

# Monetary Policy in a Hayekian Supply Side Model

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## **ABSTRACT**

In this paper standard macroeconomic models are combined with the Hayek-Garrison model of the business cycle in order to demonstrate in which way modern central banks are prone to initiate boom-bust-cycles through monetary policy. It is shown under which conditions such a policy will occur and why central bank authorities tend to be misled by an apparently stable price-level. Without central bank interference, productivity increases due to technological advances, other cost reductions or an increased supply of cheaper labor would bring about temporary deflation. Left to its natural path, rising profits and a higher purchasing power would move the economy towards an expansion and increased expenditures. However, with central bank interventions that are directed at maintaining the so-called price level, the monetary authorities will expand the money supply and transform a productivity-led wealth increase into a debt-driven boom, which produces the foundation for the bust later on.

## **Basic Structure of the Model**

In this paper the commonly held notion is being challenged that when the economy achieves high rates of economic growth along with price level stability, monetary policy is at a neutral stance. It is shown that under the conditions of significant productivity gains, modern central banks create a credit-driven boom also when they achieve their inflation target.

Based on Mises-Hayek's business cycle theory (Mises 1912, Hayek 1931, 1941) as elaborated by Garrison (2001), the model presented here serves as a complement to the modern version of capital-based macroeconomics. Garrison (2001), Selgin (1994) and Salerno (2002) among others developed models that study the role of credit expansion in the business cycle and the role of deflation. The monetary expansion is the starting point of the boom bust cycle. Garrison in particular has advanced the Austrian theory of the business cycle by developing an approach that links features of standard macroeconomic modeling with Hayek's theory of the business cycle. These models concentrate on the intermediate period, on the analysis of the production structure in the upswing and downswing phase of the business cycle. The model presented here puts active monetary policy at the center of the analysis. It elaborates

the sequence that takes place when central banks aim at price level stability in a constellation when productivity gains would require temporary deflation.

By expanding the money supply and thereby bringing the monetary interest rate down, central banks transform the productivity-led economic expansion into a debt-driven boom. At the upper turning point of the cycle, the liquidity, which has been accumulated by various rounds of monetary expansion that were initiated in order to fight deflationary tendencies, shows up as open inflation when the productivity gains peter or when negative supply side shocks should occur. It is at this stage, when monetary policy loses control, as its instruments cannot be adequately calibrated in the inflationary phase and later on in the contractive phase.

### **Aggregate Demand and Supply**

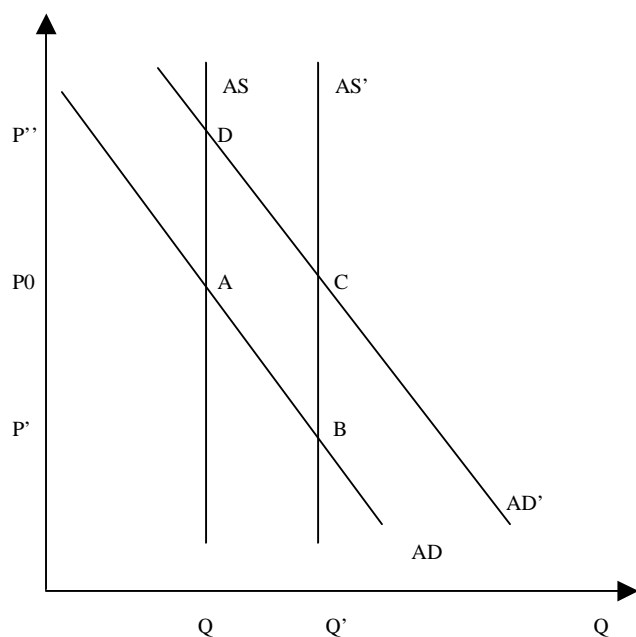
Money expansion comes along with new credit and represents additional expendable cash balances. This mechanism lies at the heart of Wicksell's loanable fund model (Wicksell 1898). An increase of the money supply augments the supply of loanable funds beyond autonomous savings and brings down the monetary interest rate below its natural level. Investors are being deceived about the sustainable size of funding and embark upon credit-financed expenditures that are not matched by the availability of resources to maintain the capital structure.

In the standard Keynesian macroeconomic models a monetary expansion augments aggregate demand and thereby national income. In real terms, however, the supply side conditions of the economy represent a production possibilities frontier to debt-driven demand. Monetary expansion comes with higher expenditures, but without a corresponding expansion of the supply side, this policy results in inflation when more money chases a limited amount of goods. In the aggregate supply and demand model, the intersection of the two curves determines the price level and output. The capacity of the economy to produce goods and services has a limit, which is given by the availability of the factors of production. A monetary expansion will increase aggregate expenditures, but it cannot augment at the same pace the availability of resources. This model explains the futility of trying to produce higher economic growth by expanding the money supply.

The aggregate supply and demand model is mainly used to demonstrate the impact of negative supply shocks and the futility of demand side policies as effective counter measures. A negative supply side shock would move the supply curve to the left, resulting in an economic contraction and a higher inflation rate. A stagflation of this kind cannot be effectively overcome by demand measures. Given the constraint that is represented by the steep part of the aggregate supply curve, demand expansion would not result in higher real growth but in more inflation. What happens, however, when concentrated technological progress occurs and/or when cheaper labor supply enters the market?<sup>i</sup> In the graph below (figure 1) this would move the aggregate supply curve function to the right (AS to AS'). While production would increase, this occurrence would also ceteris paribus produce a deflationary impact (movement from A to B in Figure 1).

Figure 1

Aggregate Supply and Demand



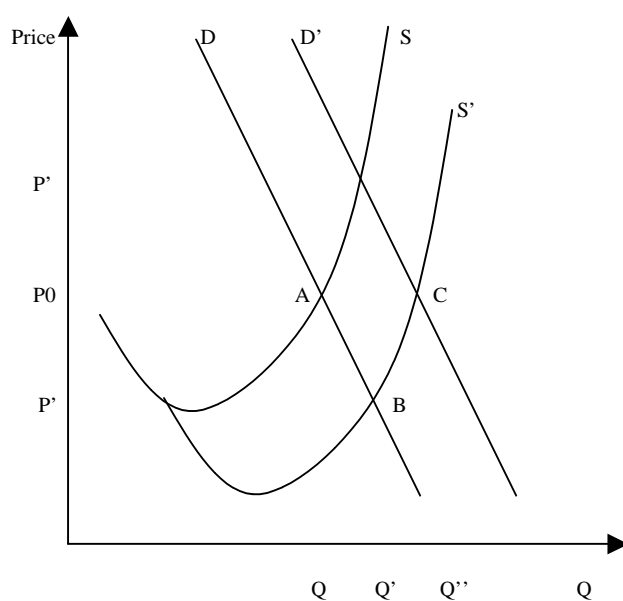
As presented in the graph (figure 1)<sup>ii</sup>, the rightward shift of the supply curve brings down the price level from  $P_0$  to  $P'$ . A deflation of this kind does not imply a recession: a higher real output is now available at lower prices. The economy has become richer due to a rising purchasing power. When left to its own, the deflationary impact would be short-lived and the economy would move more or less smoothly to a situation where aggregate demand through new investment and more consumption would rise (movement from B to C in figure 1). This was basically the scenario before the inception of modern active central banking: the ABC-movement, with the sequence of a shift of the equilibrium point from point A to B and then from B to C. Before central banks became active in monetary policy, recessions were short-

lived and recoveries happened accompanied by a relatively stable price level (Juglar 1889). Ups and downs in business activity occurred, but these moderate swings were correctly labeled as “business fluctuations”.

Before the inception of active central banking with fiat monies as their tool, the constraints on the money supply held back the boom and forced the economy on a path to gradual adaptation. There was no space for making the economic subjects think that scarcity had disappeared. The limited access to credit made the entrepreneur rely on generated profits and forced the consumers to live within his means. Loanable funds came from the savings out of income, and thus the additional resources for investment were set free by savers who gave up on higher consumption for some time. Business fluctuations happened, but after the spurt of inventions or increasing labor supply, wages and profits became normalized when money wages would rise and the boost of technological progress would peter out and continue at a slower pace for the next period until a new wave would appear.<sup>iii</sup>

At the micro-level, the productivity gains and the other cost advantages will mean a right-downward shift of the marginal cost curve that represents the producer’s supply curve (see figure 2). Firms can provide a higher quantity at lower prices (point Q’).

Figure 2  
Productivity Gains at the Individual Company



With monetary expansion, additional nominal demand is fed into the system and shows up in higher demand (D'). While output will further expand to Q'', product prices will also rise and eliminate the original effect of the higher productivity on prices (point C in figure 2).

Without central bank intervention, the companies that benefit from the new technology and cheaper factors of production<sup>iv</sup>, would move towards producing at point B and thereby generate the funds to increase investment and provide the basis for higher income from which higher authentic savings can be obtained. The whiff of deflation dampens the boom, but it provides also the conditions that the following expansion can be achieved without credit expansion. The natural rate of interest is not artificially lowered by central bank intervention, and the economic expansion is led by productivity gains and funded by authentic savings.

In a credit-driven boom, instead, the increase of loanable funds is provided by the monetary expansion and is not supported by savings out of income. With the interest rate artificially lowered, the competitive situation forces the company to expand production furthermore (and move to producing at point C with an output of Q'' in figure 2). Without credit expansion, demand follows supply; under the condition of monetary expansion, supply is forced to catch up with higher nominal demand that comes from the credit injection. The natural path of the expansion is being transformed into an economic boom.

### **Productivity-led versus credit-driven booms**

With the inception of active central banking the natural process of adaptation has undergone a profound change. In contrast to the situation of passive central banking, modern central banks aim at maintaining a certain inflation rate and want to foster economic growth. The inflationary bias has characterized modern central banks since they were institutionalized as fiat money managers shortly before and during World War I (Rothbard 1999). Typically, modern central banks define "price level stability" as a positive range of the inflation rate and not as a range around zero or call their policy aim right away "inflation targeting".

The inflation-bias of modern central banks lays the groundwork for the occurrence of major boom and bust cycles. Under the absence of substantial technological progress, modern central banks produce inflation; in periods of intensive technological progress they achieve lower inflation rates but thereby they produce credit-driven booms that do not show up

immediately in the consumer price index. Modern central banks transform a productivity-led economic expansion into a credit-driven expansion that is unsustainable. Instead of the natural AB-BC-shift, central banks strive to make the AC-shortcut as seen in the model (movement from A to C in figure 1). Assured that there is no excessive inflationary risk, monetary policy applies expansive measures and produces a monetary interest rate below its natural level. This policy moves the economy to higher debt levels. Productivity gains make it possible that credit expansion comes without price inflation as measured by the consumer price index.

Expansionary monetary policy shifts the demand curve to the right as a means to counter the deflationary impact of the cost reductions. Instead of producing at point B, the economy is pushed to C. The effect of central bank policy is that an artificial boom is being created, while this higher growth comes along with a stable price level. Apparently, central bank policy is vindicated. By increasing the money supply, the inflation target will be achieved, and the economy will experience an additional boost this time coming from the demand side. Such an expansion is quite different from a movement that would occur without central bank intervention.

By not letting deflation occur as the natural consequence of productivity gains and other cost-reductions, central banks transform an economic expansion that began on the supply side into a demand-led and credit-driven boom. Given that the period of high concentrated technological progress occurs in time spans covering often many years, this process of monetary expansion in the face of potential deflation tends to be repeated several times. Each time when the central bank authorities fear deflationary potential, they will be inclined to augment the money supply, thereby pushing the economy to higher debt levels. A period like this will be characterized by high economic growth rates combined with low inflation rates as long as the productivity advances continue at a high pace and when no adverse supply-side shocks occur.

The transformation of the original expansion based on the productivity gains to a boom, which happens under the guidance of modern central banks, implies that with each intervention the debt levels are brought to higher levels. Businessmen cannot simply opt out and renounce new credit that is offered at these low interest rates. The competitive situation forces the individual business to invest in the new technology when it becomes financially obtainable. The interest rates works like any other price. In the same way that businesses will increase or reduce production when prices are raised or lowered by interventions in the goods

markets, they must react likewise to the interest rate be it above or below the natural market equilibrium.

Credit expansion implies the built-up of an overhang of liquidity. When central banks continue to expand the money supply even when the productivity increases begin to peter out or when adverse supply-side shocks occur, the liquidity will show up in the form of an open inflation. When the productivity increases no longer happen, the overall monetary expenditures are confronted with the vertical supply function. Further expansions of the money supply will produce inflation. At this stage, monetary policy transmits directly into the price level.

### **Monetary Policy in the Boom Bust Cycle**

When inflation begins to accelerate, the velocity of money circulation increases also, and amplifies the expansive monetary impulses; when the bust sets in, the velocity of money circulation will contract. It was this phenomenon of a collapsing money supply that attracted the attention of the monetarists. The basic error of monetary policy, however, is not the inactivity of central banks in the slump, but the active stance at the inception of the boom, when central banks lower the monetary interest rates and feel vindicated by an apparently stable price level. Fooled by the absence of the direct link between monetary expansion and the consumer price level under the condition of productivity gains, this relationship revives in the second stage, while in the contraction phase, the link breaks down again.

The monetarist view is based on the equation of exchange and holds that the monetary aggregate (M) multiplied by its velocity of circulation (V) is identical to nominal national income (Y) that in turn can be split into the price component (P) and its real value (Y<sub>r</sub>).

$$(I) \quad M \times V = P \times Y_r$$

Assuming that real economic growth is determined by non-monetary factors and that the velocity of money is trend-stable, the relationship between the monetary aggregate (M) and the price-level (P) becomes proportional. In the monetarist perspective there is a direct link from the variations of the monetary aggregate to the price level.

$$(II) \quad P = f(M)$$

As Garrison (2005) explained, this model suffers from over-aggregation. Disaggregating the real side of the economy ( $Y_r$ ) opens the black box of  $Y$  by differentiating between final investment goods ( $Q_i$ ) and consumption goods ( $Q_c$ ).

$$(III) \quad MV = P (Q_c + Q_i)$$

In the Garrison model the analysis is focused on the stages of production and thus a further dis-aggregation in terms of the stages of production (given by  $Q_2 + Q_3 + \dots + Q_n$ ) is required:

$$(IV) \quad P (Q_c + Q_2 + Q_3 + \dots + Q_n)$$

Taking the Garrison-version of the equation of exchange as a starting point for our analysis in order to demonstrate the effects of monetary policy, it is necessary to disaggregate slightly more the variables of the equation. The monetary aggregate  $M$  consists of the monetary base ( $MB$ ) multiplied by the monetary multiplier ( $m$ ) while on the right side of the equation three types of transactions need to be differentiated when assets along with investment and consumption goods are included. This way the standard equation of exchange is disaggregated into the monetary base ( $MB$ ) and the monetary multiplier ( $m$ ) on the one side, and into consumption goods ( $Q_c$ ), final investment goods  $Q_i$  and assets ( $A$ ) and their respective price levels on the other side (equation V).

$$(V) \quad MB \times m \times V = P_c (Q_c) + P (Q_2 + Q_3 + \dots + Q_n) + P_A (A)$$

It is mainly the monetary base that is under direct control of the central bank. Although the other variables are not completely autonomous, their link to central bank actions is rather loose. As shown by the equation above (equation V), the monetary impulse coming from the monetary base can transform into various degrees of strengths depending on the monetary multiplier and the velocity of circulation, and from there it can affect in different degrees the components on the right side of the equation. In turn, the performance of these components will also have a feedback on the monetary multiplier and the velocity of circulation.

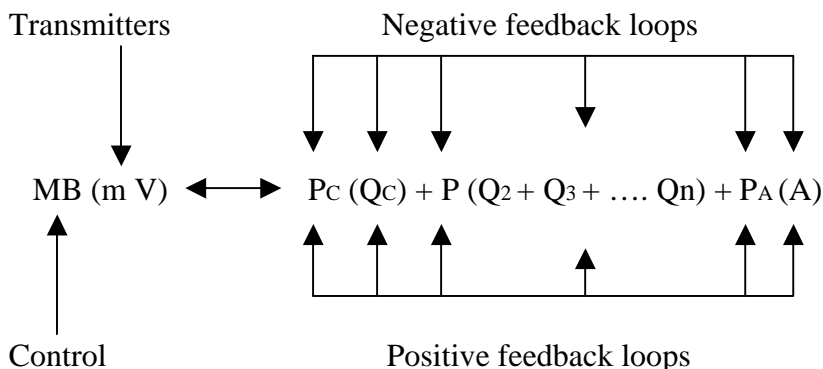
The expansion of the monetary base can affect both the consumer goods and the investment goods, and, as Garrison has shown following Hayek, within the investment goods the different stages of production. However, variations of the monetary base may likewise affect

asset prices and the effect of a certain quantity of variation of the monetary base can be amplified or minimized by the monetary multiplier and by the velocity of circulation. If expansive monetary policy takes place in an environment of compensating productivity or other cost reduction gains, prices for investment and consumption goods need not rise and the excess liquidity would go into the asset markets.

Slightly more disaggregating the equation of exchange ( $V$ ) shows the complexity of monetary policy. If central banks should meet their inflation target ( $P_c$ ), so the model suggests (see figure 3), it is more likely to be the result of a specific constellation brought about by other factors than the accurate management of the control variable ( $MB$ ).

Figure 3

Monetary policy as a control system



Theoretically, a monetary impulse coming from the monetary base ( $MB$ ) can be amplified or nullified depending on the value of the monetary multiplier ( $m$ ) and the velocity of circulation ( $V$ ). Even when assuming the rare case of smooth transmission, the question arises as to which degree the different variables react to the original monetary impulse. A variation of the monetary base may go into the prices of consumer goods, or it may affect mainly the prices of investment goods, or the excess liquidity may go into the asset markets. When the main impulse goes to the investment goods, it will affect differently the various stages of production. Here, like with the other two transaction classes, it cannot be determined ex ante, how the impulse transmits from prices to quantities. In addition, there is also takes a feedback place among the three transaction classes (consumer goods, investment goods and assets). The

original impulse that comes from the monetary base will affect the different transaction classes, and have a different feedback on the monetary multiplier and the velocity of circulation.

Given that there are no constant quantitative relations among the variables, central banks will be unable to calibrate their policies. One can know the direction of the impulse, in the general form that a monetary expansion tends to increase prices and that it tends to accelerate the velocity of circulation and the monetary multiplier and vice versa that a monetary contraction tends to lower the price level or put a break on its expansion while also amplifying these effects when the variables  $m$  and  $V$  contract. Both impulses become amplified, in an accelerating way with monetary expansion, and in a contractive way with a restrictive monetary stance.

### **Is Modern Central Banking a Fashion Industry?**

Since its inception, modern central banking has gone through various fashions and has adopted opposing paradigms. In the 1920s, the U.S. central bank had a deeply Fisherian character, as Irving Fisher laid it out by promoting the central concepts of modern monetary policy such as the “price level” (Fisher 1922). In the great wars of the first half of the 20th century, central banking has adopted a political character and its role became that of supporting the war efforts. In the 1960s and 1970s, many central banks adopted a Keynesian perspective only to make a 180-degree turnaround in the late 1970s when they embarked upon the monetarist experiment. Since the late 1980s most central banks, and prominently the Federal Reserve System, have turned away from the monetarist quantity formula and have focused on “price-level stability” in the form of a pragmatic inflation targeting approach. Central banking has gone full circle and since the 1990s it has become “Fisherian” again.

In the heydays of academic Keynesianism its adherents tried to make belief that they could retool the world and usher the economy into a golden age of permanent high growth. This model broke down intellectually and practically by the monetarist counter-revolution and due to its ineffectiveness to cope with the stagflation in the 1970s. In the late 1970s and early 1980s, the monetarist conception collapsed at the practical level when the direct linkage between monetary aggregates and the price level disappeared. In the 1980s came supply-side economics as a practical policy concept, and intellectually the rational expectations movement

revived neoclassical economics. Along with these developments, the real business cycle models came into prominence.

All of these schools foresee in one way or the other an active role for government and central banks. The real business cycle models put the role of money and credit to the sidelines and concentrate on technology shocks as the prime movers of the business cycle. As to monetary policy, they claim a role for the central bank that stresses “credibility” and “time-consistency”. While monetarism broke down when the assumed trend-stability of the velocity of money disappeared, and when it became more difficult to define exactly what monetary aggregate should be considered as the essential variable, the real business cycle models have resurrected central banking as the guardians of financial system stability.

Along with these changes of fashion, the rational expectations models have put Keynesian and monetarist theories on its head. In the rational expectations models, the macroeconomic insight dominates business action. What these models neglect is the pressure of the market forces. When monetary policy lowers the interest rate and credit becomes cheaper, investments that were unprofitable before the interest rate cut, now become attainable. In a competitive situation this means that companies must acquire new equipment that is more efficient. The interest rate works like any other price. In order to maintain competitiveness, each individual business is forced to obtain the new equipment. There is no room for rational (macroeconomic) expectations in the business world. Macroeconomic models cannot serve as a reliable guide to business action. What counts are prices. When prices – in this case for credit—get distorted, business decisions get distorted, too.

### **Implications for Monetary Policy**

Under the condition of major cost reductions due to intensive technological progress or because cheaper factors of production become available, a monetary policy oriented at price stability is prone to initiate an unsustainable boom. Instead of allowing deflation to run its course, monetary authorities pursue so-called stabilization policies. This way they push the economy on a path to debt accumulation. The more intensive the technological advances and the cost reductions will be, and the longer the period will continue when monetary policy holds down the interest rate, the more the economy will be induced to increase its debt levels.

The size of the debt level relative to the productive base at the peak of the boom will make monetary policy ineffective once the contraction phase takes hold.

In the case of a dearth of productivity gains and under the condition of rising labor costs, the inflationary bias of modern central banks produces inflation and stagflation, as expansive monetary policy feeds directly into higher consumer prices. It is mainly under the conditions of high productivity gains or when other factors bring down production costs on a large scale that central banks have an easy shot to achieve “price-level stability” or rather hold the inflation rate within the established target. This way, however, central banks are misled about the consequence of monetary expansion, as it does not yet show up right away in the consumer price index. By ignoring the role of the interest rate on the capital structure, monetary policy amplifies the economic expansion that began on the supply side and turns it into a demand-driven boom based on credit creation.

The critical stage and the turning point take place when the phase of concentrated technological progress ends and/or when an adverse supply-shock occurs. Then, the foundation on which the pyramid of debt was erected breaks away. Debt-free growth could have been achieved if the central bank had let work out the short-lived deflationary episode, but instead the monetary authority, in their endeavors to fight deflation, have created a credit-driven boom. At the first stage of the monetary expansion, the managed interest rate produces an economic boom; at the peak of the boom, the debt-load has made the economy vulnerable to adverse supply shocks. Shocks that would hardly affect a robust economy now represent a threat. Central bank management becomes increasingly precarious and the tendency increases to fight as long as possible against any potential downturn with further increases of the money supply.

In terms of the capital structure of the economy (Garrison 2001, 2005), both, the goods nearer to the consumption side and those nearer to the investment side with a larger time horizons get the main incentives from monetary expansion. For the consumer, consumption goods become more easily attainable, while for businesses the acquisition of better capital goods that render higher productivity can be financed more easily. With authentic savings, savers reduce their potential consumption and provide funds for investment and/or consumption by the credit takers. With monetary expansion, more savings appear to be available than there are in terms of the availability of resources, and demand for investment goods (particularly at the

early stages of the production process) will increase along with the demand for consumer goods.

At the end of the boom phase, productivity gains will peter out or adverse supply side shocks will occur that no longer can be easily absorbed. With the absence of compensating productivity gains, monetary impulses now feed directly into the goods prices. In the model the aggregate supply curve moves to the left. When central banks continue with monetary expansion, inflation will result. With inflation rising, the monetary multiplier and the velocity of circulation tend to increase and drive furthermore the price level upward. When instead central banks try to counter the higher price level, a contraction of the monetary multiplier and the velocity of circulation will amplify the restrictive stance of monetary policy.

The model presented here may shed new light on what happened in the United States in the 1920s and what has been going on since the mid-1990s. The model can also shed new light on the great boom and bust cycles that happened in Japan in the 1980s and what has occurred in developing countries, such as, for example, in Brazil in the 1960s and 1970s during the time of its “economic miracle”. The basic structure of the model can also be applied to the boom-bust cycle of the 1980s and 1990s in a series of South-East Asian countries and may serve as a framework when studying what is currently happening with China’s economy.

Great economic booms are characterized by high productivity gains due to new technology and often by a concurrent increase in the supply of cheap labor. By not allowing deflation to run its course under these conditions, central banks boost the boom even when they meet their inflation target. They provide ample liquidity in a situation where deflation would be required. The expansion of the money supply beyond authentic savings comes along with increasing debt levels. In such a situation, manufactured by central banks, when an excessive debt level relative to the productive base has been reached, deflation indeed becomes a problem.<sup>v</sup> In a low-debt economy, the positive effects of deflation in terms of increased purchasing power outweigh its negative side and will be beneficial. In a high-debt economy, deflation becomes vicious. Therefore, modern central banks will be inclined to make the debt surge go on as far and as long as they can.

The model presented here does not provide a recipe to cure the slump. The policy implications of this model are quite different from the post mortem cure-theories. In the perspective of the model presented here, the cure for the boom bust cycle is the prevention of

the excessive boom. However, there is little reason to expect that central banks would accept deflation at a stage in the sequence of the business cycle when it is possible to fabricate a boom with only moderate inflation rates. Therefore, the more general conclusion of this model for monetary policy says that instead of pursuing the futile endeavor to improve central bank management, one should search for institutional solutions that make the monetary system more autonomous beyond the need of active central banking.

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<sup>i</sup> One may think here of the information technology advances of the 1990s and the entry of millions of new workers into the global market after the end of the Communist rule in Eastern Europe and the entry of China and of other countries into the world economy. One may also think here about the effects of the mass availability of the new means of transportation and the concurrent technological advances in the 1920s.

<sup>ii</sup> In this presentation, the aggregate supply curve is to represent the production possibilities frontier of the economy. This way, the interpretation here deviates from the standard textbook interpretations and is compatible with the Garrison-model. Many of the standard textbook presentations of the aggregate supply and demand model make a problematic distinction between the “short run” and the “long run”. This ambiguity is avoided here when the aggregate supply curve is interpreted as the production possibilities frontier. As to its micro-foundations, the curve as interpreted here reflects the steep part of the marginal cost curve. Among the standard textbooks, the Baumol/Blinder (1997, pp. 628-642) interpretation of the aggregate supply curve comes most closely to the view adopted here.

<sup>iii</sup> “The international gold standard at the beginning of the twentieth century operated smoothly to facilitate trade, payments, and capital movements ... The world price level may have been subject to long-term trends but annual inflation or deflation rates were low, tended to cancel out, and preserve the value of money in the long run. The system gave the world a high degree of monetary integration and stability.” (Mundell, 2000, p. 328)

<sup>iv</sup> By large technological progress the whole economy may benefit and not just those companies that offer the new technology. One may think how the substitution of the horse carriage by train and trucks has increased productivity in almost all industries, and how the use of modern information technology impacted as a cost-reduction device upon almost all kinds of production.

<sup>v</sup> Irving Fisher who was an exuberant cheerleader of the stock market boom in the 1920s, changed his intellectual course in early 1930s when he published his “deflation theory of great depressions”. Fisher’s analysis (1933) saw the accumulated debt of the previous boom as the main cause for the persistence of the depression: “Thus over-investment and over-speculation are often important; but they would have far less serious results were they not conducted with borrowed money ... The same is true as to over-confidence. I fancy that over-confidence seldom does any great harm except when, as, and if, it beguiles its victims into debt.” (p. 341)

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