



The behaviour of the bank lending channel when interest rates approach the zero lower bound: Evidence from quantile regressions[☆]



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ARTICLE INFO

Article history:

Accepted 12 May 2015

Available online xxxx

Keywords:

Bank lending channel

Zero lower bound

European banks

Quantile regressions

ABSTRACT

This paper examines the dynamic behaviour of the bank lending channel at the mean and at various quantiles for a sample of European banks, by making use of the quantiles regression methodology, spanning the period 2000–2012. In the first case, the bank lending channel exists. In contrast, when policy interest rates are estimated at lower quantiles as the rates approach the Zero Lower Bound, the monetary policy's capacity to influence banking loans seems to lose its momentum and is found to be completely ineffective below a critical policy interest rate. The results remain robust for different bank characteristics such as capitalisation, asset size, and liquidity, as well as for alternative scenarios concerning the definition of monetary decisions and the construction of lending activities. The empirical findings also survived other robustness checks, such as a different methodological approach, the role of securitisation and the role of non-conventional monetary policy measures. The empirical findings are expected to be significant in the context of the recent global financial crisis where central banks had to push down their policy interest rates close to zero. In such a distressed financial environment, changes in bank lending terms should form an explicit component of macroeconomic models that describe monetary policy rules used for policy advice.

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1. Introduction

The monetary transmission mechanism includes various channels through which monetary authorities can affect the macroeconomy. The credit mechanism is one of these channels. It concentrates on how monetary policy affects the transmission of liquidity through the availability of deposits and loans (Hernando and Pages, 2001). The bank lending channel, a sub-channel of the credit channel, relates to the supply of credit and 'stems from financial market incompleteness and relies on imperfect substitutability' (Gambacorta, 2005).

Historically, central banks have used their intervention rates as the primary instrument of monetary policy, lowering the rate to generate more demand and raising it to slow economic activity and control inflation. Generally speaking, monetary policy has important effects on real investment and consumption, on the valuation of financial assets, and on the overall aggregate economic performance (Bernanke and Kuttner, 2005; Boivin and Giannoni, 2006).

[☆] The authors need to profoundly thank two referees of this journal for their recommendations that enhanced the merit of this work. They also profoundly thank the Editor for giving them the chance to revise and resubmit their work. Needless to say, the usual disclaimer applies.

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Since December 2008, the majority of intervention (policy) interest rates, the Federal Funds rate in the US is one of them, have been near zero, i.e. thus, lowering the rates further to produce more stimuli has not been an option. However, purchasing short-term securities cannot lower interest rates when they are at zero and just increasing the monetary base is not considered an effective stimulus. In that case, money and bonds become close substitutes and the public can simply choose to hold central bank injections of money as currency 'under the mattress', which prevents the additional money from stimulating economic activity. This is the case of the liquidity trap and can motivate central banks to focus on specific markets and/or interest rates rather than simply expanding the quantity of money. Based on the above arguments in relevance to the new zero lower bound, central banks have relied only on unconventional policy tools, such as large-scale asset purchases and forward guidance to try to affect long-term interest rates and influence the economy. Assessing the impact of these measures in the new environment has proven to be a challenge. If effective easing beyond a zero policy rate is desired, a policy rate constrained at zero would no longer conveniently summarise the stance of monetary policy and its typical transmission into the yield curve (longer-maturity interest rates) and the economy. According to Cour-Thimann and Winkler (2013), in the case of the ECB, such non-conventional measures seem to be a complement to rather than a substitute for conventional monetary policy. Such non-conventional actions have substantially improved financing conditions and credit flows in the Euro area, especially after

the outburst of the recent sovereign debt crisis, without, however, jeopardising price stability goals.

The zero lower bound (ZLB) restricts a central bank's ability to reduce nominal interest rates when disinflationary shocks hit the economy, impairing the attempts of central banks to stabilise output and inflation (especially during stressed periods) and imposing significant output costs (Williams, 2010). Werning (2012) shows that it is optimal for the central bank to keep interest rates close to zero for longer periods. This is expected to lead to higher output and inflation in the short- and in the long-run, which jeopardises the central bank's commitment to implement stronger expansionary policies. The majority of central banks, however, have built inflation-fighting credibility, which in the context of the ZLB is a liability, given that they need to convince the public that they allow, only temporarily, higher inflation rates (Sims, 2010). Krugman (1998) argues that the liquidity trap boils down to a credibility problem in which private agents expect any monetary expansion to be reverted once the economy recovers; others investigate the ZLB effect along with the phenomena of deflation and the liquidity trap during the Japanese experience (Adam and Billi, 2006, 2007; Kato and Nishiyama, 2005). Williams (2009) claims that central banks should embrace the ZLB as it shows that the monetary policymakers are doing all they can to stimulate an underemployed economy. He suggests that the failure to hit the ZLB in the past was a sign of suboptimal policy response.

The issue of the ZLB constraint has received substantial attention after the recent financial crisis and the ensuing recession since it drove a large number of central banks to cut their short-term policy rates effectively to zero without, however, providing an adequate stimulus to drive their economies out of recession. Prior studies include Gagnon et al. (2011), Hamilton and Wu (2012), Swanson and Williams (2012) and D'Amico and King (2013), among others. However, these papers focus only on measuring the effects on the yield curve, while the motivation behind our paper is the need to assess the efficiency of the bank lending channel under practically zero interest rates. To the best of our knowledge, this paper represents the first attempt to investigate the effectiveness of monetary policy in influencing the banks' willingness to provide loans under conditions of practically zero interest rates. In that sense, the empirical analysis explores the effectiveness of monetary policy along the lines of the analysis in Clarida et al. (1999) and Woodford (2003), but explicitly takes into account the fact that nominal interest rates cannot be negative.

However, if very low interest rates (practically close to zero) and both conventional and non-conventional monetary policy actions cannot provide the required stimulus consistent with the erosion of any spare capacity that seems to persist for materially longer than currently anticipated, it would be more appropriate for monetary policy makers, in pursuit of further falls in real interest rates, to drive their intervention rates possibly even below zero (Bank of England, and Committee, 2013). Recently, the European Central Bank (ECB) has forced negative policy interest rates a region Governor Mario Draghi defined it as the new 'lower bound'. The rationale for such an action was to force commercial banks to pump their liquidity into the real economy rather than hoarding cash at the central bank. These monetary policy actions seem to have been effective, given the crimping trend of bank profits, since banks pass those policy actions to their depositors who react by transferring their deposits either abroad or to their 'matresses'. The persistent maintenance of policy interest rates below zero could eventually harm the entire banking system by undermining its ability to deliver the basic banking functions of maturity transformation and secure payments transfer since persistent negative rates would provoke massive movements into cash, indicating the central bank is a monetary authority that would no longer redeem sight deposits on demand. Moreover, negative interest rates could potentially lead to a compression in banks' net interest margins and a reduction in their profitability, which could also constrain their ability to rebuild capital and to extend new loans.

Nevertheless, such monetary policy actions constitute a signal that traditional monetary tools are totally ineffective, while they might lead to persistent 'deflation'. In that case, the central bank should be innovative and turn to non-conventional tools of monetary policy if they wish to effectively fight the shortage of liquidity in the real economy and the high unemployment rates.

A very important novelty of the paper is that it employs the methodology of quantile regressions. Most of the empirical papers on estimating monetary policy rules provide estimates at the conditional mean using econometric methods that take into account endogeneity problems, such as Instrumental Variables (IV) and Generalised Method of Moments (GMM) methodologies. However, certain studies (Chevapatrakul et al., 2009; Wolters, 2012; among others) argue that one might expect different responses at different points of the conditional distribution of interest rates. In particular, the relevant literature argues that when interest rates approach the ZLB, the assessment of the efficacy of monetary policy to target output and inflation cannot be properly implemented due to the presence of asymmetries (Adam and Billi, 2006; Kato and Nishiyama, 2005; Orphanides and Wieland, 2000). The presence of asymmetries and nonlinearities in monetary policy specifications lead to very different empirical results. Cukierman and Muscatelli (2008) provide evidence in favour of the presence of nonlinearities in line with Fed's preferences towards inflation, while both Florio (2006) and Bunzel and Enders (2010) find asymmetric monetary policy reactions to policy interest rate changes. By contrast, Dolado et al. (2005) find no evidence for nonlinearities associated with monetary policy decisions.

To address these concerns, we make use of quantile regressions to estimate the complete conditional distribution of policy interest rates. While preserving linearity in the monetary policy rule (i.e., policy interest rates) properties, quantile regressions impose no function form constraints on parameter values over the conditional distribution of the interest rate. This type of regression allows the systematic movements of the monetary policy reaction coefficients over the conditional distribution of the policy intervention interest rate. At the same time, the quantile regressions methodology allows us to estimate at which part of its conditional distribution the interest rate is located and to draw substantial conclusions about the range of monetary policy effectiveness obtained. Chevapatrakul et al. (2009) also make use of the quantile regression methodology to estimate interest rate reactions across various points of their conditional distribution. According to the authors, reactions of both the output gap and inflation at low interest rates do not necessarily behave symmetrically to those reactions at high interest rates; therefore, only a quantile regression can realize how both variables react to policy interest rates across the entire spectrum of their distribution.

Our study makes use of the quantile regression methodology not to measure the central bank's response to both output and inflation shocks, but for the first time, to capture the nonlinear/asymmetric response of commercial banks' lending activities to policy interest rates changes. We are not expecting that lending activity can behave symmetrically across changes in policy interest rates; therefore, examining only the mean of policy rates distribution and not the quantiles of the whole spectrum of their distribution would lead to misleading results.

The rest of the paper is organised as follows. Section 2 reviews the literature concerning the bank lending channel and the ZLB, while Section 3 presents the data set. Section 4 outlines the methodology used to estimate the effect of monetary policy on the bank lending channel, while Section 5 reports the empirical findings. Finally, Section 6 concludes the paper.

2. Literature review

Based on the bank lending channel mechanism, when central banks implement an expansionary (contractionary) policy by increasing (decreasing) bank reserves and lowering (raising) interest rates,

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