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The impact of setting negative policy rates on banking flows and exchange rates

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ABSTRACT

In the aftermath of the great contraction of 2008, policymakers were faced with the Zero Lower Bound (ZLB) on nominal interest rates. Central banks implemented several unconventional monetary policies to overcome the ZLB, including setting negative nominal interest rates. This paper explores possible unintended effects of setting negative policy rates. Using Danish data, I assess the impact of paying a negative interest rate on reserves. Results suggest that going into negative territory has a particular impact, distinct from that of simply lowering interest rates: it leads to higher banking outflows and depreciation of the currency. Due to the reluctance of commercial banks to pass on negative rates to their depositors (retail deposits can easily be switched into cash), paying a negative (vs. positive) interest rate on reserves creates a disconnection between the assets and liabilities of commercial banks' balance sheets. Commercial banks can avoid this disconnection by holding external assets or assets in foreign currencies. This incentive to increase banking outflows appears to explain the particular impact of going into negative territory.

1. Introduction

Negative nominal interest rates were widely considered unrealistic until the Great Recession. Subsequently, several central banks decided to pay a negative interest rate on reserves (hereinafter referred to as going into negative territory) to overcome the Zero Lower Bound (ZLB) on nominal interest rates.²

Policymakers stress the reluctance of commercial banks to pass on negative rates to their depositors (see [McAndrews \(2015\)](#) and [Borio and Zabia \(2016\)](#)), presumably out of concern over a possible shift of retail deposits into cash. This creates a disconnection between the assets and liabilities on commercial banks' balance sheets and might have unintended consequences when the central bank pays a negative interest rate on reserves. [Borio and Zabia \(2016\)](#) and [Bech and Malkhozov \(2016\)](#) point to the theoretically unexpected reaction of mortgage interest rates in Switzerland when the Swiss National Bank went into negative territory. In order to preserve their profitability or to

avoid making losses, Swiss banks responded by raising their mortgage rates. In line with these concerns, I focus in this paper on any unintended effect that going into negative territory might have on banking flows and the exchange rate.

The literature has considered the consequences of central banks paying a negative interest rate on base money. However, since the implementation of negative policy rates is recent, there is no clear consensus about their impact on the economy which, to my knowledge, has never been assessed either empirically or in an open economy framework. I contribute to this strand of the literature by empirically examining the impact on open macroeconomic variables of setting a negative (vs. positive) interest rate on reserves at the central bank. I use data from Denmark³ to assess potential regime shifts in banking flows (using disaggregated data) and the Taylor-rule fundamentals model of exchange rates.

I estimate Markov Regime Switching with Time Varying Transition Probabilities (MS-TVTP) models. I consider cases where the transition

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² Danmarks Nationalbank (the Danish National Bank; July 5, 2012) was the first central bank to set a negative interest rate paid on reserves. It was followed by the European Central Bank (ECB; June 5, 2014), Sveriges Riksbank (the Bank of Sweden; October 27, 2014), the Swiss National Bank (December 18, 2014) and more recently the Bank of Japan (February 16, 2016). Sveriges Riksbank paid a negative interest rate on reserves (its deposit facility) in July 2009, but this was merely technical due to its fine-tuning transactions (see [Sellin and Sommar, 2012](#) for more details).

³ Denmark was chosen so as to analyze the impact of going into negative territory on banks' balance sheet data and because a large data sample was needed.

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variable is either the interest rate paid on reserves or policy differentials between Denmark and the euro area.⁴ Then, I compare regime changes found from the estimated MS-TVTP models to policy differentials both in periods when the interest rate paid on reserves was positive and when it was negative, to disentangle the impact of going into negative territory from that of lowering interest rates.

Results suggest that the impact of going into negative territory is distinct from that of simply lowering interest rates: it leads to higher banking outflows and depreciation of the Danish krone. When the interest rate paid on reserves is negative, banks increase their outflows, which seems to promote depreciation of the currency. Higher banking outflows mean commercial banks can avoid receiving a negative interest rate on one component of their assets: reserves at the central bank.

Regime changes for both the exchange rate and banking flows are consistent with changes in policy differentials when the interest rate paid on reserves is positive. By contrast, when the interest rate paid on reserves is negative, the *high banking outflows* regime and the *exchange rate depreciation* regime dominate even when policy differentials move in the opposite direction. These findings support McAndrews (2015)' argument that there are distinct characteristics of negative (vs. positive) nominal interest rates.

McAndrews (2015) discusses the purpose of and the complications associated with going into negative territory. With other policymakers (see Borio and Zabia (2016) and Bech and Malkhozov (2016)), he argues that one of the main complications with negative nominal rates is that they are not intended to be passed through to retail depositors. Retail depositors can avoid negative rates relatively easily by holding cash instead of bank deposits. This explains why central banks and commercial banks alike may wish to protect ordinary retail bank depositors against experiencing negative interest rates.

When the central bank pays a negative interest rate on reserves, commercial banks receive a negative interest rate on one component of their assets (reserves at the central bank) but are unable to pass this policy through to their retail deposits (one component of their liabilities). This disconnection between the assets and liabilities of commercial banks' balance sheets might adversely affect the health of financial intermediaries.

However, commercial banks can avoid this disconnection by holding external assets or assets in foreign currencies. This incentive to increase banking outflows when the central bank pays a negative interest rate on reserves seems to explain my results showing a distinct impact of going into negative territory on banking flows. Furthermore, changes in the exchange rate regimes are closely related to changes in the banking flows regimes when the interest rate paid on reserves is negative. This suggests that the additional depreciation pressure on the currency due to being in negative territory is partly driven by an increase in banking outflows.

Central bankers and academics argue that the Great Recession resulted in a new type of central banking (see Mishkin (2012) and Duf rnot and Jawadi (2016)), and the literature on unconventional monetary policies implemented since the Lehman Brothers bankruptcy is growing rapidly (see Kiendrebeogo (2016) and Garc a-Posada and Marchetti (2016)). However, paying negative interest rates on base money did not receive as much attention and the literature (discussed briefly below) is based on closed economy theoretical analyses. This paper complements the literature by providing an empirical investigation in an open economy framework.

The ZLB on policy rates comes from the traditional assumption about paying zero interest on money. This assumption might be reasonable for currency, but not for commercial banks' reserves at the central bank. Goodfriend (2000) and Blinder (2012) recommend

paying a negative interest rate on reserves (a carry tax), which is technically costless for central banks, to overcome the ZLB. But its negative floor would be the storing costs of currency (otherwise commercial banks would store reserves as vault cash). However, paying a negative interest rate on base money (both currency and reserves), while costly for central banks, is still technically feasible (see Goodfriend (2000)). Buiter and Panigirtzoglou (2003) show that paying a negative interest rate on base money is sufficient to avoid and escape a liquidity trap and Buiter (2009) suggests several ways to implement such a policy.

Yates (2004) and Ilgmann and Menner (2011) consider that inflation and paying a negative interest rate on base money (money taxes) are perfect substitutes. Menner (2011) confirms this intuition and shows that, at moderate inflation levels, negative policy rates (taxing money) have a positive impact on the velocity of money and on the real economy.

Unlike my framework in this paper, the above conclusions are based on closed economy models. My findings do not contradict these results, but they suggest that future research on this subject might benefit from an open economy framework.

2. Methodology

Since the Great Recession and after hitting the ZLB, several central banks decided to set negative policy rates. Based on Danish data⁵, I assess the impact of going into negative territory and consider regime changes in both the exchange rate and banking flows.

I estimate Markov Regime Switching with Time Varying Transition Probabilities (MS-TVTP) models⁶ to allow these endogenous regime changes. I consider cases where the transition variable is either the interest rate paid on reserves or policy differentials between Denmark and the euro area (policy differentials between Denmark and the euro area are defined as the spread between the main policy rates in Denmark and the euro area). Finally, I compare regime change to policy differentials both in periods when the interest rate paid on reserves was positive and when it was negative, to disentangle the impact of going into negative territory from that of lowering interest rates.

The fixed exchange rate in Denmark means that Danmarks Nationalbank should mirror the monetary policy measures of the ECB, not only its interest rate changes but also the introduction of unconventional measures (see Spange and Toftdahl (2014)). However, given the differences in implementation of monetary policy between the two economies, interest rate variations in Denmark do not follow all the ECB's decisions. Still, the fact that policy differentials between Denmark and the euro area do not vary greatly, due to the fixed exchange rate regime, makes it easier to determine whether there is a particular impact of going into negative territory.

The following presents briefly the MS-TVTP models estimated here:

$$y_t = \alpha(S_t) + X_t\beta + \epsilon_t \quad (1)$$

where X_t is the matrix containing the independent variables defined below, $E(\epsilon_t|X_t) = 0$, $\epsilon_t \sim \mathcal{N}(0, \sigma(S_t))$ and the indicator $S_t \in \{1, 2\}$ ⁷ which determines the state at time t . The switching dynamics are driven by the following time-varying (which depends on the transition variable) transition matrix:

⁵ Denmark was chosen so as to analyze the impact of going into negative territory on banks' balance sheet data and because a large data sample was needed.

⁶ Deterministic regime switching and both the logistic and exponential transition functions of the STR models seem to be less appropriate for the analyzed data; see Hamilton (2005) for a brief introduction to Markov models.

⁷ The indicator S_t which determines the state at time t should not be confused with the nominal exchange rate s_t defined below.

⁴ Policy differentials are defined as the spread between the main policy rate in Denmark and the main policy rate in the euro area.

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