the markets (Joyce et. al 2011).

4. Purchases overwhelmingly focused on gilts.

This was due to a tradeoff in priorities between improving market conditions and increasing nominal demand. The Bank prioritized the latter; additionally, "buying primarily private sector assets means that the government chooses to act in specific sectors or even in specific companies, which can distort economic activity. Buying gilts increases the amount of money in a more 'economically neutral' way" (Lilico 2011).

5. The Bank chose to introduce an unconventional monetary policy in combination with conventional methods to revitalize the economy.

Lowering the interest rate so near to its effective lower bound was already a significant "loosening" of what was considered conventional monetary policy. However, in the face of a growing financial crisis and "one of the largest falls in output ever recorded in the UK…There was a consensus among members of the MPC that this loosening of conventional policy would not be enough to combat the GFC, and so the Bank opted to combine conventional monetary policy with the unconventional method of quantitative easing in the hopes that the effects of the two strategies would give the economy the boost it needed" (Fisher 2010).

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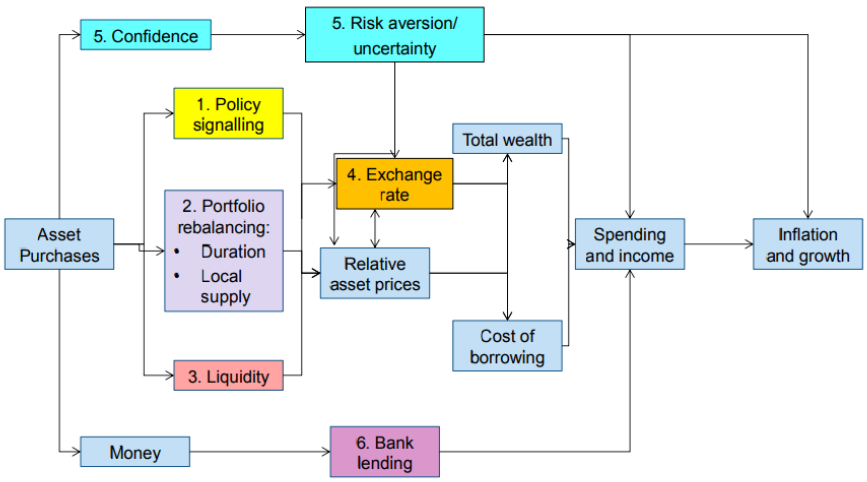
Figure 3: Stylized transmission mechanism of QE



***Source:** Haldane et al. 2016.*

The first channel was portfolio rebalancing, which was considered to be particularly important. By way of this channel, "central bank asset purchases push up the prices of assets bought, along with other assets…higher asset prices mean lower yields, lower borrowing costs…[and] an increase in net wealth of asset holders…which stimulate[s] spending" (Joyce et al. 2011).

The second channel was liquidity, which QE would achieve by "actively encouraging trading" (Joyce et al. 2011). However, the effectiveness of this channel may be limited to the period of time in which the central bank is actively making purchases. As such, "this channel was not expected to be very important in terms of gilt purchases – instead, it would [focus] on the Bank's (relatively) small-scale purchases of private sector assets and directly improve the availability of capital market finance to companies" (Joyce et. al 2011).

The third channel was confidence. Consumers would see the Bank's willingness to employ unconventional monetary policy and would become more certain about market outlook (Joyce et al. 2011, Haldane et al. 2016).

The fourth channel was money. QE expanded the balance sheet, loosened the money supply, and facilitated bank lending (Joyce et al. 2011, Haldane et al. 2016).

The fifth and final channel was policy signaling. The methods by which QE was conducted provided information to economic participants about "potential future paths of monetary policy" and would thus inform those participants' future actions (Joyce et al. 2011).

Finally, the Bank's plan included a two-step process through which QE would impact the macroeconomy.

The first "impact" phase involved portfolio rebalancing – when reinforced by policy signaling and a rise in asset prices, this would in turn foster demand. The second "adjustment phase" would lessen the imbalance between money and asset markets, "and price level would slowly increase until it restored real money balances, real asset prices, and real output to their desired levels" (Joyce et al. 2011).

6. In August 2009, the Bank lent out some of the gilts it bought through the Debt Management Office in exchange for gilts with readier availability.

During QE1, the Bank purchased a large proportion of certain gilts in issue, which created risk that sections of the gilt market would become dislocated. By lending out some of the gilts purchased the Bank was able to lessen that risk. The Bank deliberately did not lend out the gilts against cash, as "that would reverse some of the effects of the first asset purchases" (Joyce et. al 2011). This scheme successfully alleviated issues within the gilt market and market contacts reported that "the spread between repo rates and the general collateral secured rate somewhat normalized for the types of gilts that had been heavily affected by the Bank's purchases" (Joyce and Tong 2012).

7. **In August 2009, the Bank began purchasing all conventional gilts with maturities of three years or more, thus extending the maturity of potential purchases.**

Over the course of the program, the Bank had come to hold a large proportion of gilts in issue at the 5-25 year maturity range, and this was another strategic measure to avoid dislocation of the gilt market (Joyce et. al 2011).

8. **During QE1, gilt auctions initially occurred twice a week, but after the MPC's August 2009 meeting, the auctions were spread over two weeks and there were three instead of two.**

This was done to accommodate the newly enlarged purchase range mentioned above in Key Decision 6 (Joyce and Tong 2012).

9. **The Bank initiated a second episode of QE starting in October 2011.**

QE was not explicitly planned to be a recurring event; but "amid fears of a double-dip recession and a crisis in the Eurozone," the Bank resumed the program. In a statement released on the 6th of October, the Bank detailed its strategy: "The pace of global expansion has slackened, especially in the United Kingdom's main export markets. Vulnerabilities associated with the indebtedness of some euro-area sovereigns and banks have resulted in severe strains in bank funding markets and financial markets more generally. These tensions in the world economy threaten the UK recovery" (Allen 2011, The Telegraph 2011).

III. Evaluation

The majority of existing literature holds that quantitative easing did have a positive effect on the economy of the United Kingdom. However, uncertainty exists as to how much and in what ways, as it is both hard to create reliable counterfactuals and to isolate the policy of QE from other economic recovery programs implemented both domestically and internationally at the same time. In addition, it has been estimated that "the degree of uncertainty surrounding the macroeconomic effects of asset purchases is at least twice as large as that for conventional monetary policy" (Haldane et. al 2016).

There are a few main categories that stand out in the existing attempts to quantify the impact of QE on the United Kingdom's economy. The first of these is the impact of asset purchases on gilt prices and other asset prices.

There is a general consensus that QE asset purchases had "a significant and persistent impact on gilt yields." Joyce et al. looked at the market reactions to the separate QE announcements and found that the biggest reaction occurred between 15 and 20-year maturities, with up to 120 basis points (Joyce and Tong 2012).

Another examination by Joyce et al. of the announcement effects of QE during the first wave of auctions found that the purchases lowered medium to long-term gilt yields by approximately 100 basis points (Joyce et al. 2011).

During the first wave of purchases, from March 2009 through March 2010, asset prices rose steadily. This trend occurred simultaneously along with a general rise in asset prices internationally, as other countries employed similar programs (Joyce et al. 2011). One estimate by Bridges and Thomas places the increase in asset prices at around 20% (Bridges and Thomas 2012). Figure 4 provides an overview of the various asset price movements during the QE episodes.

Figure 4: Summary of asset price movements over QE episodes

Summary of asset price movements

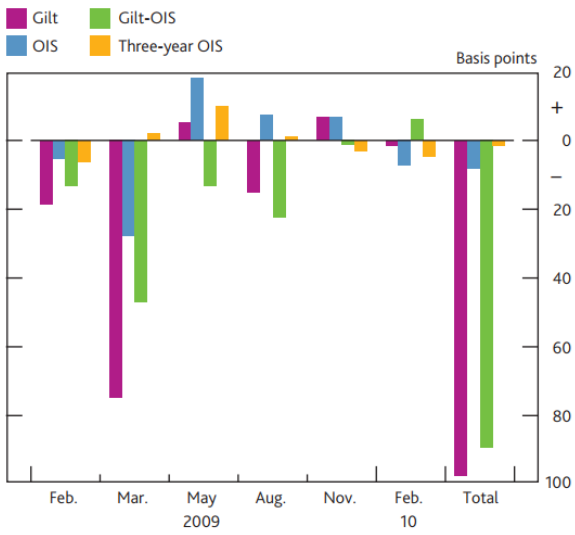
	QE1: total of £200bn purchases over 6 announcements (Feb 09, Mar 09, May 09, Aug 09, Nov 09, Feb 10).		**QE2/3**: total of £175bn purchases over 5 announcements (Oct 11, Feb 12, May 12, July 12, Nov 12).	
Asset	**Change around QE1 announcements**	**Change 4 March 2009 – 26 January 2010**	**Change around QE2/3 announcements**	**Change 5 October 2011 - 31 October 2012**
Gilts (5-25 year spot rates)	-104bp	-9bp	+2bp	-45bp
Corporate yields (investment grade)	-69bp	-390bp	-7bp	-200bp
Corporate yields (high yield)	-151bp	-1938bp	-11bp	-354bp
FTSE All-Share	-3%	+46%	+4%	+6%
Sterling ERI	-4%	+4%	1%	+6%

BANK OF ENGLAND Mike Joyce, The BoE's unconventional monetary policies

Source: *Joyce 2013*.

The effectiveness of the portfolio rebalancing channel is corroborated by other data, which shows that a decrease in gilt yields after the QE announcements (as seen in Figure 5, below) did not occur along with a decrease in interest rates from OIS contracts; "this lack of movement indicate[d] that the large fall in gilt yields [could not] be primarily attributed to signaling of future policy rates or macroeconomic news" (Joyce et. al. 2011).

Figure 5: Announcement impact on gilt yields, OIS rates and gilt-OIS spreads



Sources: Joyce *et al* (2011), Bloomberg and Bank calculations.

(a) Average change in 5–25 year spot rates unless otherwise specified.

Source: ***Joyce et al. 2011.***

Additionally, during QE1, sterling investment-grade corporate bond yields decreased by an amount that paralleled the decrease in gilt yields. However, in total, the yields of sterling high-yield corporate bonds decreased by an average of 150 basis points over the course of the six QE announcements. Finally, corporate bond and equity issuance rose due to QE1 (Joyce et. al 2011).

The second category analyzing the impact of QE examines inflation. Joyce et al. 2011 used a Phillips curve relationship to determine the impact of QE on inflation and found an impact of between approximately 0.75 to 2.5 percentage points. Another study by Kapetanios et al. 2012 estimated a peak impact on annual CPI inflation of approximately about 1.25 percentage points.

The third category looks at QE's estimated impact on GDP. Of the existing studies that examine this, one cites QE's peak impact on the level of real GDP as between 1.5% and 2.5% (Joyce et al. 2011), and the other cites it as around 1.5% (Meaning and Warren 2015). Weale and Wieladek (2016) conducted a Structural Vector Auto-Regression (SVAR) approach and concluded that the QE program may have fostered a rise in GDP.

However, there is a dissenting voice amongst the existing literature: Lyonett and Werner (2012), who argue that "QE as defined and announced in March 2009 had no apparent impact on the UK economy." They use the "Hendry" form of econometric modeling to examine the impact of QE on GDP, and conclude that the Bank of England should instead focus on the "growth of bank credit for GDP transactions," citing the fact that bank credit growth fell by "record amounts" in late 2011.

Finally, most studies that examine the macroeconomic effects of QE conclude that it successfully allowed the UK to avoid potent future risks of deflation and "output collapses" (Bridges and Thomas 2012, Ashworth and Goodhart 2012, Baumeister and Benati 2013).

It is clear that QE had an impact. A study by Joyce et al. 2011 concludes that the policy had "economically significant effects equivalent to a 150 to 300 basis point cut in the bank rate."

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V. Key Program Documents

Summary of Program

Comparative Study of Central Bank Quantitative Easing Programs (Agostini et. al. 2016) – *literature reviews of existing studies on quantitative easing.* https://sipa.columbia.edu/sites/default/files/FRBNY_Comparative%20Analysis%20of%20Central%20Bank%20QE%20Programs.pdf

The Bank of England's unconventional monetary policies: why, what and how (Joyce 2013) – *presentation taken from ECB workshop on non-standard monetary policy measures.* https://www.ecb.europa.eu/events/pdf/conferences/130607/PanelDiscussion_joyce.pdf?9b7c697afa3b9dce804543b2b4538d5b

Implementation Documents

Quantitative Easing (6/12/2009) – *Quarterly Bulletin released by the Bank of England explaining the new policy after its introduction.* http://www.bankofengland.co.uk/publications/Documents/quarterlybulletin/qb090201.pdf

Letter from the Chancellor to the Governor (1/29/2009) – *Letter from the Chancellor to Mervyn King on the creation of the Asset Purchase Facility and its purpose.* http://www.bankofengland.co.uk/monetarypolicy/Documents/pdf/apfchancellorletter090129.pdf

Minutes of the Monetary Policy Committee Meeting (3/4&5/2009) – *Minutes from the MPC meeting discussing the debate over asset purchases and how they should be structured.* http://www.bankofengland.co.uk/publications/minutes/Documents/mpc/pdf/2009/mpc0903.pdf

Legal/Regulatory Guidance

Press Releases/Announcements

Bank of England cuts Bank Rate to 0.25% and introduces a package of measures designed to provide additional monetary stimulus (8/4/2016) – *Bank of England monetary policy summary.* http://www.bankofengland.co.uk/publications/minutes/Documents/mpc/mps/2016/mpsaug.pdf

Quarterly inflation report press conference (2/10/2010) – *interview with Mervyn King in which he talks about the future of QE, among other matters.* http://www.bankofengland.co.uk/publications/Documents/inflationreport/conf100210.pdf

Speech given by Mervyn King, Governor of the Bank of England (1/20/2009) – *speech detailing the economic situation and what the Bank is considering to ameliorate it.* http://www.bankofengland.co.uk/archive/Documents/historicpubs/speeches/2009/speech372.pdf

Inflation report press conference, opening remarks by the Governor (2/11/2009) – *speech given by Mervyn King explaining the large reduction in Bank Rate.* http://www.bankofengland.co.uk/publications/Documents/inflationreport/irspnote110209.pdf

Inflation report press conference, opening remarks by the Governor (8/12/2009) – *speech given by Mervyn King explaining the use of QE, maintaining the Bank Rate at 0.5%, and increasing the asset purchase program.* http://www.bankofengland.co.uk/publications/Documents/inflationreport/irspnote120809.pdf

QE – one year on (3/12/2010) – *speech given by Spencer Dale, executive director and chief economist of the Bank of England, at a conference.* http://www.bankofengland.co.uk/archive/Documents/historicpubs/speeches/2010/speech428.pdf

Media Stories

UK in recession as economy slides (BBC – 1/23/2009) – *article with facts and figures on the UK economy pre-QE.* http://news.bbc.co.uk/2/hi/business/7846266.stm

Key Academic Papers

Quantitative Easing and unconventional monetary policy – an introduction (Joyce et. al. 2012) –*article examining the impact of QE and other unconventional monetary policies as used by central banks in the wake of the GFC.* https://pdfs.semanticscholar.org/ebce/ee0b46de5ae81d271f0cd9f41f9bde7a0aa5.pdf

Panacea, curse, or nonevent? Unconventional monetary policy in the United Kingdom (Meier 2009) – *working IMF paper discussing the "moderately encouraging" effects of QE.* https://www.imf.org/en/Publications/WP/Issues/2016/12/31/Panacea-Curse-or-Nonevent-Unconventional-Monetary-Policy-in-the-United-Kingdom-23161

Unconventional monetary policies: an appraisal (Borio and Disyatat 2010) – *article that creates a framework for classifying and examining unconventional monetary policies within a larger context of monetary policy implementation.* http://onlinelibrary.wiley.com/doi/10.1111/j.1467-9957.2010.02199.x/epdf

Reports/Assessments

Assessing the Economy-wide Effects of Quantitative Easing (Kapetanios et. al. 2012) – *article examining the macroeconomic impact of the first round of quantitative easing in the United Kingdom.* http://onlinelibrary.wiley.com/doi/10.1111/j.1468-0297.2012.02555.x/full

The Response of Interest Rates to US and UK Quantitative Easing (Christensen and Rudebusch 2012) – *article analyzing declines in government bond yields after QE announcements in both the US and the UK.* http://cepr.org/sites/default/files/events/1854_CR_EJ_2012.pdf

Evaluating Asset-Market Effects of Unconventional Monetary Policy: A Cross-Country Comparison (Rogers et. al. 2014) – *article examining effects of unconventional monetary policy, including QE, taken by four banks, including the Bank of England.* https://www.federalreserve.gov/Pubs/IFDP/2014/1101/ifdp1101.pdf

Unconventional monetary policy and the Great Recession: estimating the impact of a compression in the yield spread at the zero lower bound (Baumeister and Benati 2013) – *article looking at the macroeconomic effects of QE when the policy rate is at its zero lower bound.* http://www.ijcb.org/journal/ijcb13q2a9.pdf

QE: a successful start may be running into diminishing returns (Ashworth and Goodhart 2012) – *article examining the impact of QE1 on UK GDP*. https://academic.oup.com/oxrep/article/28/4/640/344420/QE-a-successful-start-may-be-running-into

The impact of QE on the UK economy – some supportive monetarist arithmetic (Bridges and Thomas 2012) – *working paper that uses a money demand and supply framework to estimate the impact of QE on asset prices and nominal spending.* http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.231.4153&rep=rep1&type=pdf