The impact of quantitative easing on financial markets in the United Kingdom

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Following the global financial crisis, the Bank of England was forced to take dramatic measures in an attempt to improve the UK economy. In March 2009, the Bank of England launched an unprecedented, large-scale asset-purchasing programme called quantitative easing. By October 2012, the Bank had bought £375bn worth of assets, primarily government bonds. This paper attempts a provisional evaluation of the impact of quantitative easing on financial markets in the UK and, to a lesser extent, the economy more generally. At this point in time, it is very difficult to assess these impacts by conventional means. As a result, prior studies have typically used event study analysis in attempts to quantify the policy's impact. After reviewing the event study literature, the findings from the paper's own qualitative survey of financial market experts are presented. We are able to draw two main conclusions. Firstly, the policy has had a significant effect on financial markets in much the way that was both intended and expected. In so doing, it is believed that quantitative easing will also have played an important role in stabilising the economy following the recession. This study points to a negative effect of around 50 basis points on gilt yields. However, it remains difficult to estimate the exact size of the effect that the policy has had. Secondly, the evidence suggests that the policy's main influence came through a portfolio rebalancing channel. As always, there is more research that can, and will, be done and it's hoped that the survey-based approach adopted by this paper can be extended in the future.

1. Introduction

The global financial crisis that started in 2007 was led by the sub-prime mortgage crisis in the US, but quickly became more generalised. In September of that year, the UK mortgage lender Northern Rock became the first British casualty, requiring intervention in the form of emergency funding from the Bank of England. A year or so later, events took a significant turn for the worse as one of the world's largest banks, the US investment bank Lehman Brothers, collapsed. Confidence in the global financial system and the global economy fell sharply and markets became dysfunctional, limiting liquidity and the availability of funding. A month later, in October 2008, the UK Government was forced to bail out and take a stake in three of the larger British lenders – RBS, Lloyds TSB and HBOS (BBC, 2008).

The recession that followed the financial crisis was the most severe and synchronised economic downturn in modern history. In the first quarter of 2009, UK manufacturing output fell at an annualised rate of close to 20% and unemployment rose at an unprecedented rate (Dale, 2010). In March, the FTSE 100 stock market index was almost 50% lower than it had been only eighteen months earlier (see Chart 4). In the second quarter, the UK economy was almost 6% smaller than it had been a year earlier - the sharpest fall ever recorded (see Appendix 1). The pre-recession level of activity has only been regained within the past year.

The extraordinary combination of financial crisis and recession presented a major challenge to governments and central banks around the world. It's no surprise, therefore, that the policy response was both unprecedented and unconventional. In the UK, the Bank of England's monetary policymaking body - the Monetary Policy Committee (MPC) - started to cut the bank rate, the key short-term interest rate at which commercial banks borrow from the central bank, in October 2008 (Inman, 2015). In March of the following year, the bank rate was cut for the sixth successive month to 0.5%, the lowest level in the three-hundred-year history of the Bank (Butt *et al*., 2012). This was seen as the effective floor for short rates and, hence, the effective limit to conventional monetary policy. However, it was also evident that these measures, and the expansionary fiscal policy represented by the increase in the budget deficit, might not prove sufficient (Dale, 2010). At the same time that the limit to conventional monetary policy was reached, the MPC embarked on an additional, unconventional form of monetary easing.

The term 'quantitative easing' was first applied to the Bank of Japan's purchases of government securities from the banking sector, which had been aimed at fighting off deflation

in the early 2000s (Joyce *et al*., 2012). In more recent times, the Federal Reserve, the Bank of England, and more recently still, the European Central Bank have all undertaken their own quantitative easing programmes. In the UK, quantitative easing was launched in March 2009. The policy involves taking assets onto the central bank's balance sheet and increasing the money supply as a result. The balance sheet and the money supply are the 'quantities' in 'quantitative easing'. In particular, the Bank of England set out to buy medium and long-term government bonds or gilts from the non-bank private sector (Benford *et al*., 2009). Through several possible transmission channels, or 'channels of influence', the intention was that the expansion of the broad money supply should boost spending and income, helping to stabilise growth and inflation. The MPC initially set out to buy £75bn of gilts. However, the programme quickly grew in size and in 2012 the total purchases of government bonds rose to £375bn (Inman, 2015). The MPC has subsequently maintained the stock at this level by reinvesting cash flows from maturing assets (Bank of England, 2014b).

This paper attempts a provisional evaluation of the impact of quantitative easing in the UK. We will review the literature on the topic and present our own survey in order to identify the important channels of influence and evaluate the policy's impact on financial markets and, to a lesser extent, the economy more generally. On the latter, it is hard to accurately estimate the policy's impact on the economy due to the difficulty in accounting for the coincident effects of other policy measures, not least conventional monetary and fiscal policy, as well as the impact of other influences (Joyce *et al*., 2011). For the most part, then, this paper looks at the impact on financial markets, including the gilt market. This provides an indication of the initial impact and we would suggest that the effectiveness of the policy in addressing the ultimate targets – spending and inflation – is likely to depend at least in part on its impact on the immediate targets.

The structure of the remainder of the paper is as follows. Section 2 describes the main features of the UK programme and its implementation. Section 3 sets out the main channels through which the policy might be expected to have an impact. Sections 4 and 5 then look at the impact of quantitative easing on financial markets; in Section 4, we present and discuss some of the relevant time-series data, and in Section 5 we review the recent event study analysis. Such studies analyse the market reaction immediately after each announcement or each round of quantitative easing in an attempt to hold other things equal. Our own qualitative survey of commentators, financial market practitioners and former policy-makers in Section 7 provides a different method of evaluating quantitative easing. In its own way, it's

also an attempt to hold other things equal. In our view, the survey results complement the event study analysis and strengthen the conclusions of the paper presented in the final section.

2. Implementation

Since January 2009, in the UK, money supply injections via the purchasing of assets have been conducted by a wholly owned subsidiary of the Bank of England, called the Asset Purchase Facility (APF). Full indemnity is provided by HM Treasury to protect the Bank of England against any losses, but the APF is independent of the government (Bean, 2009). Initially, at the start of 2009, the APF was authorised to buy up to £50bn high quality private sector assets – corporate bonds and commercial paper (Joyce, Tong and Woods, 2011). These purchases were aimed at reducing the illiquidity of credit markets in order to increase the available credit for firms. The APF began buying assets in February, however, market functioning was restored reasonably quickly and the quantities of assets purchased never came close to the £50bn ceiling (Fawley and Neely, 2013).

As the economic situation worsened, in March 2009, the MPC announced another programme of asset purchases to be undertaken by the APF that, crucially, was to be financed by central bank reserves. This was the start of quantitative easing (Joyce, Tong and Woods, 2011). Initially, it was proposed that £75bn worth of assets would be purchased over three months. The purchases consisted mainly of UK government bonds, otherwise known as 'gilts'. Policy-makers argued that gilt purchases from the non-bank private sector would increase broad money growth without incurring credit risk. In order to target assets held by the non-bank private sector most effectively, gilts with maturity dates between 5 and 25 years were purchased. This was because banks often hold very short-dated gilts, whereas longer-dated gilts are typically held by private institutions matching long-dated liabilities (Joyce, Tong and Woods, 2011).

The assets were purchased through reverse auctions. The Bank of England periodically announced schedules of auctions, usually held two or three times a week, along with the maturity range and quantity of gilts to be purchased (Treasury, 2011). In a reverse auction, bonds are purchased from the lowest bidders rather than sold to the highest bidders. So, in the quantitative easing auctions sellers submitted prices at which they were prepared to sell specific quantities of gilts. The APF then accepted the lowest offers until it had bought the total amount stated for that auction (Benford *et al*., 2009). The sellers participating in the

auction were banks and securities dealers who were permitted to submit bids on behalf of their clients (Benford *et al*., 2009).

The implementation of quantitative easing in the UK can be divided into two distinct periods. Following the launch of the policy in March 2009, the size of the programme was increased in May, and again in August, and then finally to £200bn in November. It remained at this level for almost two years. In October 2011, the programme was expanded as the medium-term outlook for growth and inflation in the UK deteriorated, partly as a result of growing concerns over the euro area economy (Inman, 2015). The programme was subsequently expanded again in February 2012, and then again, finally, in July of that year to £375bn. The stock of assets has been maintained at this level ever since. Table 1 lists the important announcements in more detail (Joyce, Tong and Woods, 2012; Fawley and Neely, 2013).

Table 1: **Quantitative Easing in the UK: Key Announcements**

Date	Announcement
February 11th 2009	The Bank of England's February Inflation Report gave a strong indication that a quantitative easing programme was likely.
March 5th 2009	The MPC cut bank rate to 0.5%. It also announced it would purchase an initial £75bn of assets financed by central bank reserves over the next 3 months. Gilt purchases were to be restricted to bonds with a maturity of between 5 and 25 years.
May 7th 2009	The MPC announced that the size of the asset purchase programme would be increased to £125bn.
August 6th 2009	The programme was extended again by the MPC to £175bn. The decision was made to target all gilts with a maturity of over 3 years in order to not further disrupt the 5 to 25 year gilt market.
November 5th 2009	The MPC announced that the quantitative easing programme would be increased to £200bn.
February 4th 2010	The MPC announced that the stock of asset purchases would be maintained at £200bn.
October 6th 2011	The MPC announced that the quantitative easing programme would be expanded to £275bn over the following 4 months.
February 9th 2012	A further £50bn of quantitative easing was announced by the MPC, taking the total stock to £325bn.
July 5th 2012	The MPC announced that the quantitative easing programme would increase to £375bn.

Source(s): Joyce, Tong and Woods (2011); and Fawley and Neely (2013)

3. Transmission Mechanisms

3.1 Impact on the money supply

The fundamental aim of the policy is to boost spending by, among other things, increasing the money supply. In order to directly increase the broad money supply, as measured by the monetary aggregate M4, asset purchases must be associated with an increase in the bank deposits held by the non-bank private sector (Butt *et al*., 2012). Asset purchases made from the banking sector, or that lead to non-banks repaying liabilities, won't necessarily increase the money supply, though they might have helpful impacts of a different sort. Any increase in

broad money may have an impact on the economy through a number of channels. On implementing quantitative easing, policy-makers were uncertain about the strength and the timing of the different channels due to the unprecedented nature of the policy (Benford *et al*., 2009). Some have argued that describing the process in any great detail is unnecessary and that an increase in broad money should, by definition, increase economic activity or prices (Benford *et al*., 2009). This is the quantity theory of money. In practice, while M4 growth has been positively correlated with nominal growth in the UK, the relationship has not been particularly strong and subject to so-called long and variable lags (Benford *et al*., 2009). As the programme has continued, discussion and research has tended to focus on three key transmission channels as identified and discussed below.

3.2 Portfolio rebalancing

Under certain assumptions, large-scale asset purchases should raise the price and reduce the yield of the assets in question. On that basis, a programme such as that in the UK that focuses on government bonds can be expected to reduce gilt yields. With short rates at the effective floor, the policy can be thought of as acting on long-term rates. In addition, the initial effect on gilt yields is likely to initiate a broader chain of transactions and revaluations that raise prices and reduce yields on a wider range of assets. In part, this is because some of those who sell gilts are likely to view the money obtained as a poor substitute. To rebalance their portfolios, they may use their excess money balances to purchase other assets, such as equities or corporate bonds (Benford *et al*., 2009). The money is then transferred to the sellers of those assets who may similarly need to buy other assets to rebalance their own portfolios, and on it goes. The rise in other asset prices rise, and corresponding falls in yields, may lead to an increase in the issuance of new assets and finance for new spending. The rise in asset prices also increases the wealth of existing asset holders, which may boost their spending, though some may choose to save more in response to lower rates (Joyce *et al*., 2011). This is the channels through which the MPC believed quantitative easing would have the most impact (Benford *et al*., 2009).

3.3 Impact on the exchange rate

On the same assumption that investors view money as an imperfect substitute for non-money assets, and are likely to purchase other assets as a result of quantitative easing, it's possible that some of the new purchases may include foreign assets, including foreign government bonds (Joyce *et al*., 2011). Furthermore, as a result of the decline in yields of a wider range of assets from the portfolio balancing effect, investors may exchange UK assets for foreign ones

in search of higher returns. Therefore, the policy could put downward pressure on the sterling exchange rate, making UK exports more competitive and thus increasing demand (Joyce *et al*., 2011). Another implication of this point is that some of the impact – possibly a relatively small part – of the UK programme may have leaked overseas to other economies, and vice versa in the case of the US and Japanese programmes (Butt *et al*., 2012).

3.4 Impact on short rate expectations

Large-scale asset purchases are also likely to affect market participants' expectations about future monetary policy. A programme of quantitative easing suggests – and can therefore be used to signal – that short rates are likely to remain low for an extended period of time (Joyce *et al*., 2011). If all else is equal, this should add to the effectiveness of conventional monetary policy. For some commentators, particularly those in the US, this 'signalling' effect represents a key aspect of the transmission mechanism (Joyce *et al*., 2012).

From an analytical point of view, there is an observational equivalence here in that the portfolio rebalancing effect and any impact on short rate expectations are both likely to be associated with lower gilt yields. As we shall see, additional information from other markets – including short rate derivatives – may allow us to separate the two to some extent, but they are clearly closely related in nature and effect.

4. Time-series data on the impact of quantitative easing

As noted above, there are a number of challenges in evaluating the impact of quantitative easing. The episode is unique in a UK context as is the simultaneous event of having short rates at unprecedentedly low levels. The programme is also still very recent, if not contemporary, which means the full impact may not have been seen yet. From an econometric point of view, this means that measuring its impact is very difficult; it's hard to identify all of the other relevant variables and there are very few policy-on and subsequent policy-off observations on which to base estimates. Furthermore, if the stock of asset purchases rather than the flow is the key parameter, then the policy is still in place. In addition, given that we normally assume that monetary policy works with a lag, it's unlikely that we have seen the full impact of the programme. In the future, it may be possible to undertake robust time-series analysis of the UK data, and also to make cross-country comparisons of the experience of the UK with that of the US and Japan, where a similar policy took place at a similar time, and the euro area, where it has only been introduced more recently. For now,

however, initial attempts of evaluation have tended to focus on the initial impact on financial markets and asset prices rather than the subsequent and ultimate impact on the economy.

In the sections that follow, we start by charting some key financial market and asset price indicators in order to form an impression of their behaviour during the period in which asset purchases were made. We go on to review the event study-type literature on the subject and, as a further form of evaluation, present the findings from our own expert survey into the attitudes and opinions of a sample of commentators and financial market practitioners.

The following charts plot ten years of daily data to help assess the impact of quantitative easing on the gilt market, the UK equity market and the exchange rate. These are the markets that one might expect to be most affected by the programme and, as outlined in Section 3, they are potentially key parts of the transmission mechanism. The shaded area on the charts covers the period between February 2009, when the programme was first announced, and the final round of asset purchases some three and a half years later at the end of Q3 2012.

Let us start with 10-year nominal gilt yields, illustrated in Chart 1. In very general terms, the chart shows that they are lower after the programme than before, by around 2% or 200 basis points. However, the movement within the shaded period is inconsistent and there was a sizeable, albeit temporary, rise in yields after the final round of asset purchases. The nominal gilt yield is made up of two components: the real yield, and an implied inflation component, which is a measure of the market's inflation expectations. Chart 2 and Chart 3 use data from index-linked gilts to decompose the change in nominal yields into these two components. There are two issues here. First, the changing balance of supply and demand in the gilt market during the programme might be expected to affect real yields more than inflation expectations. Second, and in addition, a successful asset purchase programme might reasonably be expected to raise inflation expectations, particularly if, as was the case, the starting-point was one in which there was a perceived risk of deflation (Benford *et al*., 2009).

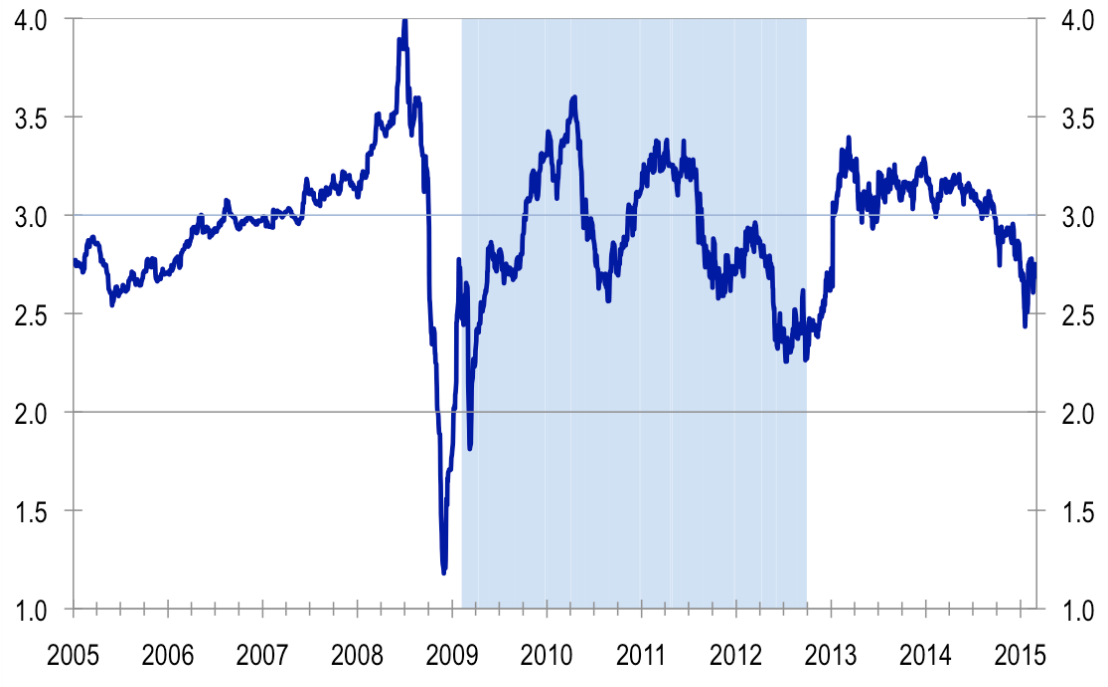
Chart 1: **10-year nominal gilt yield (%)**

Source(s): this paper's own illustration of Bank of England statistics, April 2015

Chart 2: **10-year real gilt yield (%)**

Source(s): this paper's own illustration of Bank of England statistics, April 2015

Chart 3: **10-year implied inflation (%)**



Source(s): this paper's own illustration of Bank of England statistics, April 2015

The charts suggest that both issues may be relevant. The fall in real yields in the highlighted area is of roughly the same size as the fall in nominal yields at 200 basis points, but is more consistent and extends to the point at which real yields became – and still are – negative. It also appears that the programme may have helped stabilise inflation expectations. A sharp fall in implied inflation before the programme started was reversed when the asset purchases were announced. It's clear that some of the volatility in nominal yields during the programme can be attributed to changes in implied inflation.

The trend in the UK equity market, illustrated in Chart 4, is similar to that observed in implied inflation. A fall in the equity market before the programme started was reversed when it got underway. The equity market has continued to rise more recently, reaching a high earlier this year at a level roughly double the low point seen just before quantitative easing started.

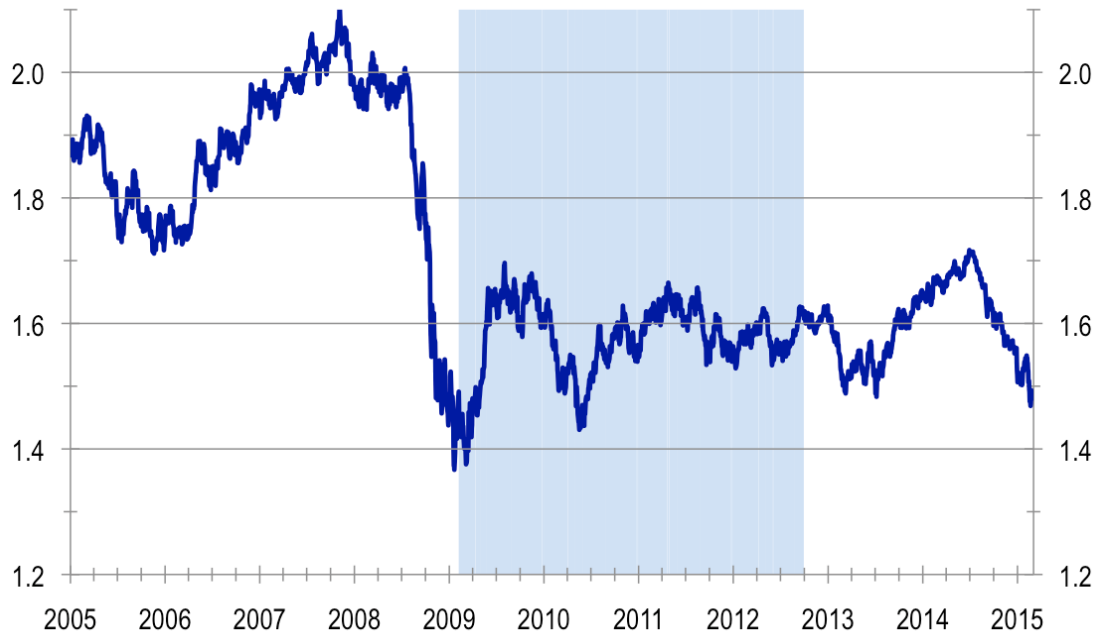
Turning to the exchange rate, Chart 5 shows the sterling-dollar cross rate, Chart 6 shows the euro-sterling cross rate, and Chart 7 shows the sterling effective exchange rate. Cross rates show the nominal exchange rate between two currencies, and the effective exchange rate measures the strength of the sterling relative to a basket of other currencies. The patterns on the main cross rates are rather different. Sterling weakened against both the dollar and the euro ahead of the programme. Since the quantitative easing started, Sterling remained closer

to the weaker end of its ten-year range against the dollar, but did return to the stronger end against the euro. As always, exchange rate movements reflect developments on both sides. The observed pattern is consistent with the expectation that the US is likely to tighten monetary policy before the UK, and that the euro area would require further monetary easing (Miller, 2015).

Chart 4: **FTSE 100 ('000s)**

Source(s): this paper's own illustration of Yahoo Finance statistics, April 2015

Chart 5: **Sterling-dollar cross rate**

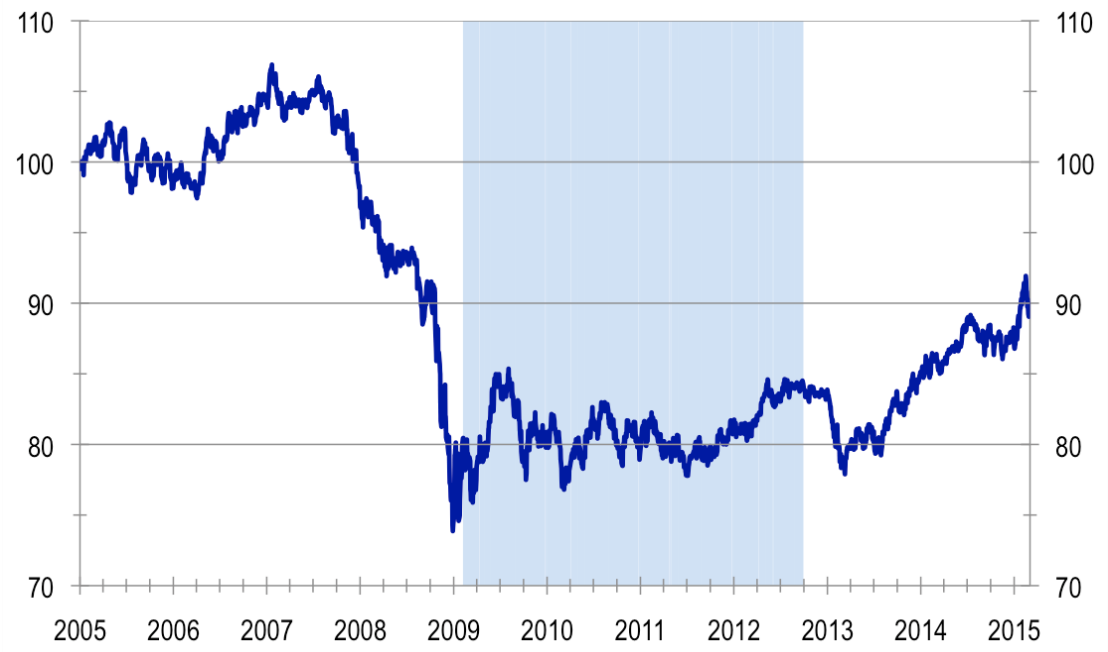


Source(s): this paper's own illustration of Bank of England statistics, April 2015

Chart 6: **Euro-sterling cross rate**

Source(s): this paper's own illustration of Bank of England statistics, April 2015

Chart 7: **Sterling effective exchange rate**



Source(s): this paper's own illustration of Bank of England statistics, April 2015

We must be cautious in drawing conclusions from this evidence. To state the obvious, observations made during the period in which asset purchases were made cannot necessarily be attributed to the asset purchases themselves. It's possible that conventional monetary policy, in the form of the extended period of very low short-term rates, or, alternatively,

various other developments in the global economy, are responsible for what we see in the charts. On the other hand, though the relationship is not conclusive or quantified, the evidence is at least consistent with the programme having had an impact in the direction that might have been expected.

In addition, we also examined the largest ten daily moves in the same financial markets and asset prices across the ten years of data. The law of averages would suggest that a period lasting around three and a half years would contain three or four of the largest daily moves in each of these markets given the ten-year timeframe. However, if quantitative easing is determined to have had a significant effect then one may expect to observe more of the largest moves between February 2009 and October 2010. In fact, nine of the ten largest daily changes in gilt yields occurred during the period of asset purchases. In contrast, all but one of the largest moves in the FTSE 100 index occurred outside the programme and all of the largest moves in the effective sterling exchange rate took place before it started. This provides further evidence – again inconclusive – that quantitative easing may have had a significant impact on gilt yields, and, albeit one that was less pronounced, or possibly simply more gradual, in the case of other financial markets and asset prices.

So much is unusual about the period that many other factors and influences could be responsible for these observations. The usual econometric approach would be to reflect those factors and influences in a series of explanatory variables in a multivariate regression. As we explained earlier, however, this is not possible at present so we need to consider alternative methods of analysis. Event studies have proved to be the most popular analytical approach amongst the literature, including research undertaken by authorities such as the Bank of England who have sought to evaluate their own policies. An event study can be defined as a method of analysis that assesses the reactions of financial markets and asset prices within a restricted time interval following quantitative easing events based on the assumption that the main explanation for any movements in such windows is the quantitative easing event itself. It's a different way of holding all other things equal. The following section provides a review of the literature and some of the key results obtained.

5. The event study literature

It's usual to expect that credible policy announcements will be factored into market prices when they are made rather than when the policy actions themselves actually occur because this is when participants will form their expectations and valuations (Gagnon *et al.*, 2011). So,

in the existing literature, researchers have typically monitored the reactions of financial markets in relatively short time-periods following Bank of England announcements on quantitative easing.

5.1 Gilt Market Reactions

The policy's impact is hard to quantify, but the consensus in the literature is that the Bank of England's quantitative easing programme has had significant effects, at least on bond yields (Joyce *et al*., 2012). The difficulty in being precise about the impact of quantitative easing is reflected in a wide range of estimates across studies. In an early study, Meier (2009) estimated that gilt yields fell in the first round of asset purchases by at least 35-60 basis points. Meier (2009) supported the event study with a comparison of gilt yields and foreign government bond yields. In July 2009, UK 10-year gilt yields were 10 basis points below their early March levels, while 10-year government bond yields in the US, Germany and Switzerland had risen by between 25 to 50 basis points over the same period. Perhaps most notably, Joyce *et al*. (2011) estimated that the asset purchases in the first year of the programme had reduced gilt yields by just under 100 basis points. The study estimated that the reactions ranged between 55 and 120 basis points across the 5 to 25-year part of the yield curve (Joyce *et al*., 2011). Compare this with the observation made in the previous section that the total fall in gilt yields during the programme was roughly 200 basis points.

In contrast to these findings, however, some other studies have suggested a smaller impact. Glick and Leduc (2011) and Meaning and Zhu (2011) both estimate that the effect of quantitative easing was closer to 50 basis points. This difference is likely to be due to the fact that both elected to use a 1-day window, whereas Joyce *et al*. (2011) used a 2-day window, finding significant impacts in the second day after an announcement. Event study analysis of financial markets often involves a short intraday interval, but this was deemed inappropriate by most researchers, as markets would need longer to incorporate the news given the novelty of quantitative easing. Joyce and Tong (2012) examined high frequency, intraday data on individual gilts, allowing them to date the market reaction to the exact time that the announcements were made rather than from the close of business the day before. Both intraday studies estimated that the first round of quantitative easing had an impact consistent with Joyce *et al*. (2011) of around 100 basis points. However, they also found that throughout the programme, the gilt market took varying amounts of time to incorporate quantitative easing announcements into prices, reducing the validity of results via event studies.

This reflects that this method of analysis relies on the ability to attribute the market reaction to a single event independent of anything else. Evidently event study analysis is sensitive to the length of the window used. In this case, due to the severity of the global crisis, there was regularly other relevant news around the time of announcements driving government bond yields in different directions (Joyce, McLaren and Young, 2012). If the window is too short the full reaction may not be captured and if the window is too long then the reaction could be contaminated by other events (Joyce *et al*., 2012).

It's also worth noting that event study analysis suggests that the policy's main impact was after the first two announcements. According to several studies, the largest reactions occurred in response to the February 2009 Inflation Report and the March 2009 announcement on the launch of quantitative easing itself (Joyce *et al*., 2011; Joyce, McLaren and Young, 2012). It seems that the reaction to later announcements was noticeably smaller. Indeed, many reports suggest that the second phase of quantitative easing, from October 2011 to October 2012, had little to no impact (see Meaning and Zhu, 2011; Joyce, McLaren and Young, 2012; Martin and Milas, 2012). Joyce, McLaren and Young (2012) even go so far as to associate the £125 billion of gilts purchased between October 2011 and May 2012 with a small rise in medium to long-term gilt yields.

However, there is no conclusive evidence that quantitative easing became weaker over time, and it's possible that later rounds of quantitative easing had an impact that was comparable to that of earlier rounds. First, gilt yields rose by less than international yields on announcement days between October 2011 and May 2012, which suggests that other economic news, including market-moving developments in the euro area, may have been affecting results during the event study windows (Joyce, McLaren and Young, 2012). Secondly, the fact that event studies show smaller reactions over time reveals a fundamental flaw of this method of analysis. It's likely over time that the market gained a better understanding of the programme and was more able to accurately anticipate the relevant announcements (Joyce, McLaren and Young, 2012). In measuring the immediate reaction to announcements, event studies reveal the extent to which the news is different to expectations. They measure extent to which the event was a surprise, rather than the magnitude and impact of the event itself. It's possible that correctly anticipated moves have an impact prior to announcement, and that news that is contrary to expectations has an impact on the day of the announcement that reverses one that happened previously, or that is itself reversed subsequently. There may also be moves on days when there was no announcement but one was expected.

This helps to explain why there was such a large movement in shorter-maturity bonds following the February 2009 Inflation Report as the original and mistaken market perception was that the asset purchases would be targeted at shorter-dated gilts (Joyce *et al*., 2011). Following the March 2009 announcement in which the details of the programme were revealed, the largest effect was seen in 15 to 20-year maturities (up to 80 basis points), reflecting a correction in the earlier expectations (Joyce *et al*., 2011). Joyce *et al*. (2011) note that the announcements that followed up until November 2009 in which the programme was expanded to £200 billion were widely anticipated, which explains why the event study approach finds little reaction in the gilt market. Joyce, McLaren and Young (2012) confirm that the phase of quantitative easing announced in October 2011 was also widely expected due to the deterioration in the medium-term outlook for UK inflation, and thus it is probable that much of the effect of quantitative easing had already been incorporated into gilt prices prior to the event study window.

5.2 Reaction of corporate bonds, UK equities and exchange rate markets

Assuming investors do not view money as a perfect substitute to gilts, we would expect to see a response in the prices of other assets, such as corporate bonds and equities, and also possibly the sterling exchange rate. Announcements about quantitative easing may also affect perceptions about the future performance of the economy, and thus future corporate earnings; and changes in gilts may have an effect on the rate at which investors discount future cash flows (Joyce *et al*., 2011). Therefore, it's possible that quantitative easing will have had an impact on other asset prices and the exchange rate.

The literature is less clear about these other impacts. Joyce *et al*. (2011) estimate that the first six announcements outlined in Figure 1 caused a 70 basis point fall in Sterling investment grade corporate bond yields, and a 150 basis point fall in non-investment grade corporate bond yields. According to their study, the effective exchange rate index fell by 4%. However, the largest fall by far was following the February 2009 Inflation Report, which also indicated the likelihood of a further short rate cut, meaning that this fall may not be solely related to quantitative easing (Joyce, McLaren and Young, 2012).

Throughout the programme, there was no uniform response to quantitative easing news in equity prices according to the literature (Joyce *et al*., 2011; Joyce, McLaren and Young, 2012).

As is the case with gilt yields, event study analysis in the existing literature indicates that the second phase of quantitative easing, lasting a year from October 2011, had very little impact. Joyce, McLaren and Young (2012) find an incremental increase and decrease in investment and non-investment grade corporate yields, respectively. However, they emphasise that this is because news regarding quantitative easing was widely anticipated by the markets.

It is also noted by Joyce *et al*. (2011) that the method of observing an immediate reaction to announcements relating to quantitative easing is less suitable when examining the impact on other assets. This is because it may take time for market participants to fully rebalance their portfolios and, thus, for the full impact of quantitative easing to be incorporated into asset prices.

5.3 Evidence of transmission channels

The literature on this topic provides considerable evidence to show that the main impact from quantitative easing in the UK has come through the portfolio-rebalancing channel. This was expected by the Bank of England when they designed the policy as detailed in section 3.2. Much of the research uses interest rates from Overnight Index Swap (OIS) contracts to shed light on the significance of the role that the portfolio rebalancing channel plays compared to the role of short-term rate expectations. OIS are derivative contracts involving the exchange of a predefined fixed interest rate with one linked to a compounded overnight interest rate (Joyce *et al*., 2011). They are popular amongst financial institutions and considered to provide an accurate measure of default risk-free rates. If the main transmission mechanism of quantitative easing was through an impact on future expected short-term rates, one might expect to see a corresponding movement in OIS rates (Joyce, McLaren and Young, 2012).

Following the February 2009 and March 2009 announcements, OIS rates fell around half as much as gilt yields, indicating that some of the initial influence of the policy came through a change in short rate expectations. However, the move in gilt yields was much larger than that in OIS rates in the other event study windows (Joyce *et al*., 2011). The fact that gilt yields moved appreciably more over all the event windows has led to a belief in the literature that the portfolio balance effect is the most important channel of influence (see Joyce *et al*., 2011; and Joyce, McLaren and Young, 2012). Christensen and Rudebusch (2012) further support this interpretation by decomposing gilt yields into expectations about short-term interest rates and term premiums using dynamic term structure models. They found that declines in gilt yields reflected reduced term premiums more than lower expectations of future rates,

supporting the claim that the policy was successful in changing the relative supply of assets held by private investors.

5.4 Impact on the wider economy

It is outside this paper's scope, but we might briefly mention that some studies have attempted to quantify the impact of the asset purchases on the macro-economy using model-based simulations. On the assumption that the asset purchase programme did indeed reduce gilt yields by 100 basis points, as suggested by the event study conducted by Joyce *et al*. (2011), the Bank of England (2014b) estimated that the peak cumulative impact on real GDP could have been around 2.5%. Whilst these findings are an interesting and illustrative contribution to the debate, they cannot yet be seen as definitive. Given that this policy has only been used in severe financial crises, when even conventional monetary policy has uncertain effects, it will probably be some time before we are able to determine the broader impact of quantitative easing (Breedon, Chadha and Waters, 2012).

5.5 Summary

For all its weaknesses, the event study literature does suggest that quantitative easing has had an effect on gilt yields ranging from around 50 basis points up to 100 basis points. Furthermore, there is evidence, albeit less strong, to conclude that the purchases may also have affected the prices of a wider range of assets. There is also evidence to suggest that the most influential transmission mechanism was the portfolio balance effect.

However, the event study research also suggests that the early rounds of asset purchase announcements may have had a larger impact than the later rounds. Earlier announcements may have had a larger effect on markets due to the novelty of the policy. This is a problem with the event study approach and one that this paper has sought to address through an expert survey as discussed in the following section.

6. The results of a qualitative survey

This section presents the findings from this paper's own research. As discussed, it's extremely difficult to accurately estimate the impact that quantitative easing has had on financial markets in the UK. The typical approach in the literature has been to use event study analysis, which, as explained in the above sections, is limited due to the fact that it measures the extent to which the market has expected the news regarding quantitative easing, rather than what the news itself is. In order to overcome this problem with the previous literature, this paper

offers a survey into the attitudes and opinions of a small sample of individuals in an attempt to provide an insight into what the experts believe the impact of quantitative easing to have been in the UK.

The weaknesses of this approach are that the sample was not designed to be representative of any wider population and the responses are in many cases qualitative. On the other hand, the strength is that a reasonable number of well-placed and well-informed respondents are, by definition, being invited to assess the impact of quantitative easing separately and independently of the various other factors and influences at work at the time. As we have seen this is extremely difficult, but this paper believes that this means of approaching the task is complementary to the others, and we are particularly interested where we find similarities between our conclusions and those made by other methods of analysis.

The sample of 35 experts included a range of commentators, financial market practitioners and former policy-makers. Some current policy-makers declined to participate. The sample was intended to contain a cross-section of people who were likely to have an opinion on the issues of concern. The survey asked them to evaluate six key aspects of quantitative easing. The questions were as follows. How important is each channel of influence? Respondents were asked to rate the importance of money supply, the exchange rate, short-rate expectations, the gilt market and other asset markets on a scale of one to five. They were also asked whether the stock or the flow of gilt purchases was the more appropriate parameter in terms of measuring the impact of the programme. The survey asked what was the estimated impact on the 10-year gilt yield, and whether this adequately summarised the impact of the programme more generally. The survey asked which other markets and asset prices were likely to have been affected by the policy and/or any fall in gilt yields. The options were the UK equity market, the sterling exchange rate, UK residential property and alternative asset markets. Lastly, the respondents were asked what is the most likely exit strategy. There was a high measure of agreement on some of the questions, but less so on others. For charts illustrating the responses to each question, the reader is referred to Appendix 5.

6.1 Importance of transmission channels

There was a lack of a consensus in the sample on the importance of the money supply as a transmission channel, with responses ranging across the scale. In part, this may reflect a disinterest in, and unfamiliarity with, the money supply as a concept. More respondents thought that the impact on expectations or the ‘signalling’ channel was important. However,

the lack of consensus was evident again, with almost a quarter of respondents deeming this transmission channel completely insignificant. The clear majority of respondents thought that the policy's impact on the gilt market and other asset markets was important or very important. This would support the view discussed in the literature that the portfolio rebalancing effect played a large role in the UK programme. Although there were mixed responses on the importance of the exchange rate, it's worth noting that the majority of respondents saw some of the policy's effect come through the exchange rate. This is an interesting finding given that policy-makers rarely speak of this channel of transmission due to the political consequences of a policy that will depreciate the exchange rate.

From the responses to this question, we would suggest that there is clear agreement that quantitative easing had a strong effect through the gilt market and other markets. Thus, the results from the survey suggest that the portfolio rebalancing effect was most powerful, complementing the existing literature. There is some recognition of other channels of influence, but no real consensus concerning their importance.

6.2 Importance of stock/flow of gilt purchases

The majority (just over 60%) of respondents suggested that the flow of asset purchases mattered more than the stock. The Bank of England has typically suggested the opposite (Dale, 2010). The survey results suggest that the largest impact of quantitative easing would have been while the purchases were being made, with a smaller ongoing impact when, as now, that was no longer the case.

6.3 Impact on gilts and other markets

The responses to the question on the size of the impact on gilt yields were evenly split between the 'up to 50 basis points' category and the 'between 50 and 100 basis points' category. On average, then, we might suggest that the respondents view the impact to have been around 50 basis points. Interestingly, this is broadly consistent with some of the event study results summarised above and, again, can be compared with the observation made in a previous section that the total fall in gilt yields during the programme was roughly 200 basis points.

The sample was also clear that the impact on 10-year gilt yields doesn't summarise the full impact of the programme. This, again, supports the view that portfolio rebalancing was important. The impact was felt most immediately and most strongly in the gilt market, but

other markets have seen secondary or subsequent impacts. In particular, a considerable number of respondents pointed to a strong effect on UK equities and, less so, on the exchange rate. It's worth noting that much of the previous research on the topic fails to identify whether the equity market or the exchange rate was significantly affected, so the responses to this question make a useful contribution. There were also some who thought that there had also been an effect on property and alternatives. In addition, the sample was almost unanimous that the exit strategy would consist of raising short rates rather than making asset sales.

6.4 Summary

Overall, while it's difficult to draw strong conclusions from the survey, we would highlight some key findings. First, there is a clear consensus that the impact on gilts and other assets was important to the working of the policy. Second, there is a consensus that the impact of the policy is not adequately summarised by its impact on gilt yields. Both these points are consistent with the importance of the portfolio balance effect, which is also supported by market pricing and some of the literature on the topic. Third, the survey would suggest that the impact of quantitative easing on 10-year gilt yields is, on average, believed to have been around 50 basis points. This is consistent with some of the event studies, and suggests that others may have overestimated the impact of the policy. However, a weakness of the survey is that it cannot produce a precise estimate from the results; it isn't possible to estimate a more accurate range than 0 to 100 basis points. Finally, there is significant belief that the policy had a strong impact on the UK equity market and, to a lesser extent, the sterling exchange rate.

The fact that a sample of experts agreed on a number of points but not on others, most notably the question on transmission channels, is also an important revelation of the survey. Whilst there is a general consensus that the policy had the intended impact, there is less agreement on how and why that came about. Further research is therefore encouraged in order to further our understanding.

7. Conclusion

The extraordinary combination of financial crisis and recession presented a major challenge to policy-makers in governments and central banks around the world. It's no surprise, then, that the policy response was both unprecedented and unconventional. It is, however, a relief that it appears to have been successful. It's clear that gilt yields fell significantly during the period in which quantitative easing took place. It's important to remain cautious in attributing

that to the programme itself. To state the obvious, observations made during the period in which asset purchases were made cannot necessarily be attributed to the asset purchases themselves.

Despite its weaknesses, the event study literature does suggest that quantitative easing has had an effect on gilt yields that could range from around 50 basis points up to 100 basis points. Furthermore, there is evidence, albeit less strong, to conclude that the purchases may also have affected the prices of a wider range of assets. There is also evidence to suggest that the most influential transmission mechanism was the portfolio balance effect.

The contribution of this paper relative to previous work on the financial market impact of quantitative easing has been to conduct a qualitative survey of market experts. The results from the survey show a clear consensus that the impact on gilts and other assets was important to the working of the policy, and, also, that the impact of the policy is not adequately summarised by its impact on gilt yields. Both points are consistent with the importance of the portfolio balance effect, and thus complement and validate the literature. The results would also suggest that the impact on gilt yields is, on average, believed to have been around 50 basis points. Studies have tended to use the same event study methodology, so our qualitative survey is a useful contribution to the literature as it widens the evidence base. Finally, there is significant belief that the policy had a strong impact on the UK equity market and, to a lesser extent, the sterling exchange rate. This is a noteworthy contribution that many previous studies have failed to discover.

Our provisional conclusion is that quantitative easing has played a significant part in easing monetary policy in the UK in much the way that was intended and expected. In so doing, we believe it will also have contributed to the stabilisation of the UK economy after one of the most difficult periods in recent economic history. However, it remains difficult to accurately estimate the size of the effect that the policy has had. This is a challenge that needs to be tackled by future research in order to increase our understanding of quantitative easing. It's possible that our survey-based approach can be extended to include more precise estimations from industry experts. The lack of a consensus on the size of the policy's impact on intermediate targets makes it harder to determine the extent to which quantitative easing can influence spending and inflation. This is ultimately what the policy will be judged on.

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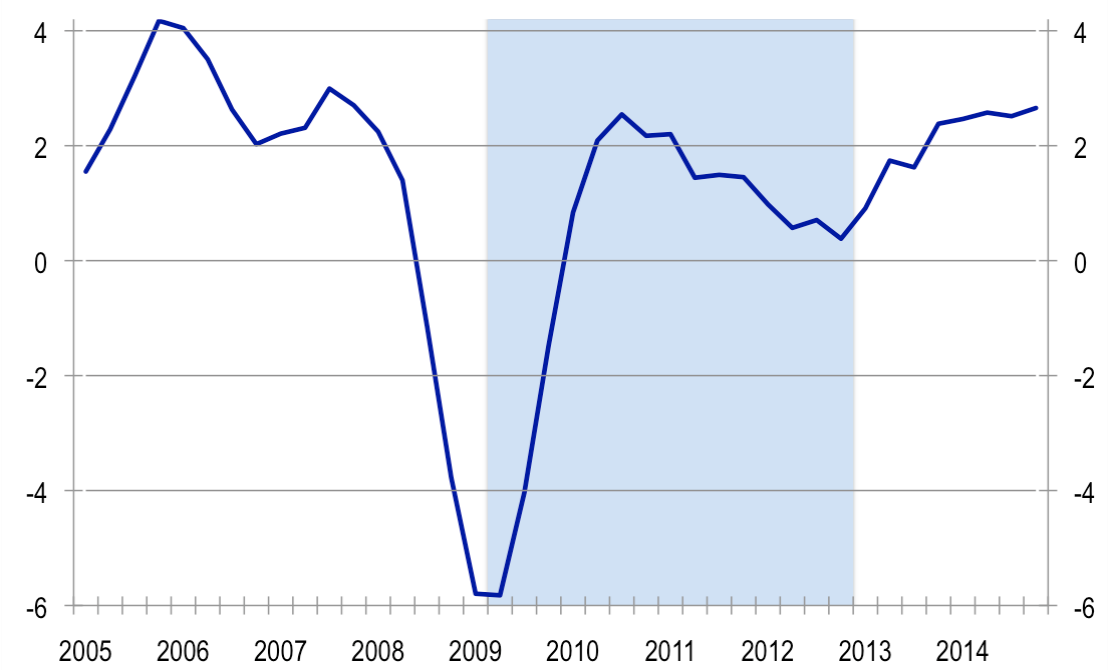
Appendices

Appendix 1

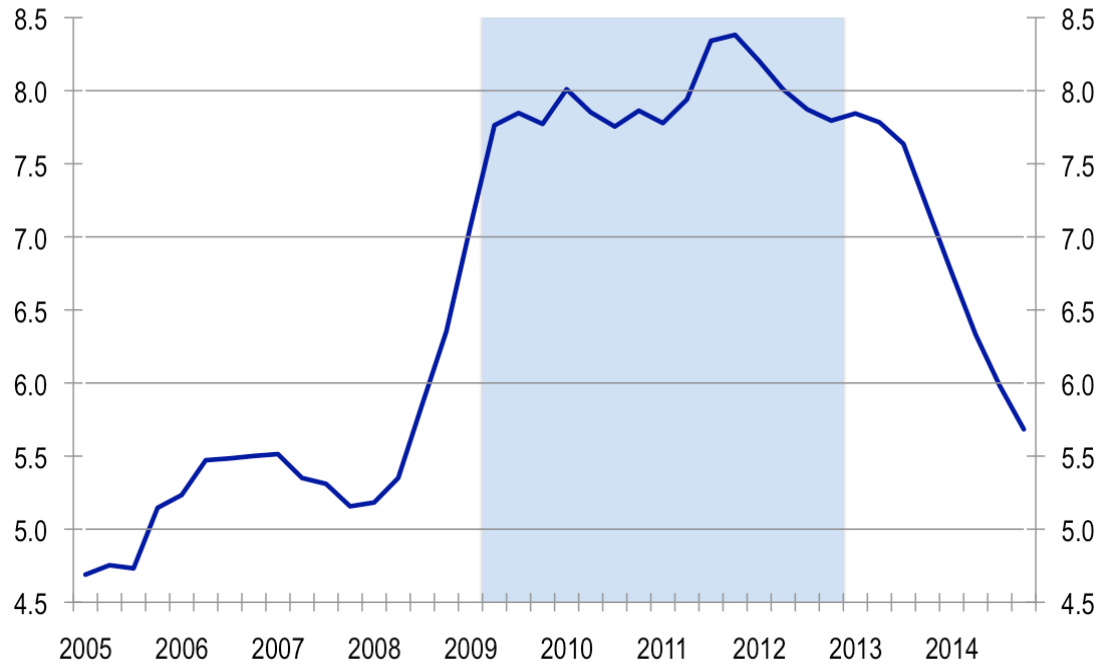
Chart 8: **UK GDP growth (quarter on same quarter previous year, %)**



Source(s): this paper's own illustration of data taken from the Office for National Statistics, April 2015

Appendix 2

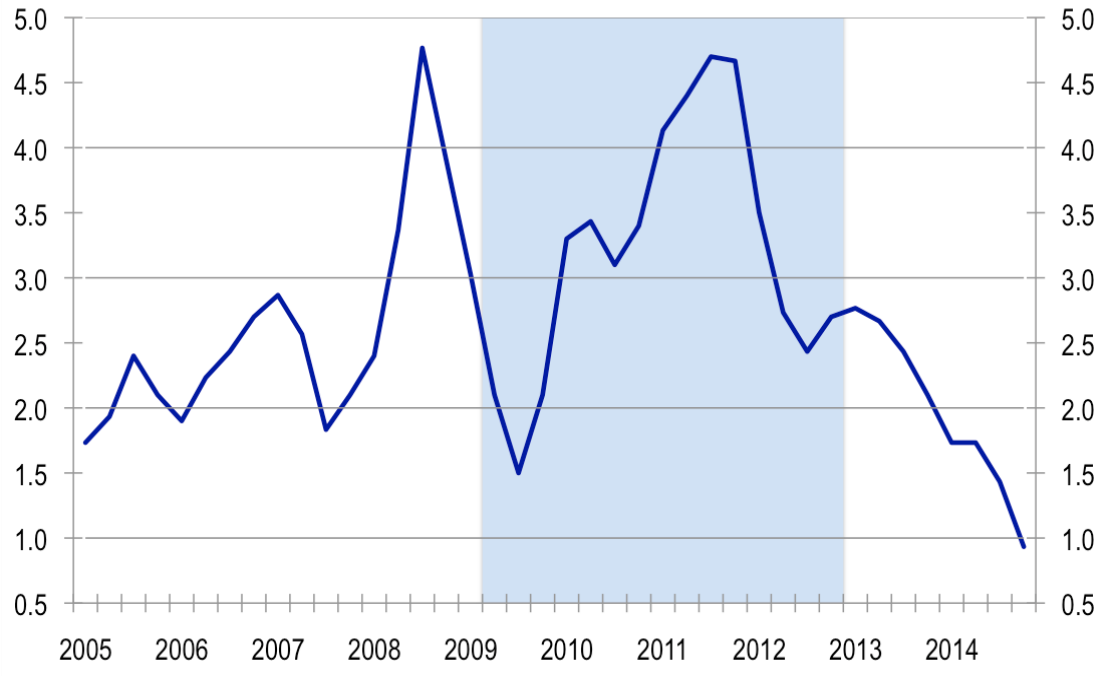
Chart 9: **UK unemployment (%)**



Source(s): this paper's own illustration of data taken from the Office for National Statistics, April 2015

Appendix 3

Chart 10: **UK CPI inflation (%)**



Source(s): this paper's own illustration of data taken from the Office for National Statistics, April 2015

Appendix 4

The survey

1. In evaluating the impact of QE, how important are the following channels of influence – please award marks out of 5 to options **A**, **B**, **C** and **D**.
(5 is very important and 1 is very unimportant)

A.	Impact on the money supply	/5
B.	Impact on short rate expectations	/5
C.	Impact on gilt and other asset prices	/5
D.	Impact on the exchange rate	/5

2. What is more appropriate in measuring the impact and extent of QE? Please circle '**a**' or '**b**'.

A. The stock of gilt purchases
B. The flow of gilt purchases

3. Is the impact of the programme on financial markets adequately summarised by the impact on 10-year gilt yields?
Please circle '**A**' or '**B**'.

A. Yes
B. No

4. What do you estimate the impact on 10-year yields to have been? Please circle **A**, **B**, **C**, or **D**.

A. Negligible
B. Up to 50 basis points
C. Between 50 and 100 basis points
D. Over 100 basis points

5. What other markets and asset prices are likely to have been affected by QE and/or any fall in gilt yields - please award marks out of 5 to options **A**, **B**, **C** and **D**.
(5 is significantly affected and 1 is not affected)

A.	The UK equity market	/5
B.	The sterling exchange rate	/5
C.	UK residential property	/5
D.	Alternative asset markets	/5

6. What is the most likely exit strategy? Please circle '**A**' or '**B**'.

A. Raising short rates without selling gilts back
B. Selling gilts back without raising short rates

Appendix 5

Charts illustrating the results from this paper's qualitative survey

Question 1

Chart 11: **Channels of influence: money supply**

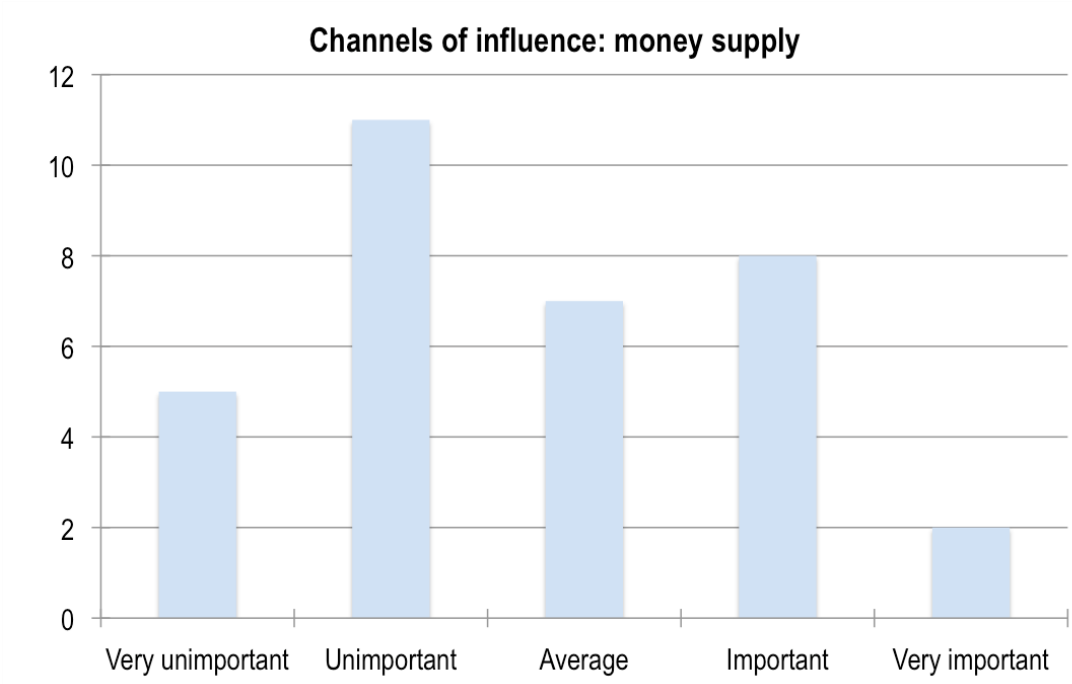


Chart 12: **Channels of influence: expectations**

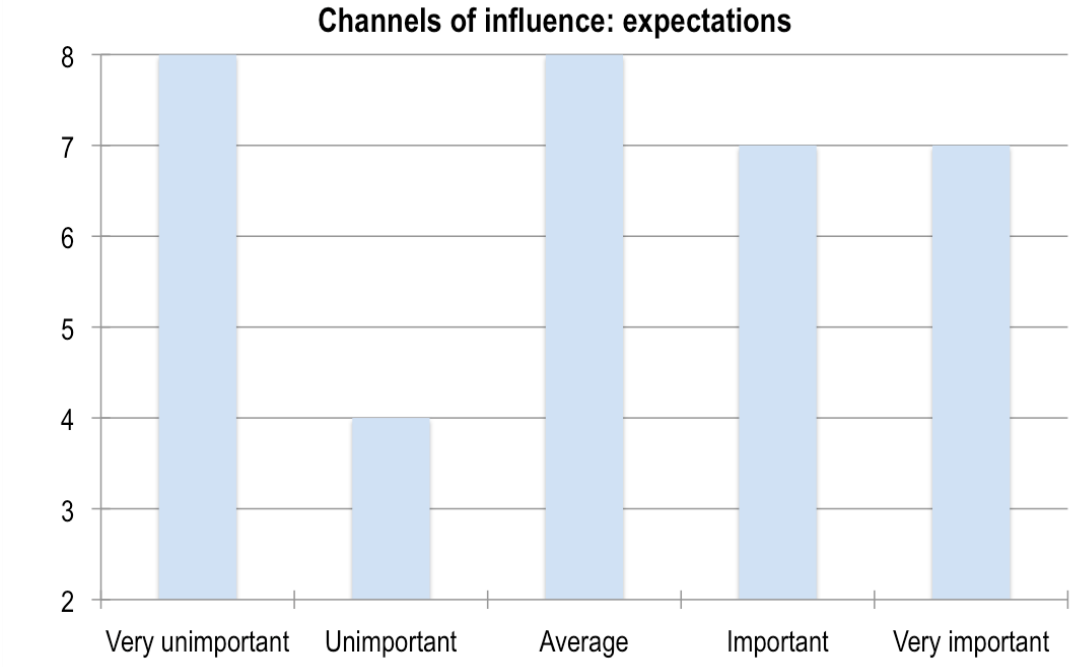


Chart 13: **Channels of influence: gilts and other asset markets**

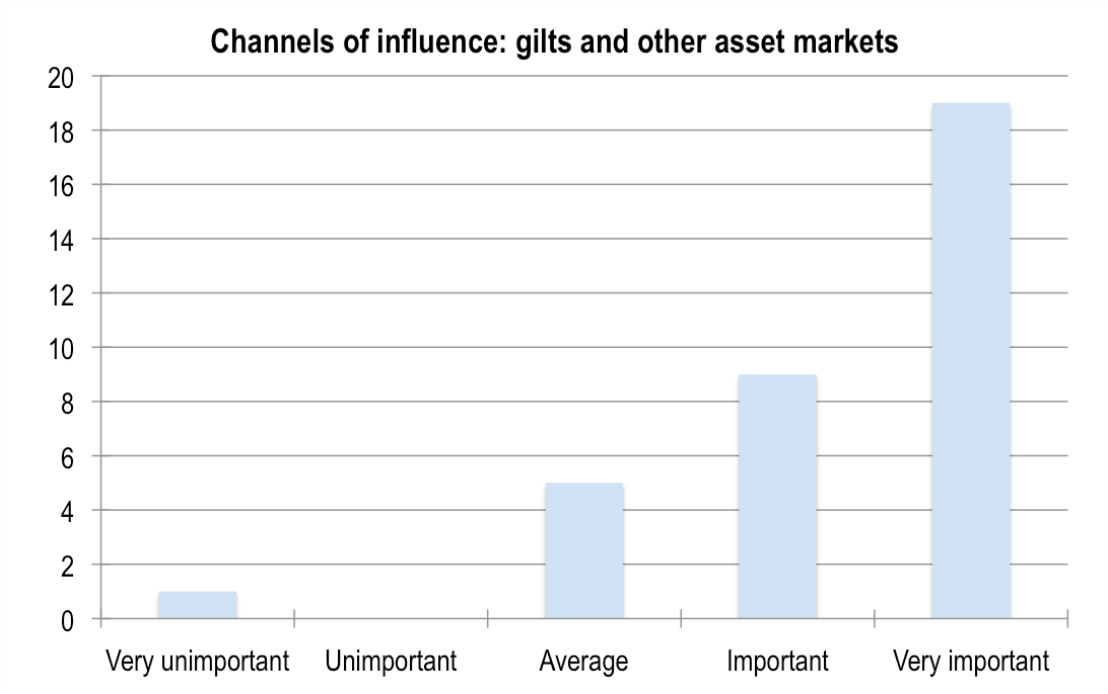
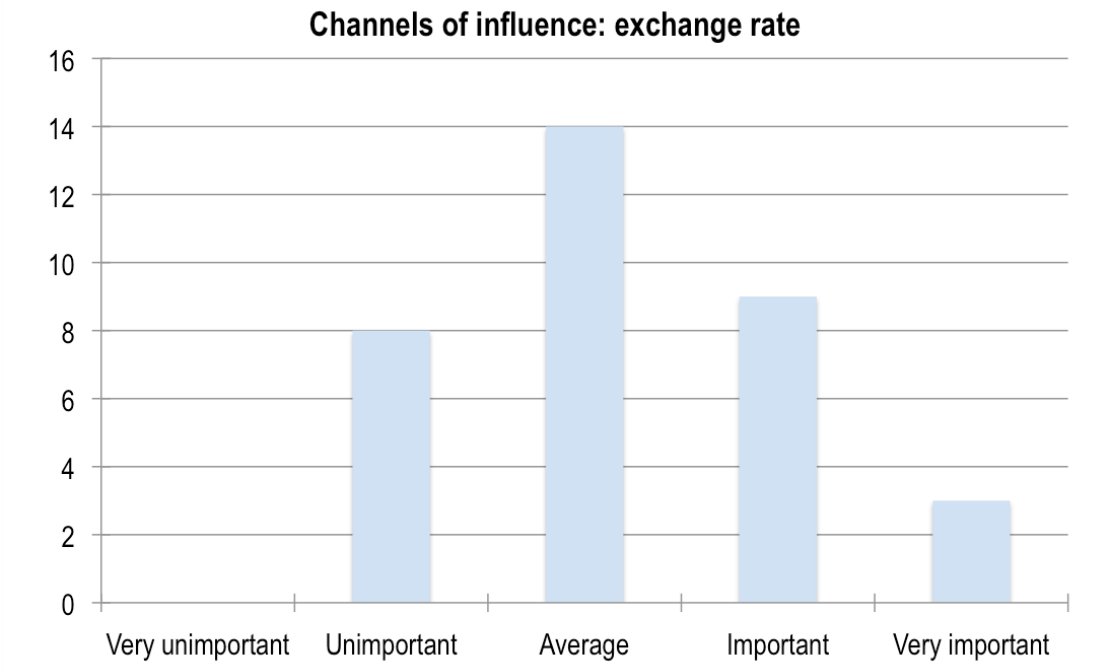
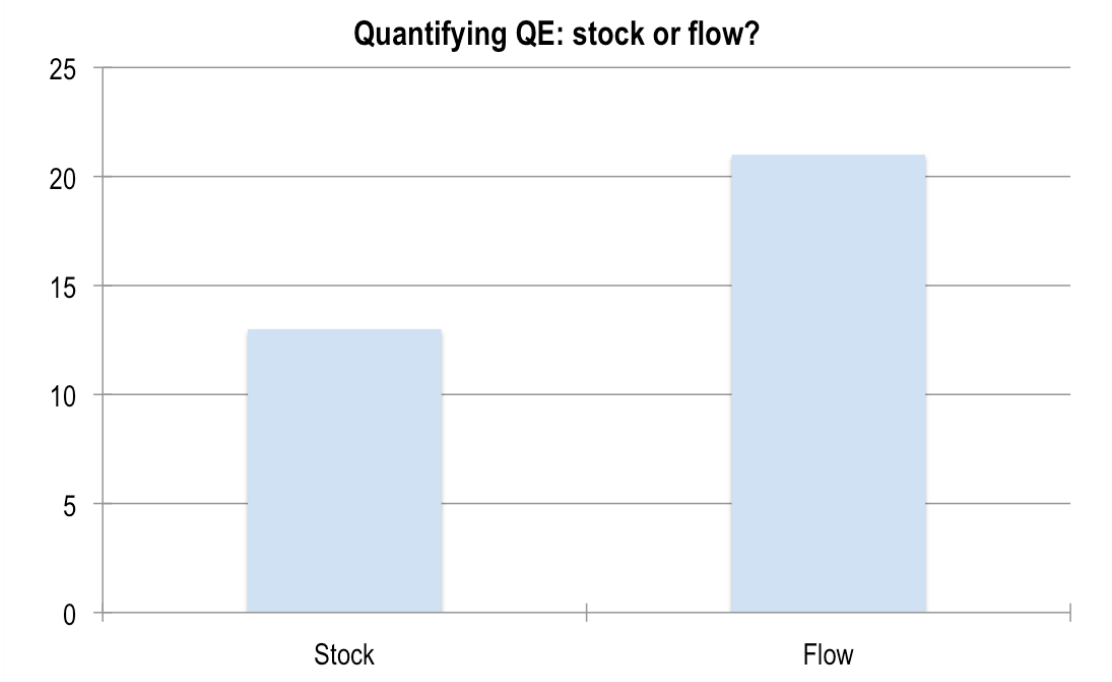


Chart 14: **Channels of influence: exchange rate**



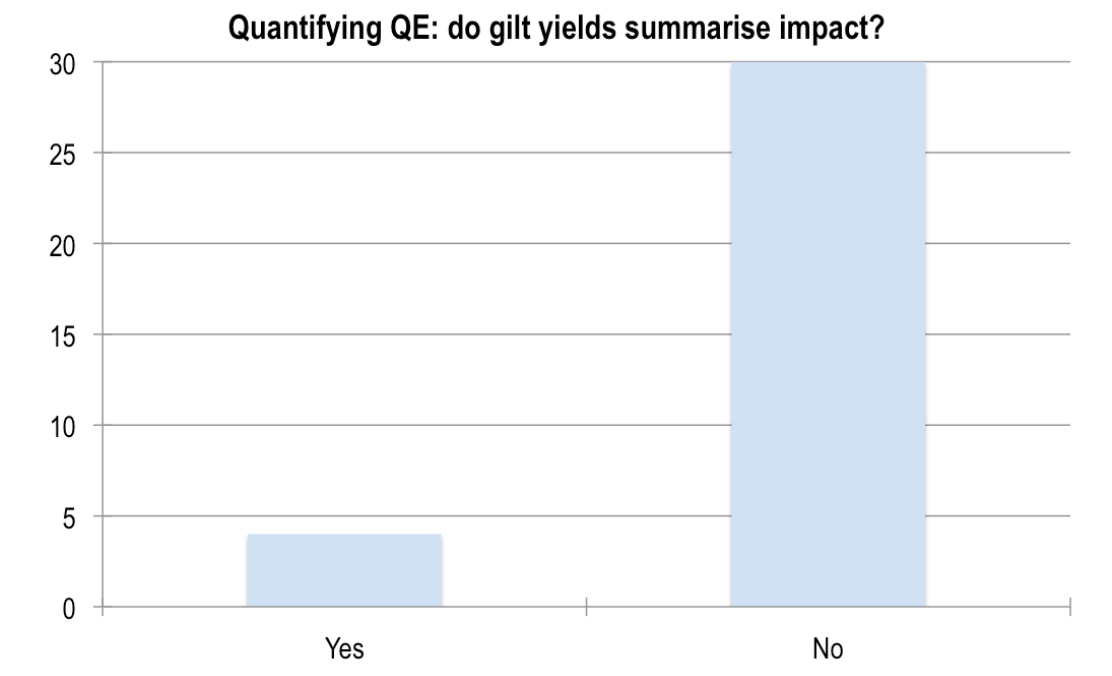
Question 2

Chart 15: **Quantifying QE: stock or flow?**



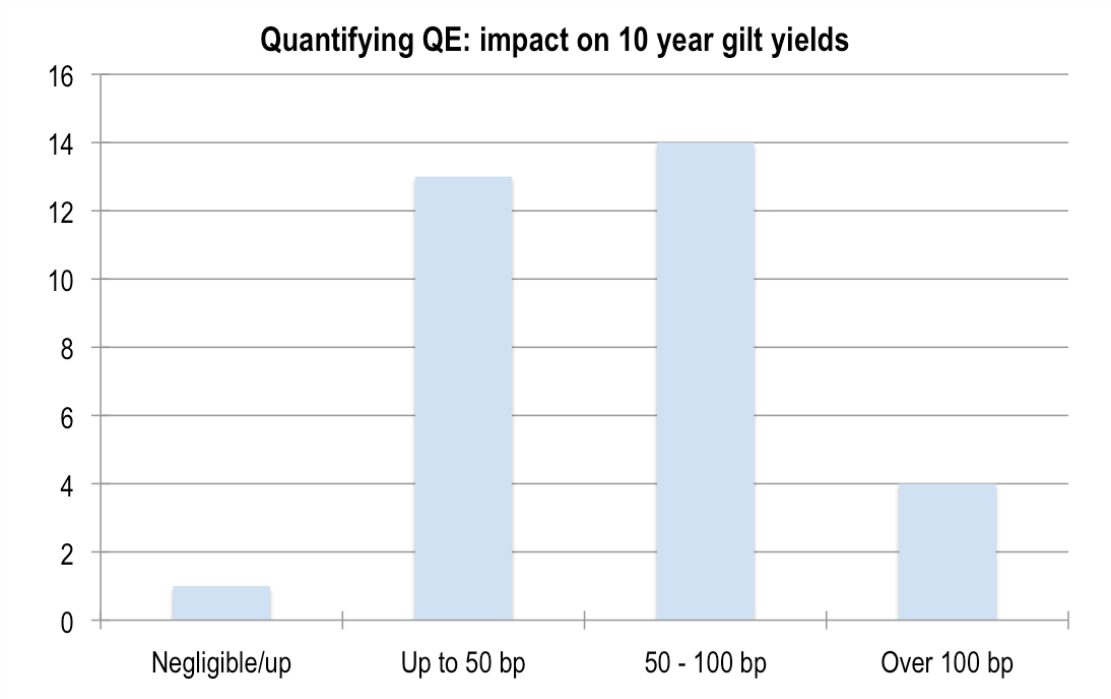
Question 3

Chart 16: **Quantifying QE: do gilt yields summarise impact?**



Question 4

Chart 17: **Quantifying QE: impact on 10 year gilt yields**



Question 5

Chart 18: **Other asset markets: UK equities**

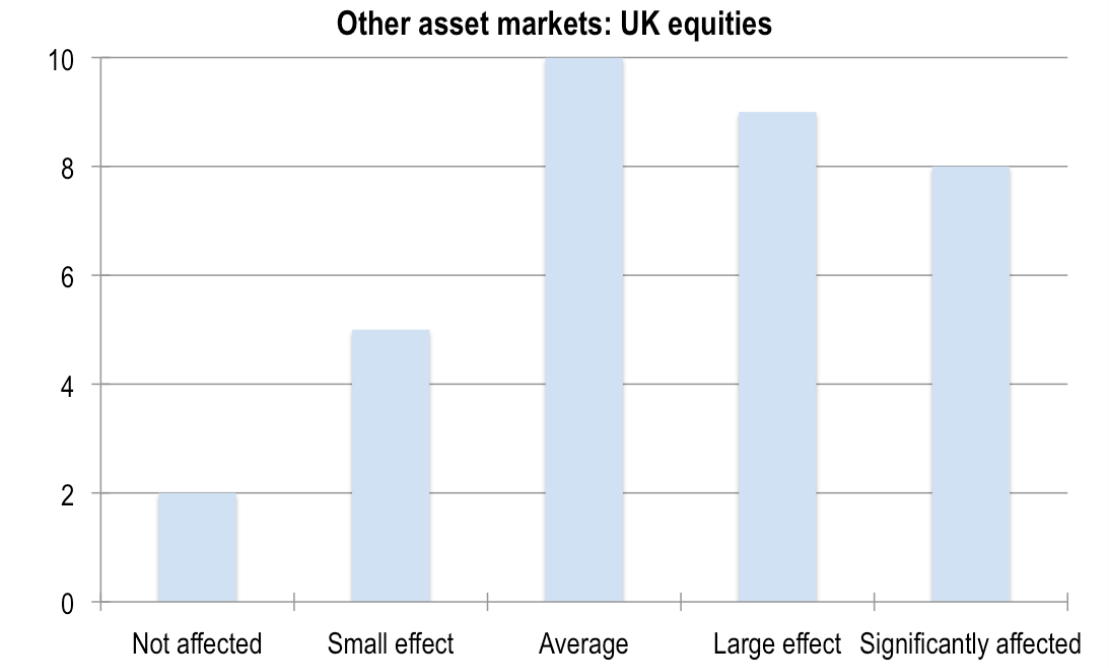


Chart 19: **Other asset markets: exchange rate**

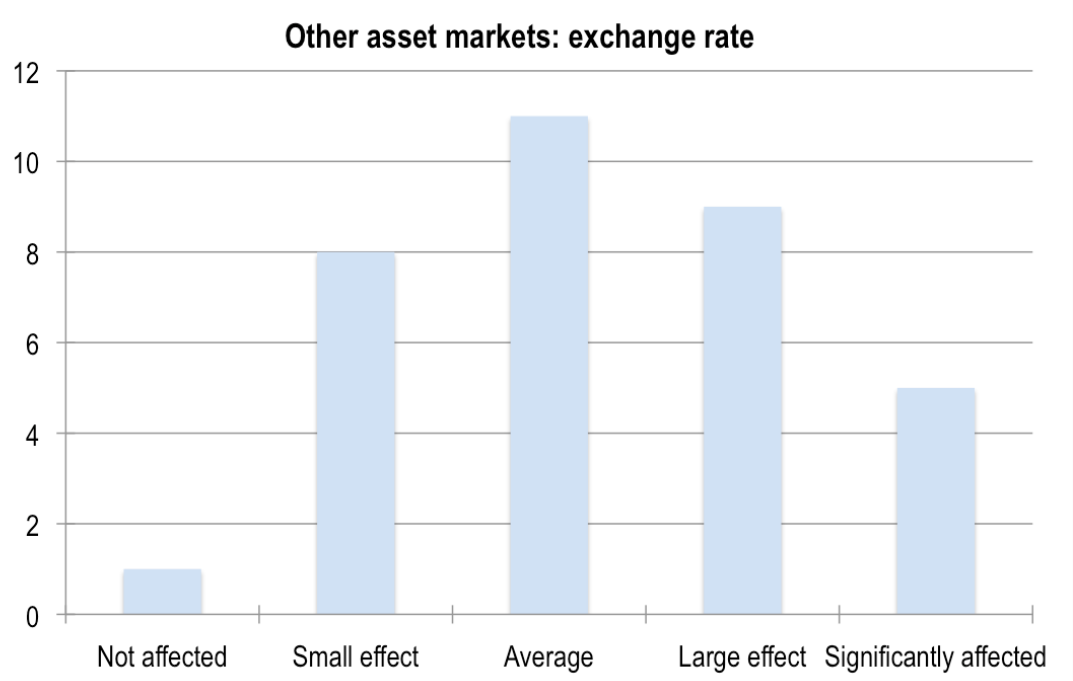


Chart 20: **Other asset markets: property**

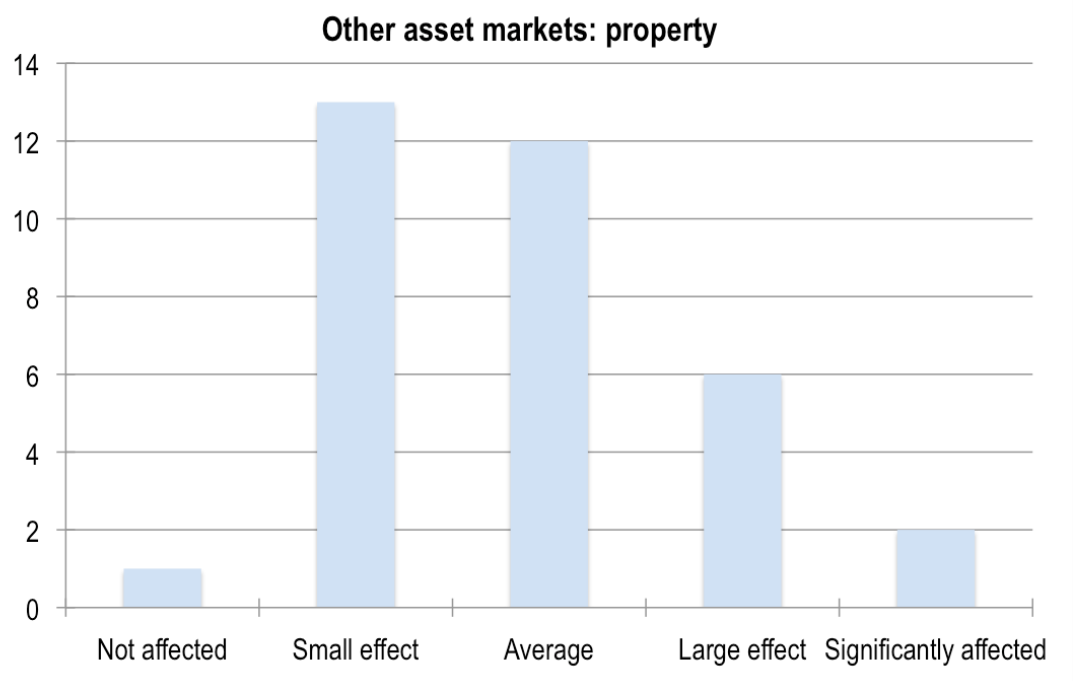
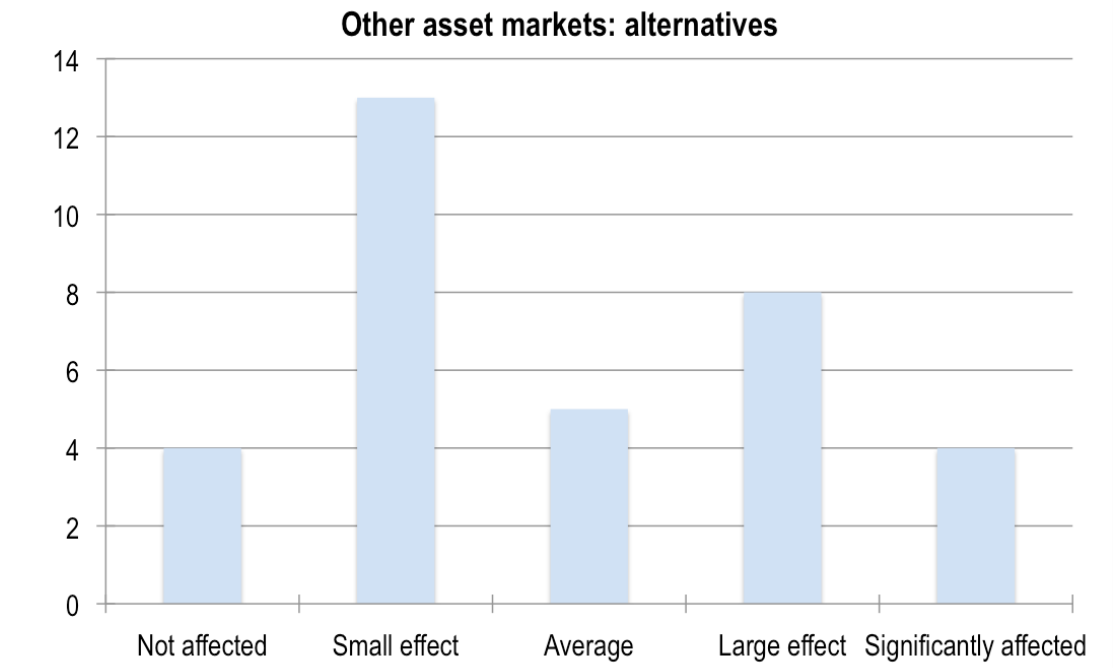


Chart 21: **Other asset markets: alternatives**



Question 6

Chart 22: **Exit strategy: raise rates or sell gilts**