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ANALYSIS OF NEGATIVE INTEREST RATE POLICIES AND THEIR IMPACT ON GLOBAL FINANCIAL MARKETS – A REVIEW OF RELEVANT LITERATURE

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Abstract: *In recent years more countries are moving their policy rates below zero thus posing questions needing to be researched regarding how global financial markets react to such changes. Our paper reviews what these changes mean for global financial markets, discussing that financial markets react the same way as they would if rates were lowered, asset prices increase.*

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1 INTRODUCTION

This paper will be looking at unconventional monetary policy and looking at how negative interest rate policies (NIRP) affect the stock market. Negative interest rates have been the subject of much research and criticism due to its limited use around the world. Currently, there are twenty-two countries globally that have interest rates below zero, these include the nineteen nations of the Eurozone as well as Sweden, Switzerland, and Japan. Based on research there have been findings of countries passing negative rates onto consumers thus charging consumers for depositing their money, what has been happening is that it has led to consumers storing their cash in vaults, banks are reluctant to lend as it is costly for them, and investors are reluctant to invest in the country. This paper will look at how taking interest rates below zero affects financial markets.

It has been observed how financial markets react to a cut in interest rates - initial reactions to this see an increase in asset prices. It is also quite possible that NIRP can have a spillover effect on other economies especially emerging economies. Due to the negative interest rates not being known to individuals outside of finance and economics, this research also sheds light on the influence negative interest rates can have on one's retirement funds and savings. Due to the global financial crisis, economies had been put under immense pressure to rebound, central banks in developed countries have implemented unconventional monetary policy measures to try and kickstart the economy to promote growth again such as quantitative easing which is the central bank purchases long term securities such as bonds from the open market to increase the money supply in hopes of increasing economic activity. Central banks during this time have also reduced their interest rates below zero or very close to zero, research has shown that these policies led to a decline in real and nominal interest rates and slowed economic recovery (Arteta et al., 2016).

Banks during this time had a perception of tighter constraints of policy easing, there was a decline in the supply of assets for central banks to purchase thus commercial banks were not lending to individuals and businesses and instead hoarding cash. Going against this, some central banks saw that reducing interest rates below zero were necessary to increase the effectiveness of the current policies in place, because of this, central banks have decided to cut their rates below zero. As it stands countries that currently have negative interest rates account for a quarter of the worlds gross domestic product. However, it must be noted that this is not the only time in history that interest rates have gone below zero. Treasury bill yields in the United States fell below zero during the Great Depression and as well during the global financial crisis, the Swiss National Bank in the 1970s reduced their rates to below zero on foreign deposits to prevent foreign capital and to prevent the parabolic increase of the domestic currency, Swiss Franc. There have been a few other periods in time where central banks introduced negative rates for a short period of time such as the Swedish Riksbank reducing interest rates in 2009 for a short period of time as well as seeing Japanese bonds in the 1990s become negative. Though it is rare, the recent upspring in central banks taking their interest rates below zero is due to the economic damage that the global financial crisis has had long-lasting effects on their economies.

NIRP has been the topic of much debate recently with even former United States President Donald Trump calling on the Federal Reserve to bring interest rates below zero (Lambert and Holland, 2020). Some have praised the use of NIRP by central banks claiming that NIRP has worked as intended while others on the flip side have claimed that due to NIRP banks are unwilling to lend and pointed out the financial stability risks that are often linked with NIRP. Overall,

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research into NIRP is a very important contribution to the further understanding and learning of NIRP.

2 LITERATURE REVIEW

Due to negative interest rate policies being quite new, there is limited academic literature associated with the topic. Reading papers about how negative interest rates are implemented via monetary policy is talked about by Jobst and Lin (2016) as well as Bech and Malkhozov (2016). Both of these papers illustrate how central banks prepare for the implementation of negative rates in the economy. The findings from both of these papers are of utmost importance to this research paper as it directly links to what this research paper is about and has given the researcher a far greater understanding of how negative interest rates affect the economy when implemented. Though the Jobst and Lin (2016) research paper is looking at bank profitability in the Euro area, it gives knowledge of how NIRP works in the economy and is an excellent starting point for the research development of this paper. Reading further in the paper by Bech and Malkhozov (2016), they discuss in their findings that negative policy rates are transmitted through money market rates in the same way that positive rates are, delving deeper into what that means they also expand on that negative rates are transmitted specifically to longer-maturity and higher-risk rates.

Bech and Malkhozov (2016) have also discussed the uncertainty of individuals and businesses if rates were to stay negative for a long period of time; the base assumption from anecdotal evidence is that financial institutions are unwilling to increase lending and individuals' unwillingness to invest money in the financial markets or deposit their money into a savings account (Skydsgaard, 2021). A very important finding in was made by Czudaj (2020), is that an introduction of negative interest rates reduced the expectations regarding three-month money market interest rates as well as ten-year government bond yields, the findings in Czudaj (2020), is important to this research as the findings are the opposite of the hypothesis in this research where expectations in short term rates and long term bond rates are lower. Though this happens the research also illustrates that NIRP has a positive effect on inflation and GDP, this specifically is not directly related to this research done for this paper however, it is important to note the effectiveness of NIRP on the economy two key areas of the economy.

On the contrary, Villanueva (2021) found there was no statistical significance of negative interest rates on GDP. Expanding on the base knowledge of negative interest rates Gilman (2021) discusses what negative interest rates are and illustrating that NIRP in fact do a good job at easing the economy. It also goes into the specificities of each of the numerous countries that have already implemented negative interest rates and how their policies have helped, Gilman (2021), has a different view from some of the other literature that has been mentioned in regard to how Japan has dealt with their implementation of NIRP. Gilman mentions the worrying trend that when Japan implemented their NIRP they did not apply the policy to reserve funds, however in the paper there was no solution or alternative to what Japan should have and can do as Gilman (2021), did mention that there needs to be further research into the long term effects of this policy on Japanese reserve funds.

Angrick and Nemoto (2017), made analyses of the implementation of negative interest rates across Europe and in Japan, they mention that a primary proponent for implementing negative

interest rates is to address the deflationary trends and the continued decline in the strength of the economy as well as discourage foreign capital inflow. Angrick and Nemoto (2017), make an interesting discussion regarding how interaction with new financial regulatory requirements post the 2008 global financial crisis interact with negative interest rates, due to the implementation of the Basel three capital and liquidity requirements that intend to limit the capacity of the balance sheet for financial institutions and the institutions "desire" for arbitrage opportunities across different asset classes. Angrick and Nemoto (2017), bring forward a theoretical lining to demonstrate how the previously mentioned arbitrage opportunities affect the transmission channels in monetary policy for interest rates and exchange rates which the Covered Interest Rate Parity demonstrates. Angrick and Nemoto (2017), then continued to illustrate and continue their argument that far more attention and research must be done on the potential effects of negative interest rates and current and any future regulatory requirements. Continuing on the ever-important transmission channel, Groot and Haas (2020), have mentioned a novel signalling channel and poses the questions of if negative interest rates can be effective and an optimal policy tool.

Groot and Haas (2020), constructed a financial friction new Keynesian model where monetary policy can set the reserve rate to negative but deposit rates are limited to zero. What Groot and Haas (2020), found was that the signalling channel dominated but the effectiveness depends on the degree of the policy, the amount of reserves being held and the duration of the zero bound, upon further research Groot and Haas (2020), found that the necessary conditions for negative interest rates to operate in an optimal way is time constraint policy setting as well as a preference for policy smoothing. Groot and Haas (2020), are suggesting that long term implementation of NIRP may not be effective in the long run, this has yet to be proven by any piece of academic literature on the topic of negative interest rates, which may need a longer sample of time as NIRP is something that has only been introduced in recent years.

Bernoth and Haas (2018), mentions that with the target inflation below expectations, slower economic growth and uncertainty in the financial markets, the ECB decreased the deposit facility rate below zero. Bernoth and Haas (2018), illustrates that the empirical and

theoretical literature on negative interest rates imply that NIRP has a stimulating effect on the real economy via the classic transmission channels (Bernoth and Haas, 2018). It is also mentioned that NIRP increases the credit supply and improves the wealth of households and financial institutions, what is also mentioned by Bernoth and Haas (2018), is that negative interest rates also have a negative effect on financial stability, this argument is linked to the research being done here as it will be mentioned later on in this paper. Criticism of this Bernoth and Haas (2018), is the use of the macroeconomic model by Groot and Haas (2018) to weigh the costs and benefits of the ECB's implementation of negative interest rates, in their results they assess the trade-off between the central banks' ability to use NIRP, lower future deposit rates against the costs of bank profitability. Bernoth and Haas (2018) then find that the signalling channel dominates the potential costs on profitability, in their framework NIRP they mention that NIRP is an effective monetary policy tool even when the deposit rates are bound by zero. While this is a good illustration of the implementation of negative interest rates, the economic model is simplified to illustrate the complexities of real-world processes. The financial risks that the model captures are limited. Since there is little empirical evidence regarding negative interest rates having an impact on bank profitability.

A very important piece of research that will be a cornerstone for this research is the findings done by Fukuda (2018). This study is looking at the effect of Japan's negative interest rate policies on Asian financial markets and if there are any spillover effects in other advanced economies, and

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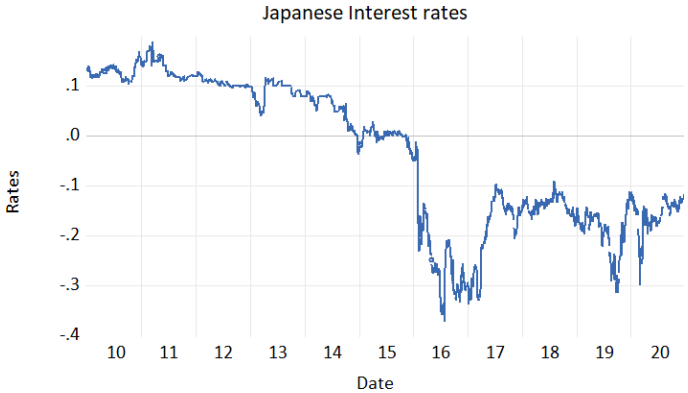
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maybe there was indeed shock to other Asian financial markets. Fukuda (2018) suggests that this may be because of the strong trade links between the United States and Japan but weak financial market correlation between Japan and the United States. The negative interest rate policy in Japan did not benefit advanced economies, because of the implementation of NIRP domestic Japanese institutions were losing profit in domestic markets, this forced Japanese firms to expand profit paths outside Japan.

Finally, Arteta et al (2016) gives comprehensive implications of NIRP by looking at the reason for implementing such policies. Arteta et al (2016) mentions that the main motivation for the implementation of NIRP was to stabilise inflation expectations and support economic growth. However as mentioned this was not the case for every central bank, the Swedish National Bank and Danish National Bank implemented negative interest rates to respond to the appreciation of the domestic currency and prevent capital inflow pressures. Arteta et al (2016) discusses how NIRP can affect financial stability, mentioning that there could be an effect if rates were to stay below zero for a long period of time. As mentioned before there is not enough research to conclude if there is any impact on bank profitability caused by NIRP.

We look at numerous financial assets such as the Japanese stock index the Nikkei 225, the United Kingdom stock index FTSE 100, Japanese government 10-year bonds, the SSE index in China, the VIX in the United States as well as the NASDAQ composite index and the exchange rate of the Japanese Yen and the United States Dollar (USD). The raw data that has been collected are for the dates 4th of January 2010 to the 30th of December 2020, these dates were chosen and deemed appropriate for this research paper as it covers enough time before negative interest rates were introduced to capture pre-policy change volatility of the financial assets, as well as enough time post-policy change to observe the volatility of the financial assets. All the data collected is daily data and the data collected has been obtained from Datastream. First, we begin with looking if the FTSE100 stock market index and how the FTSE100 reacts to changes to the Japanese policy rates. We can see a continuous reduction in the Japanese rates in figure 1 as the BoJ continuously looked to prevent deflation and boost economic growth.

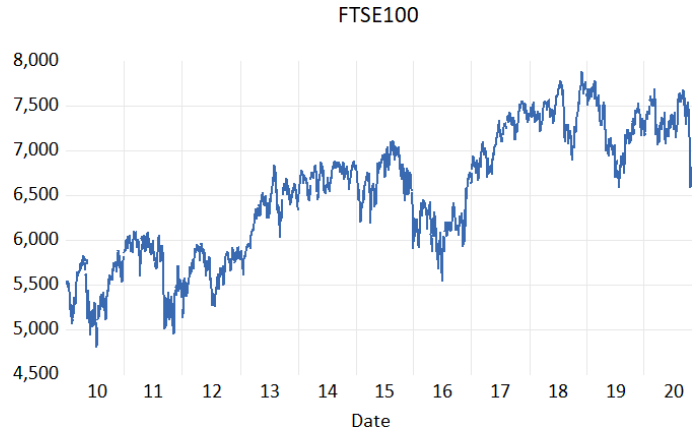
Figure 1. Interest rates in Japan



We see that the BoJ implemented NIRP in early 2016 and since then rates have been below zero. There are observations to be made when we visually look at the effect that NIRP in Japan had on overseas financial markets, figure two reports the FTSE100 over our sample period and

we observe the FTSE100 not taking much of a reaction to the implementation of the NIRP in Japan, this is due to the United Kingdoms vote on leaving the European Union in mid 2016. However, just based on visual there definitely has been growth but as our model reported the spill over effect on the FTSE 100 was marginal.

Figure 2. FTSE 100 10 year



Cutting policy rates slightly below zero in principle should see a similar result as a cut in rates to low territory e.g 0.25%. However, what is unclear is the long term affect of NIRP and how there could be disruptions to financial markets. NIRP could also have an effect on emerging markets and economies, as investors search for higher yield as a reaction to negative interest rates in more advanced economies, this can affect the inflow of capital to emerging economies but this does not come without speculation that emerging economies can often have or lack macroeconomic fundamentals which would see a limitation on gains from financing conditions in countries that currently implement negative interest rate policies due to balance sheet pressures coming from the appreciation of the United States dollar which could see a challenge to policy.

Central banks across the world have had to deal with the initial impact of the global financial crisis as well as the long last effects from the disruption that the global financial crisis caused, the global financial crisis came with below target inflation. Since then, there has been a lack of investments along with savings and a lessening amount of high rated low risk fixed income assets have been in decline in the equilibrium of real interest rate (Rachel and Smith, 2015). Because of these reasons as well as an increase in the concern of deflation in economies, a number of central banks have decided to take extreme measures and cut their policy rates below zero. With cutting policy rates below zero, this now means the central bank is charging commercial banks for their cash reserves, this essentially is a tax on the banks for hoarding their cash. It is not uncommon for commercial banks to hold deposits, the main reason for commercial banks to do this is for interbank transactions and to meet the legal minimum requirement for reserves (Arteta et al., 2016).

Central banks have defended their decision to implement NIRP, which has been said to stabilize inflation expectations and to support economic growth, in some cases some central banks have said that their reason for implementing NIRP was in response to the appreciation of their local currency as well as to limit capital inflow to the country, some NIRP were introduced alongside other policies that ease financing conditions to help stimulate financial activity while

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also limiting any possible adverse effects on the earnings from the commercial bank (Arteta et al., 2016). When the European Central Bank (ECB) first introduced negative interest rates that are applied on the deposit facility in June of 2014 was in response to the previously mentioned risk of a deflation and no economic growth. In the same year the Riksbank in Sweden also cut their deposit rates below zero for the same reasons. The Bank of Japan (BoJ) and Magyar Nemzeti Bank (MNB) in 2016, also have brought their rates below zero by implementing NIRP, making them the most recent central banks to do so.

When looking at the central banks in Denmark and Switzerland, their reasoning for implementing negative rates is different to the other central banks that have already implemented NIRP. Looking at both countries the spill over effect from the financial conditions that were apparent in other countries in the Euro area. The Swiss in 2014 changed their deposit rates to be below zero to prevent the inflow of capital and to maintain the exchange rate cap of the Swiss Franc to the Euro. The Swiss National Bank (SNB) mentioned that a key reason behind introducing NIRP is that they believed that the Swiss Franc was "significantly overvalued" and that introducing NIRP will make Swiss Franc

investments less attractive to foreign investors. The Danish National Bank (DNB) maintains its currency, the Danish Krone, with a narrow band around the Euro set their deposit rate below zero in 2012. This NIRP was introduced as the Danish economy was seeing a rise in capital inflows due to heightened financial stress from the inside the Euro area. The DNB in 2015 metioned that they needed to take action on the foreign exchange markets to decrease the amount of foreign capital inflow the DNB cut its rates to 0.75%.

With the risk of deflation, no growth in the economy, currency depreciation and increasing foreign inflow of capital, there has been a discussion on the apparent limits of unconventional monetary policy have seen encouragement from the extension of policy options such as the removal of the lower bound constraint on economies, the four main reasons of why these central banks introduced NIRP instead of expanding on previous unconventional monetary policy measures such as quantitative easing (QE). Introduction of NIRP signalled to bond investors the long term intention of keeping policy rates at extremely low levels, this then in theory would see the yield curve shift downwards, further evidence of this will be illustrated later on.

Due to the global financial crisis central banks were forced to implement unconventional monetary policies which saw central banks introduce asset repurchase programs, credit easing as well as intervening in exchange rate. This then saw a rapid increase of the balance sheet of central banks, this then reduces the amount of assets in the asset pool, the ECB purchased €80bn per month, this purchase program mainly consisted of sovereign bonds. A more recent example of a severe asset purchase program is the United States Federal Reserve doubling their balance sheet from $4.2 trillion at the end of 2019 to $8.4 trillion in September 2021 (Federalreserve.gov, 2021). This was done in response to the financial distress that the COVID-19 pandemic brought. The BOJ balance sheet increased sharply under its first Qualitative and Quantitative Easing (QQE) program, the BOJ did this as a response to help jump start the Japanese economy before deciding to bring policy rates below zero to further extend policy measures.

3 TRANSMISSION CHANNELS UNDER NIRP

The current system contributes heavily to the growth of the economy by channelling financial resources between consumers that borrow and consumers that save money, this makes sure that the stimulation of their investments and the allocation of financial risk (Bernoth and Haas, 2018). Since the central bank can determine the level of short term interest rates on the domestic currency and the amount that is being distributed in the

economic weekly, the monetary policy decisions heavily influence the level of liquidity and income levels of the banks. A large proponent of the commercial banks profits are from the net interest margin which can be described as the spread of the interest rate the commercial bank pays to savers or the central bank in exchange for the returns on the loans, assets and reserves they hold at the time, when the central bank implements changes to their monetary policy this forces the commercial banks to adjust their balance sheet as they see fit (Bernoth and Haas, 2018). This in turn results how the behaviour of the commercial bank contributes to transmission channels of monetary policy to the real economy particularly through the interest rate channel and credit channel.

Interest rate channel: When the central bank decides to cut rates below zero this in theory should reduce the amount of borrowing and lending by financial institutions (Arteta et al., 2016). Rates brought below zero should see a reduction in bond returns and money market rates, with the NIRP there will be a decline in the short term interest rate will result in lower long term interest rates, there will be an arbitrage opportunity for investors for expected returns across numerous securities with varying maturity dates. With rates being cut below zero there is a chance that yields could squeeze if charging the financial institutions for keeping cash lead to purchases of securities because of this they combine to push real interest rates and borrowing costs down even more, this in turn encourages businesses to uptake and increase their investment holdings. Under conventional monetary policy or other words known as normal times, the central bank will lower their policy rate and due to the competition of commercial banks this forces the commercial banks to pass the lower refinancing costs onto their customers. This then has a knock on effect of how the commercial bank adjust their rates on loans and deposits to keep the profit from the net interest margin stable and positive (Bernoth and Haas, 2018). In an environment with negative interest rates the transmission channel is disrupted, commercial banks find it far more difficult to pass NIRP onto depositors; even though deposit rates have declined over the years they are bounded near zero. Since this is the case, commercial banks are very eager to control their net interest margins the commercial banks have little to no incentive to reduce their loan rates in response to NIRP (Bernoth and Haas, 2018). With a reduction in net interest margin over the recent years that the commercial banks have unwillingly possibly, settle for a partial pass through to loan rates (Bernoth and Haas, 2018).

Portfolio channel: NIRP's should see more of a demand for high returns in securities; because of this, investors will then see higher returns in their portfolio which should produce more economic growth through investments however there is a problem with this as unconventional monetary policies can lead to bubbles and have asset prices become over inflated.

Exchange rate channel: Policy induced declines of short term interest rates are done through adjustments to currencies. The domestic currency, in theory, should depreciate to help risk adjusted returns on debt securities be more "equal". NIRP will discourage capital inflow but will contribute to net exportation of goods.

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Credit channel: NIRP is expected to negatively affect the availability of credit to businesses and households. NIRP can be seen as a tax on banks and households holding cash, what banks often can do is to increase their lending rates to hedge their losses from the NIRP and because of this financial institutions may be far more reluctant to lend (Arteta et al., 2016). The credit channel has an effect on the supply and demand of the commercial banks credit, it differentiates the bank lending channel and balance sheet channel. The bank lending channel operates from the effectiveness of the monetary policy changes on the bank balance sheets (Bernoth and Haas, 2018). The expansion of monetary policy including the central banks purchase of assets can help ease the commercial banks constrain on borrowing due to the asset purchasing from the central bank increasing the commercial banks reserves and because of the increase of the commercial banks reserves there is an increase in the willingness of the commercial banks to extend loans at given levels of interest rates (Bernoth and Haas, 2018), this in turn helps stimulate the economy.

The balance sheet channel causes changes in the monetary policy to affect borrowers balance sheets and income statements and this then affects the demand for credit, the fall in key interest rates causes the asset prices to increase (Bernoth and Haas 2018), this increases the value of financial institutions and households that would see an increase of the value of their collateral example being the value of a households house increasing to allow that household to use the house as collateral for another loan the same applies to firms seeking to expand via debt solutions. The ECB's unconventional monetary policy measures in combination with negative interest rates have been successful in giving additional liquidity to firms and households, because of this there has been a growth in credit and lending rates have begun to fall and easing the financial environment after the global recession of 2008 (Bernoth and Haas, 2018). Altavilla et al (2017) discusses that significant gains on high yield assets and a reliance on funding have been strategies used by commercial banks as a response to the increasing cost of excess returns in an economy with negative interest rates.

Risk taking channel: Monetary policy can transmit to the real economy due to the risk appetite of commercial banks (Rajan, 2005). The asset side sees an impact from the monetary policy which lowers the income investors see from assets on the balance sheet of the commercial bank and that can drive a wedge between nominal returns and actual returns (Bernoth and Haas, 2018), because of the positive perceived impact of lower interest rates on assets across different classes which sees the increase of both assets and collateral commercial banks adjust their risk appetite by looking at the probabilities of default. On the flip side, since lower interest rates decrease the cost of acquiring debt commercial banks can make positions for themselves by increase their leverage and to issue more debt instead of equity to be more profitable (Adrian and Shin, 2009). The research on if negative interest rates affect the risk appetite for commercial banks is limited and far more research has to be done on this specific area. There has been little research that presents a negative relationship between commercial banks risk appetite and short term interest rates (De Nicolo et al., 2010). This research, however, has been challenged with presenting the opposite view that there was no evidence to suggest that commercial banks adjust their risk appetite for higher yields (Bikker and Vervliet, 2017). Commercial banks maintained their profits and did not feel the need to increase their risk appetite for their reduced net interest income to make riskier investments to cover the possible losses (Bikker and Vervliet, 2017).

4 IMPACT ON FINANCIAL STABILITY

NIRP in many ways can pose significant risks to financial stability, specifically if the NIRP has been implemented for a long period of time. In particular, long lasting effects of NIRP to financial stability could see a decline in the profitability of commercial banks and other financial institutions as well as investors being far more riskier with their investments than normal (Arteta et al., 2016). The impact of financial stability heavily depends on the level of the policy rate. The commercial banks are not willing to pass negative rates on to their customers without the decline in their reserves, NIRP will put pressure and limit the profitability of the commercial banks and have their net interest margins reduce. The effect that net interest margin on the banks profitability with negative interest rates depends on the how the commercial banks source their funding and the stickiness of deposit rates (Arteta et al., 2016), short term rates should not effect bank profitability only if the bank sources their funding from wholesale, foreign deposits and large deposits (Bernake, 2016). The commercial banks that heavily rely on retail deposits from interest rate pass throughs the NIRP would then see a larger margin compression from the commercial banks that rely on wholesale funding, because of the overnight market rates have gone negative this also affects the profitability but the effect of the NIRP on bank profitability also depends on the how the commercial bank is able to diversify their income streams and how they manage their fees (Arteta et al., 2016). Commercial bank profitability heavily depends on the overall health of the economy that affects its overall volume of lending and the quality. Stronger growth will help the non performing loans and reinforce the commercial banks the amount of capital the bank has and steepens the yield curve that is very important for banks lending and their profitability. ECB (2016) mentions that current countries with NIRP implemented that their bank margins are within post global financial crisis ranges even though they have shown signs of compressing. Commercial banks in the Euro Area under NIRP show that the commercial banks are more willing to use their reserves for new loans and purchases in the financial markets such as purchasing bonds and their willingness to other firms as also increased substantially (Rostagno et al., 2016). Though the evidence of NIRP on bank profitability is somewhat unclear, long term implementation of NIRP suggests that there could be a harmful effect over time and effect the transmission of monetary policy. The ECB implemented a package of measures to mitigate the risk of the possible harmful effect on the transmission of the monetary policy such as expanded asset purchases and the implementation of targeted long term refinancing operations (TLTRO), TILTRO allowed banks and gave the commercial banks the ability to borrow at zero or fixed negative interest rates on the condition that the commercial banks will expand their credit into the private sector. As NIRP are seen as a tax on the commercial banks' deposits, TLTRO could be seen as a way to subsidise borrowing. If the commercial banks were to increase their lending to the private sector enough to where they are able to take full advantage of the TLTRO interest rate and the effect of the negative central banks deposits rates on the commercial banks revenue could be offset, however, this heavily depends on the size of the reserves (Arteta et al., 2016).

The system of tiered deposit rates, it is worth noting that negative rates only apply to a part of excess reserves, but this tiered deposit systems can be used as an option to help ease commercial banks that operate in economies with NIRP implemented. Currently, this tiered system of deposits only exists in Switzerland, Japan and Denmark (Arteta et al., 2016). An argument is to be made regarding the tiered deposit system and how commercial banks passing on negative rates to their consumers have helped mitigate the effects on the commercial banks profitability from the negative interest rates in Switzerland (Jobst and Lin, 2016). There has been a levied for deposits

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by the central bank that have set thresholds that were deemed to have a limited impact on the overall revenue for commercial banks in Switzerland (SNB, 2015). Financial institutions such as hedge funds, insurance companies and sovereign wealth funds will often have a large portfolio of government bonds as they seek for stable returns to meet their financial goals. Insurance firms may struggle to generate good-enough returns due to low or negative yielding bonds that they often purchase, some other financial products can become more attractive to insurance firms but products like fixed rate annuities are now less attractive to insurance firms due to the common mispricing options that have the chance to be exacerbated (Hannoun, 2015). The solvency life of insurance firms are deteriorating as insurance firms are becoming more and more sensitive to interest rate policy changes by the central banks. Tax changes also affect insurance firms and their returns as different tax regimes regulations increase the sensitivity that insurance firms have across different economies and countries.

With the continuous challenges that the insurance sector faces the equity prices of insurance companies in Japan and the Euro area have continued to decline during the time of NIRP being implemented in these economies (Arteta et al., 2016). This is not to say that insurance firms have done nothing to protect themselves however, insurance firms in European markets have prepared for new regulations (ECB, 2016). However the Japanese has had a much longer period of prolonged extremely low interest rates and this has been shown that any changes that are substantial enough in portfolio and allocation of assets being held can in some cases help the insurance firm to adjust their positions when they are under economic duress (Nieder, 2017).

It has been found that financial stability issues emerge in economies that have low or negative interest rates, and that reduced debt costs keep credit flowing to insolvent borrowers (Jobst and Lin, 2016). It is likely that firms that are trying to exit their industry can be delayed and this in turn hurts the prospectus of firms that are willing to add more capital to their firm (Bernoth and Haas, 2018). Low or negative lending rates can lead to firms delaying their debt restructuring of firms that are highly geared. When looking at funds in the money markets, they often make very safe investments in financial assets such as corporate or government debt that allows their investors to preserve capital while also receiving an adequate return (Arteta et al., 2016). Due to the nature of money market funds, they often face uphill battles even with low rates that are positive, money market funds can have capital outflow as the returns on these financial assets are low but positive but would see a net of expense negative returns to investors of money market funds. Money market funds often tend to avoid assets with reductions in their net value, the objectives that money market funds have set out would not be achievable if the rates in the market were in negative territory for a prolonged period of time (Di Maggio and Kacperczyk, 2016). From the research currently available the there has been no evidence that NIRP has any affect on money market funds, looking at the European money market sector, there has been a growth in the sector even with NIRP implemented and these funds have continued to see capital inflows (Huttl, 2014). Interestingly, the United States have been reluctant to implement NIRP to their monetary policy, former President Donald Trump at one point in his presidency asked the Federal Reserve about the possibility and was an advocate for it (Lambert and Holland, 2020). A proponent that would make it difficult for money market funds to pay negative interest rates is that they operate under different regulations that money market funds in the European area. There is evidence to suggest that implementation of NIRP in the US would adversely affect the money market funds more than they would in the

European area, mostly due to money market funds being so crucial to the financial system in the United States (Cœuré, 2015). The United States has an auction process that does not permit anyone to submit bids with negative rates, this further complicates the implementation of NIRP in the US. Still, Mankiw (2009) argues that implementing NIRP in the US during the global recession would have aided in the recovery.

5 HOW LOW IS TOO LOW?

We have seen that negative policy rates are a very effective monetary policy tool to help the economy, but it poses the question of, how low can negative rates really go before it threatens the market and financial stability, if for example central banks decide to take policy rates too low it could force the economy to become very cash based and see larger sectors of the economy suffer immensely such as the financial sector for example (Arteta et al., 2016). The lower bound heavily depends on the country in which it is in, if financial institutions have been largely present, they are more likely to be affected by NIRP, such as money market funds, insurance funds, pension funds. The size of deposits can be a factor for the lower bound as the lower the rates go the higher the cost of storing cash is.

With multiple factors considered there is no clear-cut picture of the floor for negative interest rates. Currently we see deposit rates in the Euro area as low as -0.4, -0.5 in Sweden and -0.75 in Denmark and Switzerland without any cause for concern in regards to the financial stability of the economy when it pertains to rates (Arteta et al., 2016). Since countries in the European area have to an extent normalised the use of negative policy rates along with implementation of other unconventional monetary policies for expansionary purposes, central banks play a key role in the ensuing increase of global interest rates as well as support systems for assets that are riskier, high yielding including support for more capital inflow to emerging markets. With more and more European countries implementing NIRP, bonds issued in the euro currency by emerging markets has the possibility of seeing pressure on the United States dollar from the increase of yield differences from the Euro area and Japan (Arteta et al., 2016). NIRP can affect emerging markets via different transmission channels, because of negative short term rates, overseas investors are seeking higher returns in their domestic market as well as international markets, this will help capital inflows to emerging markets that maintain financial stability and investors looking for higher returns in emerging markets can hedge their investments against rising rates in the United States (Ahmed and Zlate, 2014). As some European countries implement NIRP this could lead to a change in the sources of funding for emerging markets from United States dollar to Euro denominated debt assets (Arteta et al., 2016). As the ECB implemented both quantitative easing and NIRP, borrowers in emerging markets have increased the amount of bond issuances in European markets by taking advantage of the very low borrowing costs in European markets, investors do this to compensate the very low or negative rates in their domestic country. As time progresses there is a chance for a large influx of capital inflows to emerging markets that can be linked with fast credit growth and debt in the private sector rising in emerging markets.

6 CONCLUSIONS

By developing a business model that proposes the development and placing on the market of a This paper looks at the relationship between Japanese policy rates and financial assets in

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domestic and foreign markets. Even though there was a positive relationship with the FTSE100 in the United Kingdom and Japanese policy rates, this could be a little deceiving; in the summer of 2016, the same year the BoJ implemented negative policy rates, the UK decided to leave the EU and this caused the FTSE100 to dramatically lose value for a period of time. In turn, the growth of the FTSE100 since the vote could largely be attributed to the recovery from the initial shock from the result of the referendum vote.

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