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WHY ZLB ECONOMICS AND NEGATIVE INTEREST RATE POLICY (NIRP) ARE WRONG:

A Theoretical Critique

June 2016

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ABSTRACT

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Abstract

NIRP is quickly becoming a consensus policy within the economics establishment. This paper argues that consensus is dangerously wrong, resting on flawed theory and flawed policy assessment. Regarding theory, NIRP draws on fallacious pre-Keynesian economic logic that asserts interest rate adjustment can ensure full employment. That pre-Keynesian logic has been augmented by ZLB economics which claims times of severe demand shortage may require negative interest rates, which policy must deliver since the market cannot. Regarding policy assessment, NIRP turns a blind eye to the possibility that negative interest rates may reduce AD, cause financial fragility, create a macroeconomics of whiplash owing to contradictions between policy today and tomorrow, promote currency wars that undermine the international economy, and foster a political economy that spawns toxic politics. Worst of all, NIRP maintains and encourages the flawed model of growth, based on debt and asset price inflation, which has already done such harm.

Keywords: Negative interest rate policy, zero lower bound

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1. Introduction

In the wake of the Great Recession and ensuing Great Stagnation, central banks have increasingly embraced the idea of setting negative interest rates by charging commercial banks for reserves placed on deposit with the central bank. The list of central banks that have already adopted this policy includes the Bank of Japan, the European Central Bank, the Swiss National Bank, the Swedish Riksbank, and the Danish Central Bank.

Negative interest rate policy (NIRP) is now becoming part of consensus mainstream macroeconomics. In a December 2015 interview, former Federal Reserve Chairman Ben Bernanke said the Federal Reserve was likely to add negative interest rates

as a policy tool. In March 2016 Bernanke followed that up with an extended Brookings Institution blog on the tools central banks have to fight slow growth, beginning with negative interest rates. In February 2016 testimony before the US House of Representatives, Federal Reserve Chairwoman Janet Yellen stated negatives were still on the policy table. And in April 2016 the IMF jumped on to the negative interest rate bandwagon when Managing Director Lagarde declared they are a net positive to the global economy, a position that was strongly echoed by IMF financial counsellor Jose Vinals in a briefing at the IMF 2016 spring meetings.

This paper explores the new NIRP consensus and argues it is profoundly wrong. The new consensus embodies a double failure. First, negative interest rates are likely to be counter-productive regarding their impact on aggregate demand (AD). Second, NIRP continues and actively encourages the debt-led asset price inflation model of economic growth that has caused so much trouble. Not only will NIRP not solve the problems posed by the financial crisis and Great Stagnation, it risks aggravating them. The implication is mainstream economics has it wrong - once again!

2. The "modern" theory behind NIRP

NIRP represents both a continuation and elaboration of the theoretical thinking that has shaped macroeconomic policy over the past thirty-five years. The continuation reflects the focus on interest rates as the critical tool for stabilizing the economy and ensuring full employment. The elaboration reflects the embrace of negative rates which policy must deliver in times of demand shortage and low inflation, because the market cannot owing to the zero lower bound (ZLB) to nominal interest rates.

On the surface, NIRP appears revolutionary. However, its analytical justification

rests on pre-Keynesian macroeconomic reasoning that regained ascendancy in the 1970s. That thinking was celebrated in the notion of the "Great Moderation" (1980 – 2007) which prevailed prior to the financial crisis of 2008. The claim was macroeconomic performance, as measured by inflation and the frequency and depth of recessions, had been greatly improved after 1980 owing to improvements in the conduct of monetary policy.

According to Great Moderation believers, the improvement rested on two developments. First, at the theoretical level, there was a restoration of pre-Keynesian classical macroeconomic ideas which described the economy as stable and self-adjusting relatively quickly back to full employment in the event of economic disturbances. According to classical macroeconomics the real interest rate is the critical macroeconomic price and it adjusts to clear the loanable funds market, ensuring that full employment saving equals full employment investment. Second, at the policy level there was a shift to low inflation targeting conducted via independent central banks using clear credible interest rate rules. Policy identified an inflation target and then set a nominal interest rate consistent with the inflation target and the full employment loanable funds real interest rate.

Anytime the economy got into trouble, monetary policy engineered a lower nominal interest rate, which lowered the real interest rate given an unchanged inflation target. That stimulated investment and lowered saving. Moreover, to the extent that lower interest rates increased asset prices, that was also beneficial since higher asset prices encourage consumption which lowers saving, and they also encourage investment.

This policy response was adopted in the recessions of 1991-2 and 2001-2. It also

constituted the immediate response to the financial crisis of 2007-8, the belief and hope being that lower rates would quickly reflate asset prices and stimulate demand.

NIRP began to enter the picture when the policy interest rate was pushed to zero – the so-called zero lower bound (ZLB). In the first instance, hitting the ZLB prompted central banks to engage in quantitative easing (QE), which involves purchasing longer-dated bonds.[1] When that failed to adequately stimulate the economy, NIRP became the next policy of choice based on simple extrapolative logic. If lower interest rates stimulate AD, then lowering rates into negative territory should do the same.

The case for NIRP has been significantly assisted by the claim that the ZLB explains the stagnation that set in after the Great Recession of 2007-09 (Eggertsson and Krugman, 2012). The ZLB hypothesis of stagnation was originated by Paul Krugman (1998) to explain Japan's stagnation after the collapse of its asset price bubble in 1991. Now, the story has been modified in an attempt to explain stagnation in the US.

The claim is that after the financial crisis, US households decided to repair their balance sheets by deleveraging and paying down debt. That caused an increase in the full employment supply of saving (loanable funds), necessitating a fall in the real interest rate to equilibrate the loanable funds market. However, that was blocked off by the ZLB. The resulting excess supply in the loanable funds market then compelled a contraction of employment and output, to balance the goods market.

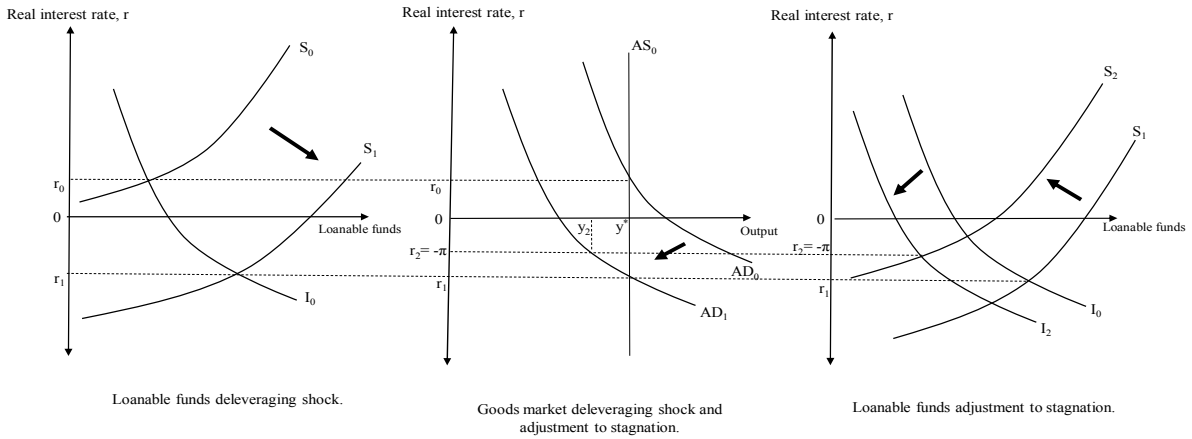
The ZLB theory of stagnation is illustrated in Figure 1.[2] The left-hand panel

[1] QE has many similar downsides to those discussed in this paper regarding NIRP, particularly as concerns promotion of asset price bubbles and adverse political economy effects (Palley, 2011). However, QE is a less radical policy, which is why it may still be positive on balance.

[2] This section draws from Palley (2016) who also provides an empirical critique of ZLB based explanations of stagnation. The bottom line is that attempts to apply ZLB narratives do not fit the data.

shows loanable funds market in which saving and investment are equilibrated via adjustment of the interest rate. The economy is initially at full employment equilibrium with an interest rate of r_0. Given an exogenous inflation rate (π), the nominal interest rate is $i_0 = r_0 + \pi$.

Figure 1. The ZLB story of stagnation.



According to the ZLB story, the equilibrium was disturbed by a deleveraging shock that increased saving and shifted the saving function (i.e. the supply of loanable funds) to the right. Maintaining balance between full employment saving and full employment investment required a negative real interest rate of r_1, but that was blocked of by the ZLB. The middle panel shows the goods market in which aggregate demand (AD_0) initially equals full employment aggregate supply (y^*) at the real interest rate of r_0. The deleveraging shock increases saving and shifts the AD function down (AD_1), requiring a negative real interest rate of r_1 to clear the goods market. However, that is blocked off by the ZLB, leaving the economy with demand shortage and excess supply.

With the nominal interest rate at zero (i = 0), the real interest rate is equal to the

negative of the inflation rate, but that is still not low enough to generate sufficient AD to support full employment. The excess supply of saving and output in turn trigger a contraction of output, which is illustrated in the middle panel by a shift along the new AD schedule. Output and income contract until the level of output is equal to the level of AD, given the new real interest rate ($r_2 = -\pi$).

The right hand panel shows the parallel adjustment process in loanable funds market adjustment. The fall in output from y* to y_2 reduces income, causing the saving function to shift left (S_2) and saving to fall. It also causes the investment function to shift left (I_2) and investment to fall. The contraction of output continues until saving and investment are brought back into balance at the real interest rate of r_2.

There are several features to note about the ZLB story. First, the ZLB to nominal interest rates is the cause of unemployment and stagnation as it prevents the nominal interest rate from falling, thereby blocking the real interest rate from falling. Second, the underlying economic belief is that a lower real interest rate can always solve the problem of aggregate demand shortage. It is assumed to do so by increasing investment demand and reducing saving.

Third, the core economic theory behind the ZLB story derives from pre-Keynesian classical macroeconomics. At the center of classical macroeconomics is the loanable funds theory of interest rates, according to which the goods market and saving and investment are coordinated via adjustment of the real interest rate, thereby delivering full employment. The real interest rate (i.e. the loanable funds rate) is the critical mechanism, and it adjusts to ensure full employment saving equals full employment investment demand – or equivalently, that aggregate demand equals full employment

aggregate supply. In contemporary formulations, this classical interest rate adjustment mechanism is managed by the central bank via its nominal interest policy. The central bank sets the nominal interest rate aiming to target an inflation rate consistent with its belief regarding the required loanable funds real interest rate.[3]

Fourth, though the core theory derives from classical macroeconomics, the economy can appear Keynesian because output adjusts when the real interest rate cannot. In normal times, the real interest rate adjusts to balance full employment saving and full employment investment to ensure AD equals full employment aggregate supply (AS). However, when the real interest rate cannot adjust (as at the ZLB), output does the adjusting to align AS with AD. That gives the economy its Keynesian look.

Fifth, there are two policy solutions to the problem as diagnosed by ZLB economics. Solution number one is for the monetary authority to drive up inflation expectations. Since the real interest rate is equal to the nominal interest rate (which is stuck at zero) minus expected inflation, a higher expected inflation rate lowers the real interest rate. However, that is easier said than done as inflation expectations appear to be determined by expectations of real economic conditions rather than pronouncements by the monetary authority.

Solution number two is for the monetary authority to set a negative nominal interest rate. In principle, it can do this directly by setting its own lending rate below zero, or alternatively it can adopt non-standard tools such as charging commercial banks

[3] Ironically, though mainstream economists have not yet connected the dots of their own thinking, this line of thinking stands to rehabilitate Milton Friedman's monetarist claim that it central banks which are responsible for business cycles and unemployment. For Friedman, they did this through variation of the money supply. In ZLB economics, unemployment will result any time the central bank sets too high an interest rate target. History looks set to in mainstream economic thought, yet again.

for their deposits with the central bank. Either way, according to the reasoning embodied in ZLB economics that should solve the problem of demand shortage.

3. Economists have forgotten Keynes' message that interest rates may not solve severe demand shortage

Krugman's ZLB hypothesis has now become received wisdom regarding stagnation and it has significantly informed policy discussion over negative interest rates. ZLB economics is a mix of classical and neo-Keynesian (sometimes called bastard Keynesian) economics. The classical dimension concerns its thinking about interest rates and their role in the economy. The neo-Keynesian dimension is the belief that a rigidity (i.e. the ZLB) prevents market economies from automatically self-adjusting to full employment. Both aspects of ZLB economics are wrong, showing how contemporary mainstream macroeconomics has managed to draw all that is wrong from both the classical and post-war Keynesian traditions in macroeconomics.

Keynes' (1936) *General Theory* fundamentally challenged classical macroeconomics and its theory of interest rates. First, Keynes challenged the classical claim that interest rates are determined by the supply (saving) and demand (investment) for loanable funds, thereby equilibrating goods market AD and AS. According to Keynesian economics, the loanable funds market is a fiction that does not exist, so interest rates cannot be determined in this way. Instead, Keynes proposed that interest rates were determined according to his liquidity preference theory. Asset prices and interest rates adjust to ensure asset demands (including the demand for money) equal asset supplies.

Second, Keynes argued output, rather than interest rates, adjusts to equalize AD and AS. That is Keynes famous theory of demand-determined output. If AD exceeds AS, output expands until AD and AS are equal: if AD is less than AS, output contracts until AS and AD are equal. According to Keynesian economics, it is the level output (i.e. income) that adjusts to equilibrate the goods market, not the interest rate. Of course, interest rates may be affected as output adjusts owing to the impact of changing income on portfolio demands for financial assets, but that interest rate impact is a secondary induced income effect. The Keynesian construction of the economy is therefore completely different from the classical construction.

Third, for Keynesians, it is possible that saving and investment may not respond to lower interest rates as assumed by classical macroeconomics and modern-day ZLB economics. It is here that the bastard dimension in ZLB economics creeps in and confuses debate by asserting the problem is a "rigidity" that blocks lower interest rates, rather than being a problem stemming from the inherent limited effectiveness of lower interest rates.

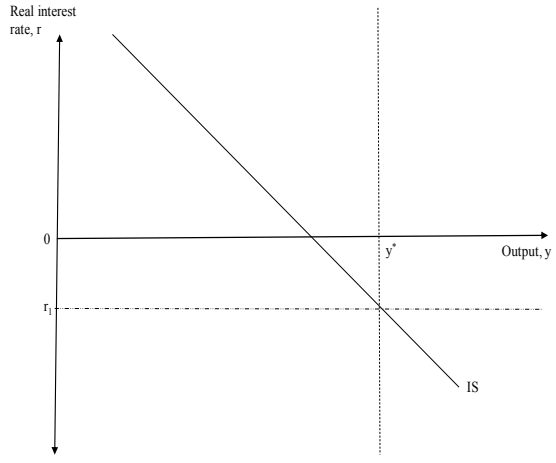
This difference was explicitly surfaced by post-war Keynesians using Hicks' (1937) ISLM model which succinctly summarized the key features of Keynes' *General Theory*. According to the ISLM model, the economy consists of a goods market and financial sector. The goods market is in equilibrium when investment demand equals saving (IS), and the financial sector is in equilibrium when the demand for money (liquidity) equals the supply of money (LM). Goods market equilibrium is represented by the IS schedule showing combinations of output (y) and the real interest rate (r) consistent with saving – investment equilibrium, while the LM schedule shows output (y)

and real interest rate (r) combinations consistent with money market equilibrium.

The original ISLM model assumed an exogenous money supply controlled by the central bank. In that model the IS schedule is negatively sloped in output - real interest rate space [r, y] and the LM schedule is positively sloped. If the monetary authority targets the interest rate, the LM schedule is horizontal.

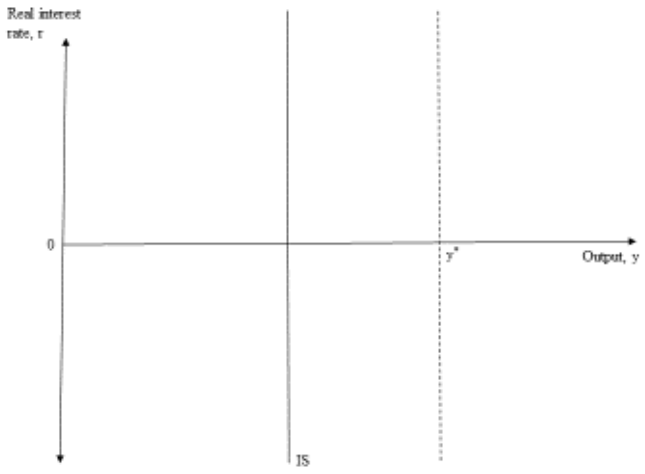
Now, suppose the monetary authority wants to reach full employment output of y^*. Doing so requires lowering the real interest rate and moving along the IS schedule (the goods market equilibrium) schedule. However, there may be a barrier that prevents the nominal interest rate from falling below a certain level. Keynes (1936) identified the liquidity trap (1936, p.207) and, especially, costs of financial intermediation (1936, p.208), which is the line of thought that ZLB economics follows. This problem is illustrated in Figure 2. Full employment output (y*) requires a negative interest rate of r_1, but this is blocked off by the ZLB. The existence of money means that agents will prefer to hold money rather than make loans (i.e. hold bonds) that pay negative interest rates.

Figure 2. The ISLM model with interest rate targeting.



The post-war "old" Keynesians drew another lesson from Keynes' *General Theory*. They argued that a lower interest rate would not be able to increase AD if saving and investment were interest insensitive. This situation is illustrated in Figure 3, and it renders the IS schedule vertical. No matter how low the interest rate, AD does not increase because investment does not increase and saving does not fall. Consequently, there is no interest rate that can deliver full employment output.[4]

Figure 3. The ISLM model with interest rate insensitive investment and saving.



It is this line of thinking that has gotten lost in contemporary mainstream economics because of the re-embrace of classical loanable funds interest rate theory. It has major analytical and policy implications. First, the ZLB does not explain stagnation. Even if interest rates were to fall, stagnation would persist. That means another theory of stagnation is needed. Second, it means the policy of negative interest rates recommended

[4] The equation of the IS schedule is given by $I(y, r) = S(y, r)$ and the conventional macroeconomic assumptions are $I_r \leq 0$, $I_y \geq 0$, $S_r \geq 0$, $S_y \geq 0$, $I_y < S_y$. The slope of the IS schedule is given by $dr/dy = [S_y - I_y]/[I_r - S_r] < 0$. If $I_r = S_r = 0$, the absolute value of the expression for the slope becomes infinite (i.e. vertical in [y, r] space).

by ZLB economics will be ineffective. In fact, as argued below, it may be worse than ineffective: it can be harmful.

Post-war "old" Keynesians argued lower interest rates could not solve the AD shortage problem because of the interest insensitivity of investment. However, the microeconomics of that argument were never properly worked out. Instead, the issue was finessed by claims that investment was exclusively dependent on entrepreneurs' animal spirits and the level of output (or capacity utilization).

An unfortunate implication of that old Keynesian framing of the problem was it appeared to squeeze money out of the picture, making it look as if the investment function was the source of the problem. That in turn took Post Keynesian macroeconomics down the wormhole of capital theory, the production function, and the demand for capital.

The old Keynesian investment function approach fails to capture Keynes' (1936) rich approach to capital accumulation which saw investment (i.e. real capital accumulation) as competing for a place in wealth portfolios, with marginal allocations depending on marginal returns. This view of accumulation is explicitly developed in Chapter 17 (*GT*, p.225-229) and it puts money at the center of capital accumulation. New capital (i.e. investment) must compete for a place in portfolios, along with other assets.

Palley (2016) explores the implications of Keynes' portfolio approach to investment, showing that how it discredits ZLB economics and the claim that the ZLB is the cause of stagnation. When framed in this way, the ZLB is not the cause of stagnation and negative nominal interest rates may not alleviate the problem of aggregate demand shortage. Instead, the problem of enduring demand shortage is due to the existence of

non-produced stores of value, which include money.

One reason why Keynes' portfolio analysis of investment may have gotten over-looked by post-war Keynesians is his use of the term "entrepreneur", which conflates the firm and the individual agent. Instead, it is best to talk about the firm as the locus of investment activity. Firms can be considered as real sector multi-input multi-output financial intermediaries. They take finance from different sources and use that finance to hold different types of assets that produce different returns, and this multi-input multi-output choice has analogies with portfolio decision making.

The core explanation of why negative nominal interest rates may have no effect on investment is that once the marginal efficiency of investment hits zero, firms will prefer to use additional finance to acquire non-produced stores of value whose marginal return is still positive. The ZLB floor is not the problem. Instead the problem is the existence of non-produced assets. Even if the central bank were to make the nominal cost of finance negative, firms will still refuse to invest more and prefer to acquire non-produced assets instead. If the return money is negative, then firms will shift toward holding non-produced assets. Thus, even Gessel's suggestion of taxing money via a negative interest rate on money does not solve the problem.[5]

The argument can be illustrated with the following simple model of investment and asset allocation.[6] On the asset side, firms have an initial capital stock (K_0) which they can increase via new investment (I), and they can also hold money (M) and non-produced stores of value (G) (land, patents, copyrights, monopoly rent streams). Each asset has its own pattern of diminishing marginal returns. The marginal return to

[5] Gessel's thinking is discussed extensively by Keynes in the *General Theory* (1936, p.353-58).
[6] The model is drawn from Palley (2015).

investment eventually becomes negative owing to the diminishing marginal efficiency of investment (MEI). The marginal return to non-produced stores of value is diminishing but always strictly positive. Money has a diminishing positive own return (i.e. liquidity services) plus interest. The interest rate on money is the central banks money market rate minus a fixed intermediation cost (a fixed charge per dollar deposited). If the interest rate on money is negative, the marginal total return on money can turn negative. On the liabilities side, firms are financed by a mix of equity (E) and loans (L) and there is a positively sloped supply of each type of finance. The loan rate is a mark-up over the money market interest rate plus a default premium that increases with lending owing to declining credit worthiness of marginal borrowers.

Rates of return and costs of finance are given by:

(1) $r_I = R(K_0) - \kappa(I) - \delta + \pi$ $\quad R' < 0, \kappa' < 0$

(2) $r_M = i_M + \varphi(M)$ $\quad \varphi' < 0$

(3) $r_G = \psi(G) + \pi$ $\quad \psi' < 0$

(4) $r_E = \xi(E) + \pi$ $\quad \xi' > 0$

(5) $r_L = i_L + \rho + \lambda(L)$ $\quad \lambda' > 0$

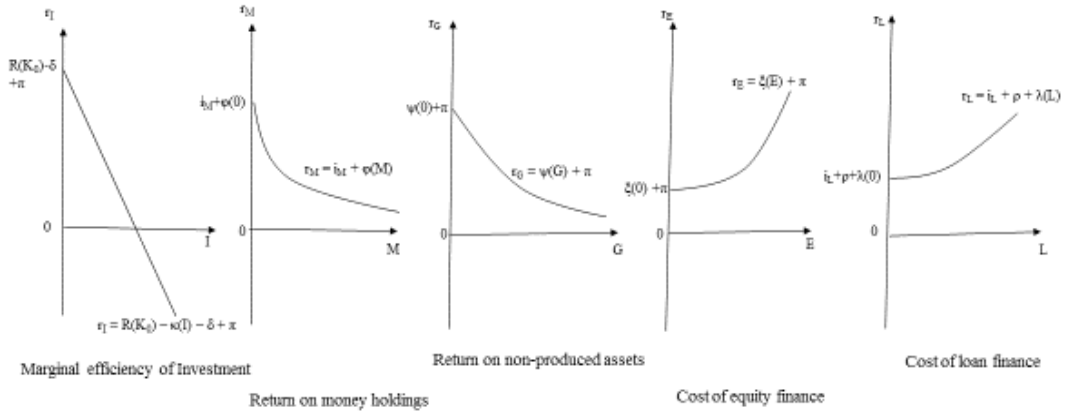
(6) $i_L = i_F$

(7) $i_M = [1 - k]i_F + c$

r_I = rate of return on investment (marginal efficiency of investment), $R(K_0)$ = marginal product of the existing capital stock (K_0), $\kappa(I)$ = marginal adjustment costs of adding new capital via investment, δ = depreciation rate, π = inflation, r_M = total return on money, i_M = deposit interest rate, $\varphi(M)$ = marginal own return on money from its liquidity services, r_G = total return on non-produced assets, $\psi(G)$ = rate of return on non-produced assets, r_E

= nominal rate of interest on equity finance, $\xi(E)$ = real cost of equity finance, i_L = wholesale cost of finance (i.e. money market interest rate), ρ = commercial banks' loan mark-up per dollar of loans, $\lambda(L)$ = default rate per dollar of loans, i_F = central bank policy interest rate, k = reserve requirements per dollar of deposits, c = commercial banks' administrative cost per dollar of deposits. Figure 4 shows the pattern of rates of return on different assets and the supply function for different types of finance.[7]

Figure 4. Total nominal rates of asset returns and costs of finance

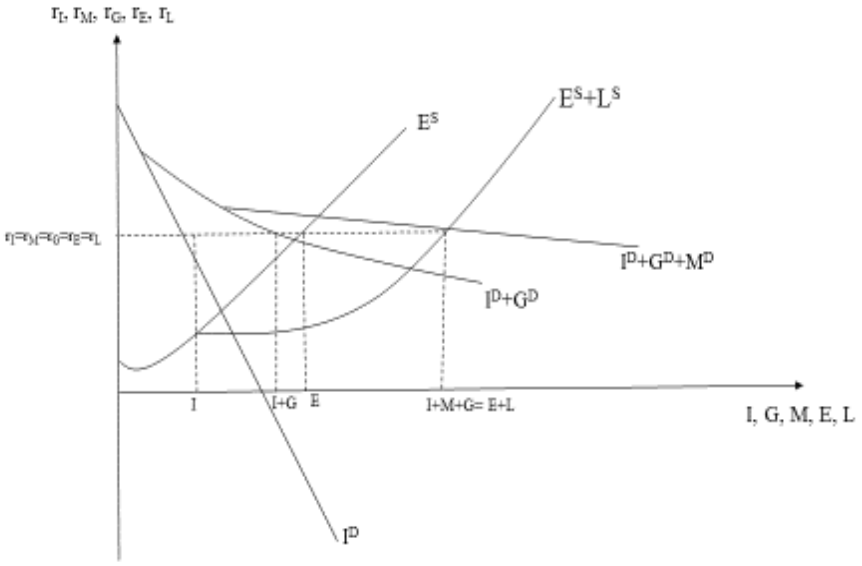


In equilibrium, firms equalize the marginal costs of sources of funds with marginal benefits from application of funds so that rates of return and cost are equalized. This implies the condition $r_I = r_M = r_G = r_E = r_L$. The solution is illustrated in Figure 5. The total demand for assets is obtained by summing the different asset demands. All variables are in real terms, deflated by the general price level. The total supply of finance

[7] The return on non-produced assets is adjusted stream of income from non-produced assets (R_G) divided by the nominal value of the stock of non-produced assets (G) plus inflation. The nominal value of the stock is $G = p_G G$ where p_G = nominal price of non-produced assets and G = stock of non-produced assets. This implies $\psi(G) = R_G/G$ and $\psi' < 0$.

is obtained by horizontally summing the different sources of supply.[8] The intersection of demand and supply determines the equilibrium return on assets and cost of finance. The mix of asset holdings and sources of finance is then determined by the individual demand and supply functions at the equilibrium rate of return.

Figure 5. Equilibrium financing, investment and asset holdings of firms in normal times ($i_F > 0$).
$r_I = r_M = r_G = r_E = r_L$



Monetary policy works by lowering the money market risk free interest rate. That shifts down the loan supply function and also lowers the return on money holdings (via a lower deposit rate). Total supply and demand shift down by an equal amount, which leaves the total size of the firms´balance sheet unchanged. However, there is a change in the composition of the firm´s balance sheet. First, firms switch from equity finance to loan finance because loan finance is cheaper. A lower policy interest rate induces firms to

[8] The supply of money is endogenous and determined by the volume of bank lending. The banking system's consolidated balance sheet constraint is given by Loans + Reserves = Deposits (L + kM = M). That implies M = L/[1 – k].

return equity to shareholders and adopt a more risky balance sheet financing structure. Second, firms reduce money holdings and increase investment (capital accumulation) and holdings of non-produced assets.

Now, suppose the monetary authority sets a negative interest rate by targeting a negative money market rate. The loan supply shifts down and its initial portion becomes negative. Money demand also shifts down and its end portion becomes negative. With regard to financing of firms, if the money market rate is sufficiently negative so that the loan rate is sufficiently low, firms may switch completely to loan finance. They do this via debt-financed share buybacks and special dividends that return all equity to shareholders.

With regard to asset holdings, even though the deposit interest rate is negative, firms still hold some money because the "own liquidity return" on money is positive and increases as the firm´s money holdings fall. Once the MEI falls to zero, no firm will invest more because they can do better acquiring the non-produced asset. Given the marginal return to non-produced assets is always greater than or equal to zero, there comes a point when all extra loan finance from negative loan rates will be directed to increasing holdings of the non-produced asset rather than investment.

The ZLB is not the problem. The problem is the existence of non-produced assets such as cash, land, commodities like gold, assets like patents and copyrights, and assets like technical knowhow and organizational capital embodied in existing firms. Negative interest rates will bid up the price of those assets but will not increase investment.

4. Other structural factors limiting investment

The above Keynesian analysis shows why negative interest rates will not increase

investment. Instead, firms will increase leverage, buy-back equity, and bid up the price of non-produced assets via take-overs.

Additionally, there are other structural factors that limit investment spending. First, production function theory is critical. In neoclassical theory additional capital can always be put to use because of perfectly smooth substitutability between capital and labor, which means it is impossible to have excess capital. However, if production is characterized by Leontieff conditions or capital is putty-clay in nature, it is possible to have excess capital in times of demand shortage, which will further constrain the sensitivity of investment to negative interest rates.

Second, capital is long-lived and lumpy. In a multi-period model, the willingness to use low interest rate loans to finance investment today depends on expectations of future interest rates. Even if today´s loan rates are negative, firms may be unwilling to borrow to finance relatively low yielding investment today if they think those investment projects will be saddled with future high loan interest costs.

Third, in neoclassical capital theory the MEI schedule is determined by technological conditions. Keynes had in mind a different construct in which the MEI depended on the state of animal spirits and perceptions of the fundamentally uncertain future. In this case the MEI may shift toward the origin in bad times, making it even more difficult to increase investment.

5. Can negative interest rates reduce saving?

The other side of the Keynesian AD shortage problem is saving. That raises the question if negative interest rates cannot increase investment, can they increase AD by reducing saving? Here too, the answer is probably not.

First, in pure consumption theory a lower real interest rate gives rise to both positive substitution and negative income effects. Consequently, the theoretical effect of lower real interest rates on consumption is ambiguous. The conflict between substitution and income effects is easily understood. Negative interest rates provide an incentive to save less and consume now. Balanced against that, negative interest rates lower future income and total lifetime income, which gives an incentive to increase saving to compensate for that loss. For instance, consider the case of a household which lives for two periods, has a zero discount rate, income of y in period 1 and zero income in period 2. The real interest rate is r. The optimal consumption plan has equal consumption per period so that $C_1 = C_2 = y[1 + r]/[2 + r]$ and period 1 saving is $S_1 = y/[2 + r]$. A lower interest rate lowers period 1 consumption ($dC_1/dr > 0$) and increases period 1 saving ($dS_1/dr > 0$).

Second, a negative nominal interest rate on money holdings (i.e. deposits) can be thought of as a form of tax on deposits. That lowers real wealth and will generate a negative "Pigou effect" on consumption spending and AD. Balanced against this, there will be a positive wealth effect on AD owing to the portfolio shift away from money to other assets that increases the price of existing assets.

Theoretically, the net impact of negative nominal interest rates on saving and AD is therefore ambiguous. Negative interest rates could reduce saving, but they could also increase saving. The saving function could be a positive function of interest rates ($S_r > 0$) but it could also be a negative function of interest rates ($S_r > 0$).

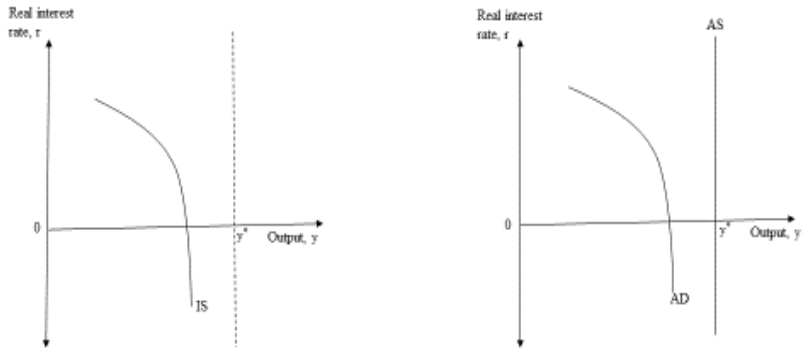
6. The slope of the IS and AD schedules reconsidered

The above theoretical excavation of saving and investment has profound implications for

the ISLM and AS-AD models. For a given the inflation rate, if investment becomes insensitive to the interest rate at certain point (i.e. I_r tends to zero as the nominal interest rate decreases) and saving is interest insensitive ($S_r = 0$), the IS schedule will become increasingly steep and eventually become vertical. This pattern is illustrated is in the left-hand panel of Figure 6. The same pattern holds for the AD schedule as illustrated in the right-hand panel of Figure 6. The effect of a lower interest rate on AD gradually diminishes and eventually becomes zero, at which stage the AD schedule is vertical.

There are two important implications. First, the impact of monetary policy, conducted via lower interest rates, will steadily diminish and eventually become zero. Second, there may be no interest rate that can ensure sufficient AD to deliver full employment. In technical terms, there is no "natural" rate of interest that equilibrates full employment AD and AS.

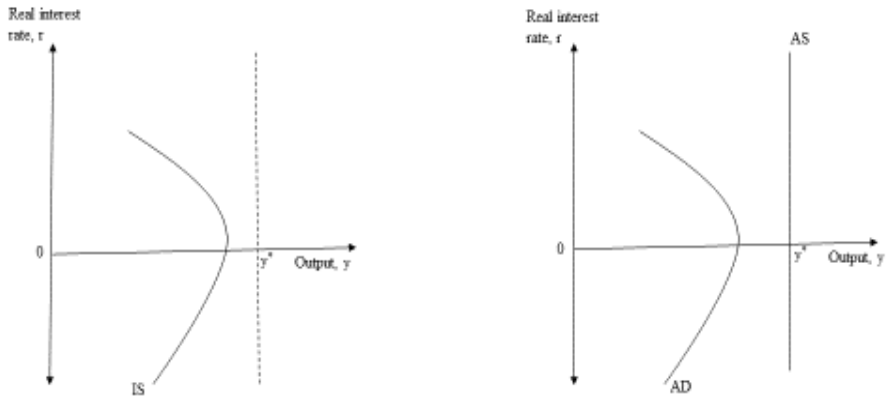
Figure 6. The ISLM and AS-AD models with interest rate insensitive investment and saving.



If the response of saving to the interest rate becomes negative (i.e. S_r moves from positive to negative as the nominal interest rate decreases), the situation may be even

more problematic. In this case both the IS and AD schedules may become backward bending as illustrated in Figure 7. In the region where the IS or AD schedule is positively sloped, lowering interest rates (and especially negative interest rates) actually worsens the shortage of demand and lowers output and employment. The economy may currently be in that region. In that case, ironically and completely contrary to ZLB economics, the perception of a ZLB may have acted as a stabilizing device to the extent that it has discouraged central banks from rushing into negative interest rate policy.

Figure 7. The ISLM and AS-AD models with backward-bending investment and saving.



7. Bank credit disruption, financial fragility, and financial disintermediation

Macroeconomic models have historically been thin in their representation of the financial sector, reflecting the mainstream economic view that money is "neutral" (i.e. impacting only the price level and inflation and not output and other real variables). That formulation means those models miss the adverse effects of negative interest rates working via the financial sector. These adverse effects include credit disruption in the

banking sector, promotion of generalized financial instability, and promotion of macroeconomic policy whiplash effects.[9]

(a) Disruption of bank credit

Negative interest rates can disrupt the provision of bank credit and also raise the cost of credit. Bank interest rates are determined as follows

(8) $i_L = i_F$

(9) $r_L = i_L + \rho + \lambda(L)$ $\qquad \lambda' > 0$

(10) $i_M = [1 - k]i_F - c$

i_L = inter-bank loan rate, i_F = central bank's money market target interest rate, r_L = bank loan rate, ρ = loan mark-up, $\lambda(L)$ = administration and default costs per dollar lent, i_M = deposit interest rate, k = bank reserves held per dollar of deposits, c = administration cost per dollar.

Banks are mark-up pricers. Equation (1) has the wholesale cost of finance for banks equal to the central bank's money market target interest rate. Equation (2) sets the loan rate as a mark-up over the wholesale cost of bank finance. The mark-up includes a profit margin plus all loan administration and default costs. Equation (3) sets the deposit rate. Deposits are perfect substitutes with wholesale finance, so banks pay an interest rate on deposits that is adjusted for the costs of reserve holdings and deposit administration. If k = c = 0, the deposit rate is the same as the money market rate.

At this stage, it is necessary to discuss how negative rates are implemented.

[9] It should be made absolutely clear that this disruption has nothing to do with reduced saving. Within a modern economy, money is endogenous and created by the act of bank lending. Credit disruption can occur because negative interest rates may change the behavior banks. Unfortunately, in classical loanable funds theory, negative interest rates may also disrupt credit by lowering saving, thereby lowering peer-to-peer lending of output ("corn"). It is this type of capacity to generate apparently similar outcomes that keeps the loanable funds model of credit alive despite its underlying microeconomic incoherence.

Option 1 is the central bank lowers its lending rate to commercial banks below zero. Option 2 is the central bank charges commercial banks with interest on their deposits of liquid reserves with the central bank. In practice, central banks have favored option 2 over option 1.

Option 1. If the central bank charges a negative lending rate, this implies $i_L = i_F < 0$. The deposit rate is strictly negative, and the loan rate can be negative if the central bank sets its lending rate sufficiently negative. As argued earlier, wealth holders will have an incentive to reduce money holdings and shift into other assets. Lower rates of return may then increase or decrease saving. As regards firms, they will not increase investment if the marginal efficiency of investment is negative. Instead, they will use credit to pay back equity (i.e. stock buybacks) and acquire non-produced assets (i.e. take-overs).

An important point about a negative central bank loan rate is that it is an implicit fiscal transfer, conducted via the central bank. Effectively, the central bank is subsidizing borrowing. Since existing borrowers will look to refinance existing loans, the central bank will likely end up refinancing much of the debt stock. Those who can borrow will also do so to buy non-produced assets that still have positive expected return, so debt would increase sharply and so would prices of non-produced assets. Viewed in this light, a negative central bank loan rate is a form of helicopter money that drops money on the debtor section of the economy. Via the intermediation activities of banks, it also impacts rates of return on assets. The fact that it is an implicit fiscal transfer, combined with the incentive it gives to increase the debt stock, may explain why central banks have shied away from setting a negative target interest rate.

Option 2 involves the central bank charging commercial banks interest on

reserves. This is a subtly different way of lowering interest rates. It works asymetrically by lowering the deposit rate but leaving the wholesale finance rate unchanged at $i_L = i_F$. The new deposit rate is given by

(4) $i_M = [1 - k]i_F - c - kp$

p = the interest penalty on deposits with the central bank. Since commercial banks deposit k of each dollar of customer deposits, the interest penalty that is passed on to depositors is kp. Charging a penalty on reserves imposes a cost on banks, and that cost is passed along to depositors.

On the positive side, a lower deposit rate induces a portfolio shift into other financial assets. That drives up asset prices and generates a wealth effect that stimulates consumption. On the negative side, lower rates on deposits are akin to a tax on that lowers interest income, which may decrease consumption spending and increase saving.

In addition to these simple effects, there are also more complex possible effects. Suppose depositors are valued by individual banks because they are a cheap and stable source of bank finance and deposits are acquired by building customer relationships. In that case, banks may refrain from passing on the cost to depositors for fear of losing depositors to other banks that are competing for depositors. In that event, the central bank's deposit charge will be shifted.

One possibility is that banks bear the cost, which will lower bank profits. That could cause banks to engage in credit rationing or withdraw from providing credit to particular markets and customers which are more risky and only marginally profitable. That would adversely impact AD.

A second possibility is that banks would pass the cost on to borrowers via higher

loan rates. In that case, the central banks attempt to generate negative interest rates to stimulate the economy would backfire in the form of higher loan rates that discourage borrowing and reduce AD. Asset prices could also fall if higher loan rates cause deleveraging of debt financed asset purchases. This would be good for reducing debt, but would be bad for AD and economic activity which is the motivation behind NIRP.

(b) Financial fragility and instability

A second financial problem from negative interest rates concerns financial fragility and financial instability, and there are many dimensions to this issue. In general, many of these concerns can also apply to lower interest rates, but they are amplified in an environment of negative interest rates.

With regard to the specifics of financial fragility and instability, the earlier analysis of investment showed that NIRP will promote risky balance sheet re-engineering by firms. Availability of negative interest rate credit will not induce additional investment. Instead, firms will use that credit to repurchase equity (i.e. shift toward debt financing) and to purchase on-produced assets (i.e. engage in speculative merger & acquisition activity). These are exactly the features we have seen, and the result is to leverage up corporate balance sheets. That leveraging of balance sheets creates financial fragility as increased debt makes firms vulnerable to future unexpected adverse developments. It also poses a threat to future economic activity by limiting firms' capacity to undertake future investments.

A second problem is that negative interest rates encourage asset price bubbles and fragile balance sheets. With regard to firms, there is an incentive to engage in credit-financed mergers and acquisitions. With regard to households, there is an incentive to

reduce portfolio holdings of money and bonds, and to increase holdings of risky assets and alternative stores of value in a chase a chase for yield and capital gains.

(c) Financial disintermediation and disruption

Another set of problems concerns financial disintermediation and disruption. Negative interest rates induce economic agents to reduce money holdings and look for other stores of value and media of exchange. As regards stores of value, this may show in the form of precious metals inflation, commodity price inflation and land inflation as agents look for other ways to hold wealth. As regards media of exchange, it may show in increased use of cash and credit cards, the introduction of new monies such as bit-coin, and devotion of more resources to minimize money holdings subject to holding charges.

These developments constitute a form of inefficiency that reduces potential economic output. Money reduces transactions costs. Imposing a penalty on money raises transaction costs, which can both discourage productive transactions and reduce the gain from those transactions that are undertaken. This constitutes an adverse "supply-side" effect of negative interest rates. Furthermore, particularly as regards use of cash, there may be adverse fiscal implications in the form of tax evasion and increased size of the underground economy.

Additionally, ultra-low and negative interest rates can cause financial disruption by jeopardizing the business models related to insurance and retirement income provision, which are large and important financial sub-sectors. Insurance companies rely on premium and interest income to meet claims, while pension funds rely on investment income to meet future pension payments. Both insurance companies and pension funds are threatened by ultra-low and negative interest rates which lower their income.

In response, insurance companies may raise premiums, which is the equivalent of a small tax that lowers aggregate demand. Both insurance companies and pension funds will also likely shift the composition of their portfolios toward risky assets, in a search for yield. That shift will add to asset price bubble pressures, and it also makes their balance sheets more fragile and vulnerable in the event of future asset price reversals. This vulnerability has no immediate impact today, but it is a channel for future economic disruption. That illustrates how use of monetary policy today can impose significant costs tomorrow.

8. Whiplash effects of NIRP

The potential future costs of financial fragility and asset price bubbles raise the prospect of policy whiplash effects. The core problem is the contradiction between current and future policy actions.

The economy currently suffers from shortage of AD owing to systemic failings related to income inequality and trade deficit leakages (Palley, 2009, 2012). That demand shortage was papered over by a thirty year credit bubble plus successive asset price bubbles, which eventually burst with the financial crisis of 2008. Now, central banks are seeking to revive AD via negative interest rates that will reflate the credit and asset price bubbles.

That process creates a contradiction. If the policy is successful, it will necessitate raising interest rates in future. That risks triggering another financial crisis as the new bubbles burst and the effects of accumulated financial fragility magnify the ensuing fallout. In effect, policy measures to revive the economy now can generate even greater imbalances and instability that produce whiplash effects later.

This whiplash process has been building for thirty years. Disinflation allowed successive lowering of interest rates from the double digit levels of 1980, thereby producing successively larger boom – bust cycles. That process appeared to be ended by the financial crisis of 2008 which pushed the economy to the ZLB. However, central banks have sought to circumvent the ZLB circuit-breaker via NIRP. If NIRP is pursued for an extended period of time, without remedying the deep causes of AD shortage, the prospect is a future more intractable economic crisis.

Each fresh crisis is harder to escape because the economy enters it with greater debt burdens and more fragile balance sheets. The history of successive crises may also induce a form of financial post-traumatic stress syndrome whereby businesses and households are psychologically scarred and fearful. That generates risk aversion which lowers investment and increases saving, thereby aggravating the systemic shortage of AD.

9. Competitive devaluation and NIRP

In addition to these adverse domestic economic effects, NIRP also has adverse international economic effects. Those adverse effects concern the process of competitive devaluation, which Brazil's former finance minister Guido Mantega, referred to as "currency wars" in 2010.

The problem of competitive devaluation was identified in the Great Depression of the 1930s and it produces "beggar-thy-neighbor" international economic relations. In an economic environment of demand shortage, countries have an incentive to depreciate their currencies. That makes their exports cheaper and imports more expensive, which together increases demand for domestically produced goods and services. The trouble is

the demand comes at the expense of demand for other countries' products: hence, the beggar-thy-neighbor label.

This problem was pervasive in the 1930s, and has re-emerged with NIRP which generates competitive devaluation on steroids. The reason is negative interest rates give investors an incentive to exit a country's money and exchange it for another's to earn higher rates elsewhere. This is exemplified by Japan, where negative interest rates have sparked a carry-trade that involves borrowing yen and then converting into dollars to buy higher yielding dollar denominated securities.

Competitive devaluation does not just shift demand between countries, it may also reduce total global demand. That makes it a negative sum game with a prisoner's dilemma structure. The reason competitive devaluation lowers global demand (i.e. is negative sum) is it creates financial uncertainty, which undermines firms' incentives to invest. Firms will refrain from making costly investments if they think exchange rate movements may undermine the competitiveness and profitability of those investments.

The reason it is a prisoner's dilemma is each country knows it will win big if it devalues and others do not. Therefore, each country has an incentive to devalue, but when they all devalue the result is global demand is reduced and all lose. This pattern is illustrated in Table 1 which shows the payoffs to a competitive devaluation game played between countries A and B. They would both be better-off if neither devalued (payoff = 0, 0). But each is better-off if it alone devalues (10 vs. -10). The result is both devalue resulting in the negative sum outcome (payoff = -5, -5).

Table 1. Competitive devaluation as a negative sum game between countries (payoff to A, payoff to B).

		Country A	
		Devalue	Do not devalue
Country B	Devalue	(-5, -5)	(-10, 10)
	Do not devalue	(10, -10)	(0, 0)

NIRP encourages competitive devaluation dynamics by encouraging carry-trade currency speculation and international chase for yield by investors. Furthermore, the incentive to competitive devaluation has been increased by neoliberal globalization. That is because globalization has encouraged an offshore manufacturing model in which developed countries either build export production platforms in developing countries or outsource manufacturing to those countries. Developing countries then sell that production in developed country markets. This has encouraged the phenomenon of export-led growth whereby developing economies grow by exports rather than by developing their own domestic markets.

Exchange rates are key to the export-led model, which intensifies the tendency toward competitive devaluation dynamics. The reason is the export-led growth model promotes intense competition between developing countries both for export markets and for new foreign investment. That intensifies the incentive for developing countries to

engage in competitive devaluation, and NIRP worsens that proclivity.

10. Political economy dangers of NIRP

A final set of problems with NIRP concern its political economy impacts. Like QE, NIRP aims to increase the price of financial assets – particularly risky assets like equities which become more attractive as interest rates fall. Since such risky assets are predominantly held by wealthier households, that further increases the relative wealth of those households at a time of heightened income and wealth inequality.

That may have significant adverse impacts on politics and policy. First, given the powerful role of money in politics, increasing the wealth of the wealthy enables them to further influence politics. Second, to the extent that the wealthy are satisfied with the impacts of NIRP, that diminishes the pressure for additional policies to strengthen the economy. As documented by political scientists Gilens and Page (2014), the affluent significantly get the policies they want. NIRP therefore does double damage: it has a plutocratic bias and it also removes the pressure for other more substantial policies.

NIRP also has profound effects on the outlook for retirement and retirement income. Lower interest rates reduce the capacity to save for retirement, and negative interest rates have an even worse effect. Ordinary households are more risk averse because of their lower wealth and inability to bear losses. Thus, asset price gains induced by policies like QE and NIRP are likely to bypass those households because they cannot afford to take the risk of holding risky asset classes and suffering potential future losses.

Historically, bank certificates of deposit (CDs) and bonds have provided returns with appropriate risk for such households, but NIRP takes both off the table. CD yields can go negative, while bonds become vulnerable to large price losses in the event that

future interest rates are higher. In a NIRP fed environment of asset price bubbles, ordinary risk averse households are stuck between the devil and the deep blue sea - the devil of negative interest rates and the deep blue sea of potentially disastrous capital losses from a burst asset price bubble. Moreover, this is particularly painful at a time when defined benefit pensions have been significantly eliminated and the risk of retirement income provision has been shifted on to individual households. This microeconomic impact is over-looked by monetary policy which tends to focus exclusively on macroeconomic concerns, and it explains why NIRP has contributed to fostering bitter political feelings that foster toxic political outcomes.

Younger workers are also vulnerable to NIRP induced asset market distortions. Those who acquire equities for their retirement portfolios risk large future losses if interest rates revert to normal levels, which is the express goal of NIRP. Historically, retirement income has been facilitated by an equity premium. NIRP risks transforming that into an equity penalty.

The problem is even worse with house prices, which are particularly prone to NIRP induced bubbles. House purchases are largely financed with mortgages, and lower interest rates therefore drive up prices by lowering mortgage payments and increasing cash-flow affordability. However, there are massive downsides stemming from mortgage debt. The interest payment on a $200,000 home at 6% is the same as the payment on a $400,000 home at 3%. Yet, purchasers are saddled with a larger mortgage that they must pay back in the future, and they also lose financial flexibility and are rendered more financially vulnerable.

As regards flexibility, if house prices subsequently fall back because interest rates

mean revert (i.e. revert to normal), then borrowers will find themselves underwater. That may prevent them from selling and moving to take up better economic opportunities. As regards vulnerability, if the household suffers an economic shock (e.g. a job loss), it may be unable to pay its mortgage and risks default and the lasting losses that go with that.

The benefits of NIRP induced stock price and house price inflation go to existing owners. Normal future capital gains are brought forward and transferred to current owners, while buyers are subjected to significant financial risk. Viewed in that light, asset price inflation is a form of inter-generational transfer that ladens the future with burdens and risks, and the transfer of future capital gains removes an important source of future economic stimulus.

Putting the pieces together, using NIRP to fight stagnation today is likely to be ineffective and possibly counter-productive for reasons discussed earlier,. At the same time, NIRP may shift stagnation into the future via asset transactions that burden the future, and that process can generate future disappointments and resentments that produce ugly politics.

11. Conclusion: the misguided new consensus of ZLB economics and NIRP

NIRP is quickly becoming a consensus policy within the economics establishment. This paper has argued that consensus is dangerously wrong, resting on flawed theory and flawed policy assessment.

Regarding theory, NIRP draws on fallacious pre-Keynesian economic logic that asserts interest rate adjustment can ensure full employment. That logic has been augmented by ZLB economics which claims times of severe demand shortage may require negative interest rates, which policy must deliver since the market cannot.

Regarding policy assessment, NIRP turns a blind eye to the possibility that negative interest rates may reduce AD, cause financial fragility, create a macroeconomics of whiplash owing to contradictions between policy today and tomorrow, promote currency wars that undermine the international economy, and foster a political economy that spawns toxic politics. Worst of all, NIRP maintains and encourages the flawed model of growth, based on debt and asset price inflation, which has already done such harm.

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