BLOG

Analysis: What is the effect of unconventional monetary policy on asset prices?

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Unconventional monetary policy and the difficulty of analyzing its effects

Traditionally, the monetary policy stance during normal times is exclusively determined by short-term interest rates. Optimal policy can be approximated with interest rate rules named after the seminal contribution by Taylor (1993), whereby short-term nominal interest rates respond to changes in the output gap and inflation. Central banks' influence on short-term rates is guaranteed by designing the operational framework such that the market "reference rate" (typically an overnight interbank rate, determined by the main policy rate) tracks closely the desired interest rate level (Borio and Disyatat, 2010). Foundations of this theory are perhaps best articulated by Woodford (2003).

However, the financial crisis introduced two major obstacles that undermine the use of short-term interest rates as the main policy tool. First, central banks cannot lower policy rates further to stimulate the economy due to the zero lower bound.[1] Second, turbulence and lack of confidence in financial markets can break the usual connection between policy rates and market rates.

As a result, the standard monetary policy tools become ineffective: nominal interest rates cannot be lowered as much as Taylor rules suggest and changes in official policy rates do not necessarily coincide with changes in market rates. In response to such development, all major central banks – including the ECB, the Federal Reserve, the Bank of England and the Bank of Japan – have turned to unconventional measures, which include guidance about future policy, asset purchases and

different forms of bank lending and liquidity support.

The impact of these measures on financial asset prices is particularly hard to measure statistically for (at least) three reasons. First, measuring changes in monetary policy stance is a difficult task when short-term nominal rates are constrained by the zero bound.For example, how to quantify the change in the ECB's policy, when the measures consist of five different decisions, which was the case on December 3rd, 2015? The literature has proposed multiple proxy variables for this purpose, but none of them is perfect.

Second, monetary policy expectations are crucial: if market participants have anticipated the policy action to some extent, this must be taken into account. Kuttner (2001) pioneered solving this problem by using future quotes of short-term interest rates as proxy for policy expectations and defined a policy surprise as a change in those quotes. This approach is problematic during unconventional monetary policy era, as short-term rates do not necessarily react heavily even if significant policy easings take place. Thus, authors such as Rogers et al. (2014) and Wright (2012) use longer-term government bond yields as proxies to analyze how yield changes (caused by monetary policy) pass through onto other asset prices.[2]

Finally, researchers must decide the time window in which the supposed impact takes place. This is especially important in the case of the often-used event study methodology, which basically comes down to calculating the immediate reactions of asset prices to a policy announcement.[3] The validity of this method relies on the assumption that with forward-looking financial markets, asset prices are expected to react at the time of the announcement rather than the actual implementation. In the literature, measurement windows from just under an hour to a couple of days have been used.

There is of course a tradeoff: both too narrow and too wide measurement windows may be misleading. For example, the immediate asset price reactions to monetary policy statements may contain significant overreaction (Thornton, 2014). Moreover, the statements have recently become longer and more complex and often include descriptions of unprecedented policy measures, which might take some time for investors to digest. However, as soon as the measurement window is longer than a few minutes, additional market-moving information (besides the policy announcement) can affect the results.

Next, I review the academic literature on two broad classes of unconventional monetary policy: *forward guidance* and *balance sheet policies*, such as asset purchases. This is a common classification in the literature (e.g. Woodford, 2012; Ueda, 2012).

Forward guidance – how does it work?

For a long time, central bankers emphasized the importance of their actions rather than words. But recently, all major central banks have started to provide interest rate outlooks and discuss the future interest rate path. Forward guidance refers to these central bank statements about future policy. Even though central banks' communication and transparency have increased and become part of general monetary policy already since the 1990s, their importance has been highlighted by the zero lower bound constraint as central banks have sought additional tools to stimulate the economy.

The effectiveness of forward guidance relies on the expectations hypothesis of the term structure of interest rates (EH), which states that long-term interest rates can be decomposed as average current and expected short-term rates plus a constant:

where E_t denotes the expected value at time *t*,

is the n-period interest rate at time *t*,

is the shorter m-period rate at time *t+mi* and

is the term/risk premium, which may vary with m and n and originates from the assumption that agents are risk averse (e.g. Campbell and Shiller, 1991).[4]

Intuitively, if lowering current rates is not possible, a central bank can then communicate its plans about future policy to have impact on the expected path of interest rates. If the market participants are convinced that short-term rates are going to remain low for an extended period of time, this should lower long-term interest rates. The longer the credible commitment to keep short rates down, the greater the effect on long-term rates (Woodford, 1999).

Changes in expected interest rates then affect the real economy: the interest rate channel implies that a reduction in nominal (and hence real) interest rates encourages business investment and household expenditure on housing and durables, increasing aggregate output (see Mishkin (1996) for a comprehensive survey of traditional monetary transmission mechanisms).

Woodford (2012) argues that effective forward guidance involves commitment to a specific criteria for future policy (Odyssean forward guidance), rather than just expressing a forecast of

future policy stance (Delphic forward guidance).[5] Unfortunately, the Odyssean guidance often suffers from time inconsistency: after commitment, the central bank may find it non-optimal to stick to its promise due to its mandate, but breaking the promise might compromise its credibility in the eyes of the public. This "tradeoff" is one reason why central bankers seem to prefer Delphic guidance by communicating their interest rate forecasts to the public, rather than tying their hands with strict commitment (e.g. Fed "dot plot").

A natural starting point for the empirical evaluation of forward guidance effectiveness is to ask whether central bank speeches matter at all. In an influential study, Gürkaynak et al. (2005) use changes in the federal funds futures prices and event study analysis to show that Federal Open Market Committee (FOMC) statements have significant effects on long-term yields that are not fully caused by surprises in current federal funds target. The authors call this a "future path of policy factor", while a "target factor" accounts for changes in the actual policy rate that moves short-term yields. More recently, Campbell et al. (2012) confirm these results by employing a longer data set and Brand et al. (2010) do so by using eurozone data. These findings suggest that forward guidance can be effective.

Kool and Thornton (2012) offer an alternative view by evaluating data and forecasts from New Zealand, Norway, Sweden and the United States. They assess whether forward guidance has improved 1) central banks' own forecasts of short-term rates compared to a random walk benchmark and 2) the ability of market participants to forecast future path of interest rates. This is done by comparing the countries above to similar benchmarks in which the central banks have not adopted forward guidance. The authors then argue that there is only weak evidence of better short-term predictability and no evidence of improved ability to forecast long-term yields. They conclude that "there is no evidence that forward guidance has increased the efficacy of monetary policy for New Zealand, the country with the longest history of forward guidance" – an opposing view to theoretical contributions by e.g. Woodford (1999, 2005, 2012).

Central bank balance sheet as a policy tool

Balance sheet policies have been studied quite extensively and can be further separated into *pure quantitative easing* that targets the level of bank reserves (liability side of central bank balance sheet) and *targeted asset purchases* (credit easing) that focuses on the composition of central bank's assets (Woodford, 2012). Expanding the size of central bank balance sheet can be carried out as outright asset purchases as well as credit operations, such as the ECB's long-term refinancing operations (LTROs).

According to the theory of *pure quantitative easing*, originating from the Bank of Japan's (BoJ)

actions in the early 2000s, an expansion in the monetary base – irrespective of how implemented – should stimulate aggregate nominal expenditure when the zero bound on interest rates binds (Woodford, 2012). This view is similar to the classic monetarist doctrine: the *amount* of central bank liabilities (money supply) matters, not the composition of assets it acquires. On the contrary, Ueda (2012) argues that while the effect of pure quantitative easing remains an open question, the economy is already satiated with liquidity at the zero bound and it is thus unclear if injecting additional liquidity should be effective. In addition, Woodford (2012) notes that having bank reserves as an operational target instead of the short-term rate was ineffective in stimulating aggregate nominal expenditure in Japan in the 2000s, contrary to the monetarist view. Such ineffectiveness is also predicted by the theoretical irrelevance result of Eggertsson and Woodford (2003), who show that in standard dynamic stochastic general equilibrium (DSGE) models, *temporary* increase in the monetary base should have no quantity effects.[6]

The irrelevance result raises the question of the importance of the *composition*, rather than the amount, of the central bank's assets. Usually, the effect of *targeted asset purchases* comes from two channels. First, such policy should affect relative prices of the securities bought (and thus other securities as well). If the central bank holds more of these assets, the private sector has to reduce its holdings of these securities in an equilibrium. The change in relative prices should generate *portfolio rebalancing*, as the portfolios preferred by investors change. For more discussion of multiple sub-channels of portfolio rebalancing, see Krishnamurthy and Vissing-Jorgensen (2011). Second, a *signaling* channel can be present to the extent that central bank's announcement of unconventional measures signals more accommodative policy in the future, hence lowering expected future short-term rates. Thus, whereas portfolio rebalancing affects the risk premia , signalling influences the expected path of short-term rates in the EH equation above. An additional often mentioned transmission mechanism is the liquidity channel: when markets for some assets are illiquid, central bank can purchase those assets and restore confidence and liquidity within that market. Here, I focus on the first two channels: portfolio rebalancing and signaling.

Portfolio rebalancing presumes that bond yields depend on the quantity of such bonds supplied. Thus, if investors regard securities with different maturities as perfect substitutes, there are no quantity effects. In other words, if a central bank exchanges short-term assets for long-term ones and investors are indifferent between holding these assets, such an operation will have no effects on the equilibrium allocations. This happens in a conventional DSGE setting (see Eggertsson and Woodford, 2003) and has been discussed more in general by Wallace (1981). Former FOMC Chairman Ben Bernanke referred to the irrelevance result in 2014, when he famously said that "the problem with QE is that it works in practice, but it doesn't work in theory". Intuitively, the irrelevance result is similar to Ricardian Equivalence[7] and relies on the assumption that the

private sector (a representative rational household who has infinite horizon and faces no distortionary taxes or credit frictions such as a borrowing constraint) sees the assets of government and central bank as indistinguishable from its own assets (Joyce et al., 2012). Hence, the only channel through which central bank asset purchases can work in standard models is the signaling channel and the existence of portfolio rebalancing requires some kind of financial frictions.

Another rationale for asset purchases is often justified by the preferred habitat theory, recently articulated by Vayanos and Vila (2009), according to which there are investors who demand bonds of particular maturity and type. For example Kohn (2009), then Vice Chairperson of the Federal Reserve System, refers to "preferred habitat behavior" regarding yield declines resulting from Fed's asset purchases. Both preferred habitat and portfolio rebalancing rely on similar financial frictions: segmented markets.

Recently, in need to understand better the consequences of the financial crisis and unconventional monetary policy, theoretical macroeconomic models incorporating financial frictions have been a popular field of research. In the model of Cúrdia and Woodford (2011), credit frictions and heterogeneous agents are present, but an exchange of reserves for government bonds (one-period claims) by the central bank has no effects because agents see them as perfect substitutes. In contrast, *credit easing* – a direct purchase of private sector assets – can affect real activity, when private financial markets are impaired and cannot be freely accessed by agents. Chen et al. (2012) analyze the effect of Federal Reserve asset purchases and simulate a DSGE model that incorporates bond market segmentation, which captures the observation that in reality a large fraction of population saves through pension funds and hence invests in long-term securities. This leads into imperfect asset substitutability and hence portfolio rebalancing after asset purchases, breaking the irrelevance result of Eggertsson and Woodford (2003) and Wallace (1981). Consequently, balance sheet policies can be effective in modern theoretical models.

The signaling channel works by affecting expectations, in a similar way to forward guidance, as described above. In addition, the effect of balance sheet policies also depends on announcements of future operations as the central bank can influence expectations about fundamentals that underpin market valuations of assets (Borio and Disyatat, 2010). A great example is the Outright Monetary Transactions (OMT) program in 2012, which is probably the most effective verbal central bank policy intervention of all time. Within OMT, the ECB promised to conduct outright bond purchases in the secondary market if necessary. Even though the ECB has not carried out any actual purchases, the announcement was enough to lower bond yields significantly.

Several authors have empirically evaluated the asset price effects of balance sheet policies. Majority of the research focuses on the asset purchases conducted by the Federal Reserve and the

Bank of England.

Gagnon et al. (2011) find that eight specific announcements of Federal Reserve's large-scale asset purchase program (LSAP) resulted in "economically meaningful and long-lasting reductions in longer-term interest rates". They investigate how asset prices changed during a one-day window around the announcements and add up the cumulative changes to form the overall effect. Hence, they assume that the program influences asset prices only when news about the expected size of the program come out and that new information affects market prices immediately, not when the purchases actually happen – a somewhat controversial assumption. However, as Gagnon et al. point out, a natural alternative – adding up all price changes between the first and last announcement – means that many additional factors affecting asset prices would be at play. Finally, the authors conclude that the direction of post-announcement yield changes is consistent with the portfolio rebalance theory.

By using a portfolio balance model, Neely (2015) reinforces these findings and argues that LSAP announcements lowered all international long-term bond yields. By utilizing commodity and stock price data, the author considers the yield changes to be caused by portfolio rebalancing and signaling rather than a drop in expected real growth. Joyce et al. (2011) and Joyce and Tong (2012) find similar results for Bank of England's QE programme. Their results are also quantitatively in line with Gagnon et al. (2011).[8] These results support the idea that central banks can affect asset prices even when constrained by the zero bound.

Krishnamurthy and Vissing-Jorgensen (2011) focus on the sub-channels of portfolio rebalancing in detail. They find significant reduction in Treasury and corporate/MBS yields due to Fed LSAPs and argue that the main effect on nominal yields was due to signaling and inflation (increase in inflation expectations) channels, while the effect of a safety channel (class of portfolio rebalancing) was milder.[9] Christensen and Rudebusch (2012) use an event study combined with a dynamic term structure model to decompose yield changes into expected short rate and term premium components. They argue that the US QE programme lowered domestic bond yields mainly through signaling (lower expected short-term rates) whereas the drop in UK bond yields following Bank of England's QE announcements reflected portfolio rebalancing (falling term premia). Therefore, while there is a broad consensus that asset purchases have significant – even though perhaps small – effects on bond yields, the main channel through which they operate is uncertain and may depend on market and institution structure.

What the literature says about the ECB's policy measures?

There exists a lot of empirical evidence on the effects of the ECB's unconventional monetary

policy measures on asset prices. These studies usually focus on single policy measures and their effects.

By conducting regression analysis with dummies for single events and controlling for several risk factors, Kilponen et al. (2012) investigate how spreads between 10-year sovereign bond yields and 10-year euro swap rate reacted to European resolution policies in recent years. Their results suggest that the announcement of the ECB's Securities Market Programme (SMP) had the most significant, negative effect on these spreads, hence reducing risk premia.[10]

The ECB has introduced three different covered bond purchase programs (CBPP1-3), the last one still being active.[11] Beirne et al. (2011) show that the CBPP1 announcements reduced the spread between covered bond yields and the 5-year swap rate significantly. The work of Szczerbowicz (2014) confirms similar effects for CBPP2. Furthermore, the author uses event study methods to argue that purchases of covered bonds exhibited spillover effects into sovereign bond yields. This could be interpreted as evidence for the interdependence of sovereign and bank risks, as covered bonds are an important source of funding for European banks. Therefore, improving the functioning of covered bond market could have lowered sovereign risk in some eurozone countries.

Using an event study, Altavilla et al. (2014) show that the series of three OMT announcements lowered the 2-year government bond yields of Spain and Italy by around two percentage points, while the yields of Germany and France were basically unaffected. Georgiadis and Gräb (2015) employ similar methodology and study the financial market responses to the announcement of the ECB's expanded asset purchase program (EAPP) in January 2015. They find that the announcement caused the euro to depreciate against the currencies of advanced economies (1.4 %) as well as emerging economies (2.4 %). Furthermore, stock returns increased in both euro area and globally and the 10-year government bond yields in the currency area fell 7 basis points on average.

One of the most comprehensive studies is conducted by Rogers et al. (2014), who study the effects of all ECB monetary policy announcements since 2007. The authors define a monetary policy shock as a change in government bond yields and then measure its transmission into other asset prices. Using intradaily data and a narrow time window around policy announcements, they isolate the yield changes caused by monetary policy statements. Thus, they employ the event study methodology using bond yields as a proxy for the monetary policy shocks. The authors find that a positive monetary policy shock, defined as a 25-basis-point reduction in cash market spread between German and Italian 10-year government bond yields, causes euro to *appreciate* 0.27 % against US dollar, the German stock prices to rise 0.92% and 5-year European corporate bond

yields to *increase* 11 basis points.[12]

Unconventional monetary policy has been effective – but it's hard to say how effective

Both theoretical and empirical research suggests that central banks can use unconventional measures to affect financial asset prices even at the zero lower bound. However, the exact magnitude of these effects is extremely hard to estimate.

The literature seems to quite unanimously agree that forward guidance can be an effective policy tool. Its importance is highlighted in the low interest rate environment. However, some authors have argued that forward guidance does not make monetary policy more efficient *per se*.

Asset purchases in particular seem to be a way to have impact on longer-term bond yields and indirectly on other asset prices as well. While there exists a rather broad consensus on this effectiveness, the channels through which the purchases work may vary case by case.

Moreover, plain announcements of the ECB's various policy measures – particularly bond purchase programmes – have been successful in lowering interest rates and risk premia in the euro area. Evidence also suggests that these effects have passed through onto other asset prices. In addition, some authors argue that not only the announcement, but also the actual implementation of asset purchases had an impact on yields.

One could assume that lowering long-term bond yields and affecting other asset prices transmits to the real economy as well through the interest rate and asset price channels (Mishkin, 1995, 2001). However, although it has been attempted by several authors, measuring the precise effect of asset purchases on economic growth is even more challenging than estimating their effect on asset prices.

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